Part III – Limits to Managing the Environment[1]

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Part III investigates some of the limits and contradictions of management of the environment and its resources, through detailed discussions of key dimensions of applied environmental management. This part introduces studies of 1) resource management (rivers as well as recycling), 2) specific techniques drawn on in corporate and public environmental management (suggestion schemes, and respectively, visualisation techniques), and finally, 3) policy discourses (Clean Development Mechanism). The studies presented here are linked by a common thread which recognises that the historicity of environmental management as a social practice requires us to scrutinise its specificity as a practical, social, cultural as well as political achievement. The ascension of science and modernity gave rise to a qualitative change in cultural conceptualisations of the human-nature relationship: nature became an object to be 'managed' by so-called experts. By now, however, environmental management has come under critique in that what it proposes as solutions may simultaneously comprise the causes of environmental problems. First, the means used by environmental management can be identified as instances of modernism, industrialism as well as capitalism. Second, scholars of environmental problems criticise the 'instruments' of environmental 'management' for reproducing the problems, rather than solving them. To examine how environmental problems ought to be approached a critical stance is now seen as essential. Necessarily then, do issues of ideology, epistemology and theory crop up.

Thus, Chapter 18 examines the knowledge drawn on by environmental managers within Corporate Energy Management. This provides a perspective which makes the practices of actors in environmental management an object of study. Chapter 19, on River Management, continues on this line of critique by establishing the interactions between a managed environmental resource, a river, and various people in its context as apt for investigation. The author urges us to reconsider the concept of 'management' itself.

Chapter 20, on Visualising Nuclear Landscapes, provides insight into the minute details of a ubiquitous technique, image production, and its effects. By teasing apart simulations and manipulations, the author foregrounds how phenomenological approaches help to conceptualise the reality of environmental management.

[1] For the chapters, presented in this part, we gratefully acknowledge the grant by the UmweltEuro by Brandenburg University of Technology.

In Chapter 21, focusing on how Clean Development Mechanism (CDM) outsources emissions, the author renders a discourse on ecological modernisation and its respective short-comings. Through this angle, an understanding of CDM as externalising, rather than internalising, carbon emissions emerges. Finally, Chapter 22 on Sustaining Waste ascertains the need for analysis to be theoretically informed by problematising the hegemonic practice of recycling. The practical use of theoretically reconceptualising an environmental manager who is setting up a recycling scheme – which sustains, rather than challenges, the mode of resource consumption – is illustrated.

18 Knowledge for Corporate Energy Management - Structural Contradictions and Hope for Change?

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18.1 Introduction

'Energy' has been continuously a topic in Western discourses on environmental and technology politics, at the latest since the global oil crises between 1970 and 1980. Potential for private sector innovation to put environmental protection goals into practice is considered significant. Implicit to the aims of energy efficiency and safe energy is the presence of actors who support corporations in reaching these aims. These agents of ecological modernisation, i.e. *environmental managers*, and their practices have rarely been scrutinised. This paper, therefore, aims to make them the object of enquiry – approached from a *Science and Technology Studies* perspective. This article studies the implications for knowledge politics of techno-economic decision-making by such an actor within the energy management at a site of a multinational corporation. Based on ethnographic research at the site the article focuses on an instance of a management tool, corporate suggestion schemes, to mobilise workers' ideas of improving the environmental performance. With this it becomes possible to attend to how corporate agents of ecological modernisation deal with the issue 'energy'. We find that the manager uses specific *forms of knowledge* – adequate to the discourse of ecological modernisation – while, however, sidelining alternative forms. Thus, the latter are lost to sustainable development. It is concluded, that the actors' knowledge practice renders corporate energy management unsustainable. To conceptualise a way out of this dilemma the article draws on theories of grounded utopias.

The global oil crises between 1970 and 1980 provided a discursive environment from which 'energy' emerged as a continuing topic in Western discourses of environmental and technology politics. Actors within this discourse normally consider potential for innovation in the private sector significant to achieve environmental protection goals. These aims are for example energy efficiency and saving energy. This presupposes the presence of actors who support corporations in reaching these aims. Within the environmental management discourse we normally conceptualise these actors, i.e. environmental managers, as acting rationally and grounded in scientific decision-making. Ecological Modernisation Theory, as con-

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ceived by e.g. Jänicke (2008) and Mol (2006), helps to conceptualise this rationality. To investigate this normative form of acting, a perspective which focuses on *how actors know* seems apt[1]. Therefore, this article draws on approaches developed within *Science and Technology Studies* (STS) to illustrate how we can focus on knowledge practices of corporate energy management.

If knowledge practices are enacted in the 'social' then we need to expect political implications as well. That is why this article studies the knowledge politics implications of techno-economic decision-making by an actor within the energy management at a site of a multinational corporation. The case which I use to illustrate this discussion is based on ethnographic research. This case provides an instance of a specific kind of management tools, so-called corporate suggestion schemes. In the instance discussed below, this tool was applied to mobilise workers' ideas of improving the corporations' environmental performance. To question the practical implications of this tool I draw on sociologies of human-nature relationships as well as their mediation by science and technology[2]. Fundamental to this approach is the understanding that knowledge is shaped culturally and, thus, a *variety of knowledges* on environments and their relation to societies exist[3]. Relying on this theoretical and conceptual base the paper addresses the question of how to problematise the societal and, following from there, ecological implications of the knowledge of corporate energy managers. While much research exists on organisations' approaches to 'green' themselves rarely can we find studies focussing on the environmental manager herself[4]. This paper aims to contribute to critical, rather than merely affirmative, research on the practices of these managers. This requires breaking with the fundamental norm of research within environmental management, i.e. that principally science is on the right track and environmental problems can be solved with (social) technology, as suggested by Ecological Modernisation Theory (Christoff 1996)[5]. Thus, as a contribution in the critical tradition I aim to point towards structural contradictions in reality. The empirical background of this discussion is an ethnography taking place at five multinationals, including Daimler and Deutsche Telekom inspired by the field of anthropology[6] between 2007 and 2011. My qualitative interpretation is based on field notes and is analysed with TAMS[7].

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[1] I reasoned elsewhere why the investigation of the actual, rather than the presumed, realities of environmental management needs to be postulated and carried out (Lippert 2010).

[2] Especially Actor-network theory and Bourdieu's thought influenced this analysis. Cf. e.g. Callon (1981, 1999) Bourdieu (1981, 1992) as well as Shackley and Wynne (1995).

[3] Haraway (1991) spread the notion of the plural of knowledge, i.e. knowledges, into a number of disciplines.

[4] Cf. Howard-Grenville (2007). She seems to be one of the first who carried out an ethnography of corporate environmental management. See also my other chapter in this book.

[5] For recent discussion cf. e.g. Mol and Sonnenfeld (2000), Buttel (2000), Jänicke (2008).

[6] See e.g. Malinowski (1922), Thomas (1993), Marcus (1995), Graeber (2004).

[7] Cf. Emerson (1995) and Weinstein (2006).

This paper is organised into five further sections. First of all, I shall sketch what I refer to as rationality of environmental management by drawing on Ecological Modernisation Theory, which aims at describing and explaining ecological modernisation as policy and practice. Afterwards I turn to the case which provides the empirical ground for questioning the political implications of using specific forms of knowledge in environmental management practices. After the analysis the article presents a brief theoretical excursion into ways out of the problems analysed and, thus, thinking possibilities of utopia. Finally you will find concluding remarks to emphasise the key contradiction in our case.

18.2 Rationality within Environmental Management

The fundamental claim of the ecological modernisation (EM) thesis is that to reach a balanced relationship between industrialised societies and their environment, these societies need to engage with nature *more technoscientifically and in ways more mediated by the market economy*. Buttel (2000, p. 61) summarises:

> "An ecological modernization perspective hypothesizes that while the most challenging environmental problems of this century and the next have (or will have) been caused by modernization and industrialization, their solutions must necessary lie in more – rather than less – modernization and 'superindustrialization'."

Thus, a better world is envisioned as coming about through making the status quo compatible with environmental needs by continuing the social and economic trajectory, with more of the practices[8] already occurring. The EM thesis construes the global environmental crisis as being transcended (Clark and York 2005, p. 410). The EM discourse postulates innovations[9] which are ecologically less detrimental or even benign both for the realm of material technology as well as social institutions. From a technoscience point of view there is no near end to ecological innovations: Efficiencies are thought to be easily calculable. Technoscientific progress constantly produces knowledge about eco-efficiency and creates artefacts which are seen as less polluting or even contributing to the environment[10]. For example,

[8] For example they suggest the continuation of developing 'sustainable technologies' (which everything can be called, i.e. storing recovered carbon dioxide emissions under pressure in the earth (sequestration)).

[9] I use the concept innovation without being familiar with innovation theory. By using 'innovation' I refer to changes which can be seen as stable, relative to the context they are in.

[10] Cf. Buttel (2000, p. 63). Elaborated versions of this kind of technoscience progress literature are limited to life cycle assessments. They tend not to include critical postmodernist contestations such as developed within the field of Science and Technology Studies and Critical Realism, which question the progress ideology (cf. Haraway 1991; Potter and López 2001).

cars are thought to be producible using less and less material and energy input, consuming less petrol and being better recyclable.

Social innovations refer primarily to innovations in management technologies and organisational structures of all kinds. For example it can be seen as an ecological innovation that universities teach industrial ecology, environmental management and environmental sociology[11]. Basically, any instance of implementing (social) technologies[12] which benefit the environment can be seen as an ecological innovation[13]. Important innovations that are widely discussed are the forms of integrating environment as an issue in governmental authorities and businesses[14]. Unsurprisingly, it is always possible to construct *best practice* cases and find institutional learning processes[15]; people today are more aware about environmental issues. Unfortunately, this social ecological innovation does not necessarily and indeed is unlikely to lead to material ecological innovations[16].

Thus, I take, as a rationality of EM, that technoscientific knowledge is used to develop solutions within the hegemonic economic framing – while seeking profits. Industry is perceived to become generally ecologically benign when instances of environmental considerations can be found. This approach is based on assumptions of science being objective, neutral and progressive, disregarding the long history of pointing out the inherent politics of scientific research with (un)intended harmful consequences[17]. In opposition to the latter, critical understanding, EM is carried out within the frame of pragmatism (Prasad and Elmes 2005): "Let's green the organisation as much as possible!" However, the concrete limitations of this are usually not addressed. With this impression of rationality of ecological modernisation let us turn to a case which we use to problematise the knowledge practices of energy management.

[11] Major significant instances of management technologies are e.g. procedural, formalised and institutionalised Environmental Management Systems (EMS) or Environmental Impact Assessments (EIA).

[12] I use the concept 'technology' to emphasise that I am talking of social institutions and dynamics which are conceptualised as mechanistic or functionalist by EM. For 'social technologies' see e.g. Bijker (1995).

[13] Of course, we find a debate over whether such instances are merely classified and construed as benefiting the environment or whether they really do (and in the latter case the question occurs whose environment is 'improved').

[14] Cf. Christoff (1996, p. 477), Sonnenfeld and Mol (2006), Søndergård et al. (2004), Mol (2006), Keil and Desfor (2003).

[15] Søndergård et al. (2004).

[16] Cf. Drake et al. (2003), Pellow et al. (2000), White (2006).

[17] Scientific practices and organisations are described as political by a number of people. One could mention e.g. Bakunin (1916), Kuhn (1970), Bourdieu (1990), Haraway (1991).

18.3 The BOTNACO 'Programme'

I encountered the setting during my ethnographic research on agents of ecological modernisation situated in multinational corporations. At a site of a corporation, which I shall name BOTNACO, 1,300 workers were employed performing the mobility industry. Mr. Kunz, who was identified by his business card as an *environmental manager*, told me about a special programme which he designed to run within the corporate suggestion scheme for a limited amount of time. His background was rooted in electrical engineering as well as in chemistry. In terms of energy he was saying: "Actually, [the] energy [issue] is pressing us for years".

We need to conceptualise both the programme and the practices of Kunz within the context of what can be called standardised environmental management: the site was certified with the European Union Eco-management and Auditing Scheme (EMAS) and ISO norm 14001. Both of these norms stipulate extensive documentation of processes which are environmentally relevant as well as continuous environmental improvement. Within this normative context, my research indicates, actors conceptualise saving energy as contributing to sustainable development. To approach sustainable energy management energy is first made calculable; and second, *standardised* calculation procedures are applied[18]. Environmental managers draw on a variety of sources to define local energy management measures, including their own local knowledge as well as workers' knowledge. The programme, to which I shall refer as 'Programme', was devised to mobilise precisely such workers' knowledges of possibilities to protect health and the environment as well as to safe energy. How did the 'Programme' work?

In order to spread the information that the 'Programme' existed Mr. Kunz sent emails to the workers and ordered a poster (Figure 18.1).

The poster declares:

A demand exists for ideas
a. which protect and sustain our environment
b. which help to improve health management for all workers.

The heading indicates a special interest in energy issues. When we met first, the 'Programme' had already taken place. However, the follow-up of it was still going on. During the first conversation Mr Kunz envisaged the follow-up process to complete his aim of mobilising these ideas as quite simple: he drafted the 'Program', got the information out and the workers developed and communicated their ideas through the suggestion scheme. Finally, in the decision-making process, he imagined commenting on the ideas such that decision-makers could make grounded choices. Figure 18.2 visualises the linearity of this process.

[18] These standardised procedures imply, however, that actors are likely to meet discrepancies between ideal assumptions, which are part of the standard, and local conditions.

Fig. 18.1. Getting it out

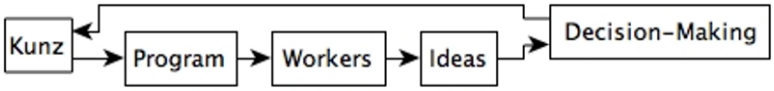

Fig. 18.2. Linear model of the 'Program'

Overall, workers handed in about 60 suggestions. The decision-making thereupon was distributed and the officer for the suggestion scheme defined who would comment on them before the final decision. Because the 'Programme' asked for ideas regarding environmental issues Kunz received the suggestions. For him, the decision whether he should recommend carrying out an idea or not was either straightforward or he had to make some inquiries and negotiate the suggestion with other actors. How did he decide? If his decision was straightforward it was so because the case was self-evident to him. One such case was the idea to install a solar panel. For Kunz this was out of question because at the site another solar panel already existed. From his point of view this case illustrated the lack of knowledge on side of the worker: the worker should have known that solar panels already existed. As the worker did not specify why another panel would be useful, but rather presented a general idea, the environmental manager declined the suggestion. He would have been interested in a suggestion, which would be situated and reasoned from his point of view and which would fit in his frame of interpreting the world. Thus, the idea of the worker was not compatible with Kunz's frame.

Another case concerned saving water. This idea had been declined. The decision upon this idea was heavily contested. Afterwards, several meetings took place to settle the case. While the case was quite straightforward for Kunz "*the [workers] did not want to accept [the decline] and [they] said: 'No! It is possible [to put their idea into practice]; why [do you not see this]?'*". This conflict constituted a problem: Kunz recognised that the *decline is placed in tension with him wanting to motivate the workers* (field note). Overall, then, the 'Programme' brought about problems and additional work. Therefore, they decided, to not run such a 'Programme' again with a specific emphasis on energy.

The significance of the environmental manager's reaction to the ideas of the workers lies within the way ideas are presented and dealt with. A tension exists between Kunz's approach and that of some workers. How can we critically interpret this tension?

18.4 Analysis: Knowledge and Contradictions

To approach this tension within decision-making, this section provides foci on both the subject matter of knowledge in the case as well as its social context. First, let us recall that the 'Programme' was devised to mobilise knowledge to support Mr. Kunz's work to green the corporation. The schemes (of perception and thinking) which he used to evaluate those knowledges which were presented to him

were based on diverse sources. Overall, we found: Kunz, himself a trained technician and analytical chemist, drew upon techno-economic knowledge and epistemology to reason about the ideas. In detail, a variety of sources were available to him. First and overarching, he conceptualised environmental issues based on his professional background as well as on professional conferences and contemporary law. Accordingly, on his wall we found a poster with an overview on legal stipulations relevant to his work. Further, he also dealt with magazines, which attended to the environment. The criteria which he used for shaping his advice fit to these forms of knowledge: it was important (1) implicitly, that the ideas are likely to improve the environmental situation, and explicitly that they are feasible in terms of (2) involved technology and (3) temporal and financial implications; he also mentioned (4) life cycle analyses. However, these criteria are all quite 'soft' and when it came down to it; he said "After all, the corporation has to get something out of it, i.e. it has to pay off for the corporation." Thus, the significant question was: is it "financially worth it"?

Kunz also had quite a bit of knowledge about the environmental situation at the production site. Actually we can find that he seemed to take-for-granted that he had the most complete knowledge of the environmental situation at the site (relative to others at the site). This can be seen as a doxic stance as described by Bourdieu: this theoretical approach suggests that actors believe in the presuppositions of a field and by that reproduce its social and economic conditions (Bourdieu 1990). In our case Mr. Kunz had good reasons to believe that he knew best about conditions relevant to sustainable energy management. He already worked for many years at the site – he was even a worker with one of the longest time spans working there. Disposed to such a stance, it can be considered of uttermost difficulty for him to *imagine* that workers may develop an idea, which has both characteristics: a) environmentally useful and b) not conceptualisable within his existing frame of knowing. Furthermore, he had relations to expert-colleagues which can be characterised by co-operation. For him, it was self-evident that together they have the best possible knowledge of the local conditions regarding the environment. Thus, this indicates clearly: his scheme and background of performing knowledge fit well to the rationality of ecological modernisation as described above.

These criteria and his background illustrate his schemes of perception. Both by training and in his practical decision-making he used hegemonic forms of knowledge: technoscience, law, seeking profit, which were shared among his colleagues and stabilised by the corporation. This kind of knowledge should be quantifiable – at least clearly categorisable. If it was not, this would have constituted a problem, not only for him, but – he well knew – also for the corporation. This was the case because his corporation tried to universalise, within its whole structure, the way environmental management was run. Therefore, this organisational habitus (Hård 1994) shaped the practices at our BOTNACO site as well. Kunz would not have been able to easily evade the rationality of the organisation.

When some workers did not know about the situation at the site in the manner he deemed adequate, he conceptualised them as being not informed (case of solar panel). This stance is structured similar to the cognitive *deficit model* discussed

within STS[19]. It suggests that laymen have gaps in their scientific knowledge of the world and that they cannot, therefore, adequately conceptualise their environment. The implication of this model being that one needs a funnel to put scientific knowledge into them. Kunz's reaction to the workers' body of knowledge, in line with this, was: *I will "write a piece in the journal, the [BOTNACO] house journal, [about] what kind of things we have here and do, in order ... to prevent such things"*. From his point of view he merely needed to teach them what kind of environmental technologies existed and then they would understand what a proper suggestion is. As he pointed out regarding the suggestion to install another solar panel, such teaching should convey that general suggestions are not proper: *"Obviously this is a rather general suggestion, and actually we cannot put this properly to use"*. This stance illustrates that he, as the environmental manager, has the power to define the terms of the situation. This signifies as well a *hierarchy* between the forms of knowledge, i.e. the general idea vs. the specific suggestion fitting to his ecological modernisation rationality. Like scientific experts knowing better than laymen, the environmental manager knows better than workers. This hierarchy is maintained through the categories in use: workers would allow the expert to define which categories are suitable to analyse a situation. By this process the relations of categories are reproduced. It is not questioned that workers might very well possess useful knowledge to deal with their environment and recognise qualities that are lacking in it.

On the other hand, Kunz also actively negotiated issues which required objective decisions upon them. For example he emphasised that his colleagues, who were part of decision-making, are *human* actors and that therefore he can discuss with them the terms of amortisation of an investment. Thus, practically, he co-constructed objectivity: the objectivity of whether a measure is worth it is socially co-constructed.

Nevertheless, for his identity it seemed to be of importance that he conceptualises himself as an adviser to the site manager and in our case to the suggestion scheme. This advice should be as objective as possible. According to his descriptions, what he and his colleagues had in common was that they developed their decisive advice to the decision-maker based on a shared commitment to rationality and objectivity. The most significant criterion around which their advice was shaped was profitability. It was on these grounds and within these relations in which the environmental manager *constructed* advice.

Let us now turn briefly to some relations in which those workers whose ideas had been declined were situated. Fundamentally, they were the means of the 'Programme'. It was aimed at mobilising their ideas and when they saw the posters and emails they were 'triggered' to develop ideas or make them explicit respectively. The ideas were based on their knowledge of their working environment. When they had a chance to use their knowledge as capital they used it. The suggestion scheme both enabled them to try to 'sell' their ideas and provided a medium for them to communicate the ideas. Thus, they were not merely passively re-

[19] See e.g. Wieser (2002), Lynch (2004), Irwin (2006) and Wynne (1992).

sponding to the poster, but also actively using the 'suggestion scheme' tool for their purposes.

When they recognised that their aim, i.e. gaining from their knowledge, had not been reached that easily they got in touch with the environmental manager. They claimed that their ideas should be judged as acceptable and hence serve them in terms of recognition. In the follow-up to this, several meetings took place to solve the tensions. These provide a chance to illustrate further dimensions of the problem.

18.4.1 Crystallised Conflict: The Meetings

The meetings were attended by Kunz, some of his colleagues and the workers. While the meetings were designed to maintain co-operative stances within the corporation the conflict was not easily solved. The positions which the two groups of actors took were laden with contradictions. On the one hand Kunz (representing the corporate bureaucracy) wanted the workers to be motivated, both in general and specifically through the 'Programme'. He recognised after a while that this had not been realised as to his aims. In conflict with this approach was the stance of him of teaching the workers. This stance makes explicit that he considered their knowledge (too) poor. On the other hand the workers were positioned within a contradiction as well. They wanted to 'sell' their ideas to the corporation, i.e. make them value the ideas and recognise the workers for their contribution. However, while they could not enforce such a recognitive stance by the organisation they still tried to move the organisation towards recognising their ideas.

Thus, between and within both groups structural conflicts existed. So, what was the use of the meetings after all? They took place for (at least) three kinds of reasons. First, Kunz needed them to explain the workers the reasons for declining their ideas. Second, the workers needed them to contest the decision. And third, to have meetings to negotiate can be seen as an act of the organisational habitus. Thus, having meetings satisfies the structural requirements on conflicts within the organisational field.

The latter points again to the relevancy of the main stake within the field: economic profit. The suggestion scheme is aimed at profit and the environmental manager, as well as his colleagues represent the organisational rationality to ensure profits. This interpretation allows the reframing of the position of Kunz and the workers in terms of their stakes.

The job of Kunz (and his colleagues) included improving the environmental management at the site. This should be done as efficiently as possible. The 'Programme' provided the chance for the environmental manager to gain significant new ideas which he could then incorporate into managing environmental issues. However, the 'Program' provided the risk for him as well, that the ideas which were presented to him which could be wearisome to deal with. This might have reduced the efficiency of the management tool. Furthermore, not only that he had to deal with the specific ideas, he was also (co-)responsible for running the 'Programme'. Thus, here is another instance of his stake in terms of managing knowl-

edges. The right choice of the right instruments to manage was part of his job. The fact that he saw the 'Programme' as a failure attests to the relevancy of this choice. For him it was his co-responsibility, which was significant.20 In that respect he decided that the 'Programme' did not run well. His original idea of how it should have generated suggestions did not work well enough (as illustrated in linear, Figure 18.2). Rather, the reality of the 'Program' revealed itself differently to him: Figure 18.3 indicates how the idea, the formal suggestion scheme apparatus and the 'Programme' became background to the more central meetings between Kunz and the workers.

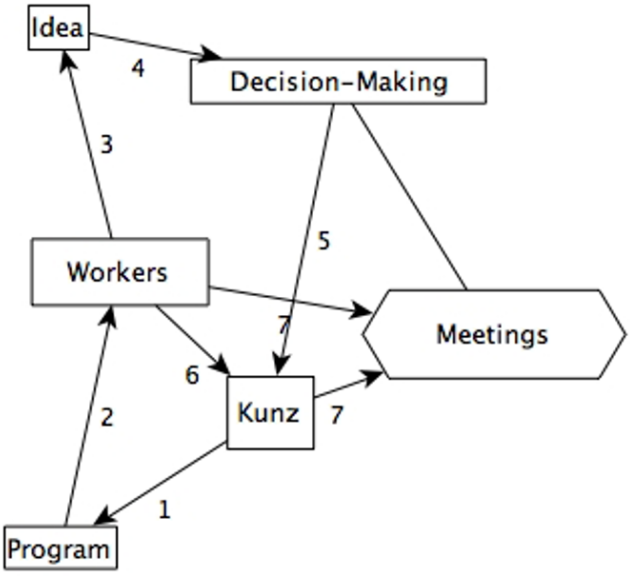

Fig. 18.3. Centrality of Meetings

Thus, for Kunz the 'Programme' was a failure: the turnout of suggestions was not big enough and some even induced considerable excess work. Moreover, he had to believe that the motivation of workers decreased. Hence, the way the reality of the 'Programme' contingently developed was in conflict with his stakes. To improve his position – and from his point of view: the priority of environmental matters as well – a successful 'Programme' would have been better. Could he have acted significantly differently? Possibly; but we cannot know. What we can see, however, is that the way he acted was well grounded in his rationality: the belief in the

[20] Although, the way the instrument worked was contingent, its working was influenced only at the most immediate level by the ideas of the workers and more indirectly by various factors which he also could not control (like the dispositions of the workers, public discourses on the environment, etc.).

neutrality and objectivity of decision-making for sustaining the profits of the corporation. This rationality is required in his position. Other actors expect to put into reality this kind of rationality for dealing with the ideas of the workers. This is at least what he has to assume in his position and he takes-for-granted. Thus, because of both the environmental manager's own background as well as social requirements on him, the field structure is reproduced. Any other agent of ecological modernisation in Mr. Kunz's position would have been disposed to a similar rationality.

For the workers, whose ideas were declined, the situation is structured as follows: The 'Programme' promised to give importance to their ideas. However, this importance is not granted by the experts. To re-construct their self-confidence, for them, it makes sense to argue for the opposite decision. Yet, if such a change of the decision does not happen – which is unlikely because the experts would have to reveal themselves as providing flawed arguments – the worker may still try to put the idea, if practically possible, into practice. This, however, is again unlikely because of the structure of the organisation in question. Workers do not have much incentive to identify with the owners. They do not have a clear stake in the profitability or greening of the corporation; the means of production are owned by others who are also responsible for environmental management. Hence, after having offered their ideas, why should they contribute to unwanted environmental improvements? Thus, for the organisation the idea of the worker is lost.

Overall, then, we find that knowing 'rightly' implies a hierarchy: Mr. Kunz, as techno-scientific and techno-economic expert – along the rationality of ecological modernisation, has superior knowledge relative to workers. This hierarchy became most explicit in his dismissal of the workers' solar panel idea together with the deficit model.

18.4.2 Lost Meanings? Ideas and Suggestions

While analysing the field and the doxic stance of the environmental manager the focus on the structure of the contested content disappeared. However, the structural difference of how the environmental manager constructed the workers' ideas and the needed suggestions reveals an important dimension of the 'Programme'.

During research it seemed that Kunz used the notions of ideas and suggestions interchangeably. However, they have quite different relations to the other elements of the situation. The poster of the 'Programme' asked for ideas while linking the 'Programme' obviously to the suggestion scheme. Those workers who had ideas, which they deemed to fit into what was asked for, accessed the suggestion scheme as a mechanism. This was possible by both material as well as digital forms. Within this mechanism ideas cannot exist – merely suggestions. What does this imply?

A suggestion needs to be clearly categorisable within the organisational division of labour, such that the officer of the suggestion scheme can direct the suggestions to experts. For the environmental manager the suggestions should be oriented towards the criteria which he used. If he was not able to conceptualise the

suggestion within these criteria then they had little chance of being approved. Thus, if an idea was not also a successful suggestion it was unlikely to be accepted and turned into reality. The 'Programme' only knew suggestions. If they did not satisfy the implicit standards then they were declined. Thus, whether the workers were aware or not, their ideas were transformed into another social reality by entering them into the mechanism suggestion scheme. The suggestions within the latter were then reviewed by human actors. Independently of how well they fitted to formal requirements, the suggestions provided knowledge.

However, the recipients of the knowledge were not disposed to deal with all knowledges in the same manner, but to select them according to their fit into their objectivist framing. It was this framing which marginalised the specific ideas of the workers. At the same time we can recognise how not only specific ideas but systemically forms of knowing are also disregarded. This resembles Ecological Modernisation Theory (EMT) in that sense that EMT is based on objectively analysing situations and developing solutions. The inherent values and problems of technoscientific knowledges are not considered but reproduced. This corresponds to what Christoff (1996, p. 478) called "a unilinear path to ecological modernity". Alternative forms of human-nature relationships cannot easily find room to evolve under an ecological modernisation paradigm.

To summarise, with this analysis we can recognise two contradictions in the setting: First, the instrument 'Programme' was developed to harvest knowledges. These are needed for effective environmental protection. However, at the same time, certain forms of knowledge are structurally excluded. Knowledges which do not fit to the rationality of ecological modernisation cannot be utilised and may even create conflicts. Second, the ideas are lost not only by excluding them through the suggestion scheme but also because the workers are not disposed to put them otherwise into practice because of their relation to the production site; they neither own the means of production nor are they responsible for the environmental effects of the production.

It is these two forms of hierarchy, among knowledges and the possession of means of production, which sustain unsustainability. With the hierarchy among knowledges embedded into the field and the workers and Kunz positioned to not question this hierarchy, communal learning processes within this kind of field are unlikely. The other form of hierarchy makes it more likely that the workers' ideas are not put into practice by themselves.

Hence, we can see this configuration of the organisational field as constraining the possibility to construct sustainable futures. This is the case even though the environmental manager is good willed and acts very much in the logic of ecological modernisation. At his position within this configuration, he is unlikely to reflexively confront his stance. Therefore, I suggest, to search for possibilities for change in the wider social context. Its actors might reconstruct the configuration of the field, such that alternative futures become more likely. In the following, therefore, we shall turn towards asking how we can conceptualise a way out of the dilemma.

18.5 A Way Out – Based on Determined Negation?

Bourdieu (1998) suggests going for a 'reasoned utopianism' in order to ground the struggle against neoliberalism, an ideology which provides the economic point of reference for ecological modernisation. Rather than focussing on his specific aim, I am interested in how to reason a utopia. In his essay *A Reasoned Utopia and Economic Fatalism* he quotes Ernst Bloch:

> "Bloch describes the 'considered utopian' as one who acts 'by virtue of his fully aware fore-knowledge of the objective trend', the objective, and real, possibility of his 'epoch'; one who, in other words, 'anticipates psychologically a possible reality'."

Drawing on him, Bourdieu argues for a rational utopianism, rather than pure wishful thinking or objectivist automatism. This rational utopianism should be based on science in order to reason both aims and means. Intellectuals (like himself and Ulrich Beck) should collaborate, leading to projects and action. This is what he calls *reasoned utopianism.*

His line of reasoning can be seen as resembling a fragment of the *Frankfurter Schule*, namely the negative dialectics of Adorno and Horkheimer. Demirovic (2005) reads them as proposing that a better future can develop based on *bestimmte Negation*, i.e. determinate negation which is an "immanent criticism [allowing] to wrest truth from ideology" (Zuidervaart 2007). In fact, notions of basing utopianism on real possibilities are widely shared: Karakayali (2004) and Demirovic (2005) describe such utopianism as a specific critique of the here and now. According to Demirovic, directed and radical change only becomes possible by negating instances of the concrete. He juxtaposes this approach to bourgeois utopianism which stabilises capitalism by posing wishes which are not possible to put into practice. The capitalist society digests the latter kind of utopianism well by teaching people that utopianism does not work out, i.e., by giving the impression that bourgeois utopianism is the only form of utopianism. It does not pose a problem for capitalist society to deal with a few dreamers and a radical youth as long as the latter know that their aims cannot become real anyway. He, like Pepper (2005), thus suggests practical utopianism which helps to transgress the boundaries of the hegemonic towards emancipation. Pepper warns against a 'heterotopia' in which utopian thought and fantasies become part of consumerist culture and "are devoid of social change potential" (ibid., p. 18). Rather, he says we need practical utopianism which helps radical movements to experiment with transgressive practices and thought. Echoing the anarchist ideal[21], he argues that such utopianism cannot be based on blueprints for revolutionary change but needs spaces in which alternative paradigms can be developed and tested while grounding them in an analysis of the local and global social and economic realities.

What could this mean for praxis of environmental management? It seems that negating the hierarchical structure of the organisation implies more than merely

[21] Cf. Franks (2006); but see also more theoretical work by May (1994) and a classic relevant to this case, Rocker (1938).

moving some workers up the decision-making ladder (which would be the orthodox Marxist approach). Rather, negating the structure refers to construction of an alternative structure outside of the organisational hierarchy. This would lead to the conducting of experiments towards socially and ecologically sustainable energy management. Indicators of such a development might be workers who organise themselves externally of the dominating organisational hierarchy (maybe with incentives by other societal actors, like labour unions).

18.6 Conclusion

This article investigated a case of corporate energy management in which the environmental manager used a suggestion scheme to mobilise workers' knowledges to improve the energy and environmental performance of the corporation. We found that the hierarchical form of organisation as well as bodies and forms of knowledge reproduced structurally a contradiction: Hierarchies were deemed instrumental for optimising corporate greening, but effectively prevented this optimisation. Thus, we conclude, good environmental management – situated within the framework of ecological modernisation – sticks to hierarchical organisation. And this very kind of organising constitutes a barrier to sustainable development. In our case this became obvious when showing how proper practice within the hegemonic rationality of ecological modernisation assumes superior knowledge by environmental experts.

These experts occupy positions in social space which allow them to decisively shape corporate environmental decision-making. It is their task to know better than so-called 'average' workers about environmental issues. Therefore, if workers – as shown in this case – frame ideas to contribute to sustainable energy management in a way which is not compatible with the rationality of ecological modernisation then their ideas are likely to be lost. We find that the environmental manager uses a *form of knowledge*, which was specific in fitting to the rationality of ecological modernisation. In the course of this, however, alternative forms and by that bodies of knowledge were sidelined and therefore lost to sustainable development. Thus, the manager's knowledge practice renders corporate energy management unsustainable. This micro-level-based analysis is paralleled by the macro take of Blühdorn and Welsh (2007) who argue that we live in an "era of post-ecologism [where] its eco-politics [are] the politics of unsustainability".

Further, this article argues, hope to overcome these contradiction lies in the negation of hierarchies. Rather than bare adjustment to structures of hierarchies, more sustainable approaches to energy management may be found outside the structures identified as problematic, i.e. outside of hegemonic organisational hierarchies. Thus, for affected to contribute to sustainable development it seems adequate to recommend engaging with experiments outside corporate rationality aiming to reconfigure the structure surrounding the organisation, rather than stabilising it. A social structure outside, which would allow for sustainable energy management within the corporation, would be characterised by its recognition of

all forms of knowledge – not limited to knowledges compatible with the rationality of hegemonic ecological modernisation. Of course, I recognise, in practice many might want to follow a dual strategy: reform within as well as stepping outside to question the hierarchies and engage with the experiments. Further research, I suggest, should enquire into how to move existing organisations towards recognising their structural weakness embedded in hierarchical organisation and leading to disregarding a variety of bodies and forms of knowledge.

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19 River Management. Technological Challenge or Conceptual Illusion? Salmon Weirs and Hydroelectric Dams on the Kemi River in Northern Finland

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19.1 Introduction

This paper takes the management of the Kemi River in the Finnish province of Lapland as an example for asking what environmental management is or can do, in practice and in theory. It argues that environmental management – if understood as controlling an environmental phenomenon following a ready-made plan – is not a suitable concept for understanding the interactions between the river and the people on its banks. Either, environmental management has to be defined widely as a dialogue between human and non-human actors, or it must be discarded as the illusion of a modernist, positivist ideology that projects static categories on the world. This paper juxtaposes the dams used for salmon fishing and those used in hydroelectricity production on the Kemi River. It illustrates the adaptability of the former to the river's processes and then shows how very different the technology and rhetoric of the latter appears when it comes to relations with the river. In spite of the significantly larger impacts that hydroelectricity production has on the river as a whole, it will be argued that upon a closer look, the operation of the system of power stations has much in common with that of the salmon weirs.

This paper explores to what degree a river can be managed. Observations along the Kemi River, the principal waterway of the Finnish province of Lapland, suggest that in spite of claims to the contrary, no management regime can control the river. Instead, river management has to be understood as a reciprocal engagement between the 'managers' and the 'object' of management. To clarify this, two types of construction that have been built across the flow of the Kemi River over its eventful history will be juxtaposed. Salmon fishing weirs and hydroelectric dams were both intended to regulate and harvest a particular quality of the river – the rising salmon on the one hand, the water's gravity on the other.

While it seems rather obvious how the construction and operation of salmon fishing weirs reflect the reciprocal engagement of its users with the dynamics of

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the river, hydroelectricity production appears like a brute attempt of controlling the river in a way that comes close to traditional understandings of 'management'. Hydropower is therefore often stylised as a means of effectively controlling the river, both by proponents and adversaries of the technology. This opposition, however, only holds to an extent. Fishing with salmon weirs was in fact highly institutionalised and in many respects managerial. Also, the actual practice of hydroelectricity production reveals that even this form of river use essentially represents a way of negotiating with the flow, the seasonal variations and the unpredictability of the river. River management, if understood as the manipulation of an environmental phenomenon according to a rigid, ready-made plan, emerges as illusionary. All engagement with a river seems to require reciprocal relations with its dynamics. The argument is based principally on ethnographic fieldwork along the Kemi River that the author conducted from August 2007 to September 2008.

The Kemi River catchment comprises the majority of the Finnish province of Lapland into the Gulf of Bothnia (see Figure 19.1) and the histories of the area and the river have been closely entwined[1]. When the region was settled after the last Ice Age, hunters and fisher people exploited the river's banks for habitation and livelihood. Since the 15th century, settlers from Karelia, Southern and Eastern Finland arrived on the scene, using the river as a means of transport through the mostly wooded and swampy area. Towns and villages were established along the river and its flow, waters and ice served a host of purposes, from sanitation and transportation to the provision of fishing grounds.

The exceptionally rich salmon fishery on the Kemi River had, in the Middle Ages, already attracted the attention of the Swedish Crown and the Christian Churches (Vilkuna 1975). Not only were they eager to baptise the people who would gather each year to seize, salt and sell the rising fish; at least as much, they were keen to levy taxes on the catch. Later, when the consolidation of territorial claims became an issue of national interest, the settlement into this peripheral area was encouraged by policies such as exemption from tax or military service for those who would dare to establish a home there. With the onset of industrialisation, factories were built on the river, taking advantage of its power to drive mechanical and later electrical machinery. The predominant industry was – and still is – the wood-processing business, providing timber for construction and small wooden products, but mainly producing pulp and paper. Until less than 20 years ago, the bulk of the logs that had been cut throughout the watershed[2] were floated along the many tributaries into the main course of the Kemi River and from there to the factories that were situated mainly at the river's mouth.

[1] As will become clear throughout the paper, the river is approached analytically as shaped by various influences, including – but not limited to – human actions. Therefore, it can be called a 'hybrid' phenomenon (see Lippert, this volume) or an 'organic machine' to take White's (1995) term.

[2] I use the term 'watershed' in its American connotation, identical to the British 'catchment area' or 'drainage basin'.

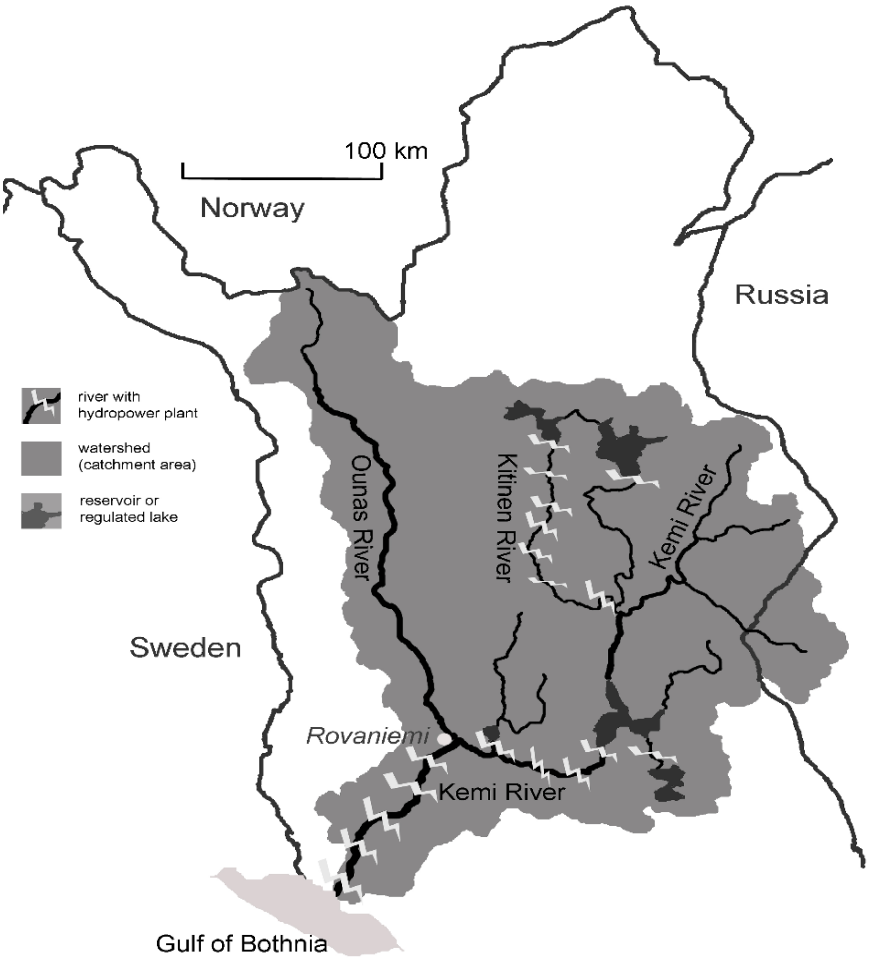

Fig. 19.1. The Kemi River watershed in the Finnish province of Lapland: Over two thirds of the province is drained by this river into the Gulf of Bothnia (Baltic Sea). Most of the salmon fishing took place between Rovaniemi and the mouth of the river. Since the mid 20th century, 18 major hydropower stations have been constructed mostly along the main channel, but also along the tributary Kitinen River. Reservoirs and lakes are used to buffer some of the seasonal variation of the river's discharge. Since 1983, the tributary Ounas River is protected by law against hydropower construction (based on Kemijoki Group 2008, p. 51)

19.2 The Kemi River as a Hydropower Source

Today, the single most prominent use of the Kemi River is the production of hydroelectricity. There are currently eighteen major hydropower plants in the watershed (Figure 19.1), sixteen of which are owned and operated by a single company[3] and a further power station is planned. In addition to the power plants along the course of the river, other plants are situated at lakes and reservoirs, which enable the electricity company to regulate the river's flow both on a daily basis and over the course of the year. The company produces almost one third, 31.4 percent in 2007, of Finland's hydroelectric power, which altogether amounts to roughly 18 percent of the national electricity production (Kemijoki Group 2008, p. 10). More important than the absolute amount of electricity produced, however, is the distinctive feature of hydropower in the overall mix of electricity production: the amount of water that is allowed through the turbines can be instantaneously regulated in order to adjust the production to match the current consumption of energy. While nuclear or coal-powered electricity plants provide high overall output, their production is very slow to adjust and impossible to fine-tune.

From a 'control room', situated in the headquarters of the hydroelectricity company in the provincial capital Rovaniemi, such regulation and fine-tuning is supervised. Adding to the automatic adjustments of the individual turbines to the slightest changes in the electricity network, the engineers[4] in the control room assign distinct production targets to the power plants in the watershed, which, when totalled, meet the overall demand for every individual hour of the day (Figure 19.2). Typically, the turbines are nearly closed down during the night, produce a lot of energy in the morning, slightly reduce the production towards midday, and peak a second time in the afternoon to then decrease production again for the night. At night, electricity production tends to drop off to around ten percent of the daytime maximum. Moreover, less hydroelectricity is produced during the weekends than during weekdays. To what extend the turbines produce electricity is centrally determined from the control room. Although the individual power stations are staffed for part of the day, this is only for monitoring and maintenance work – electricity production is steered from Rovaniemi.

[3] In fact, this company has recently taken to steering electricity production even at the two major power stations owned by another company. The electricity output of those two stations is credited to the owning company, but their regulation is achieved in accord with the long chain of other hydropower stations on the river. There are three smaller hydroelectric power stations with minor capacity in the Kemi River watershed, located at lakes on small tributaries. They are owned by different power companies and will be disregarded for the present analysis.

[4] Although I use the term 'engineers' when talking about the personnel in the control room, not all of them are in fact engineers. Two of the senior employees are actually a mathematician and a former electrician, respectively.

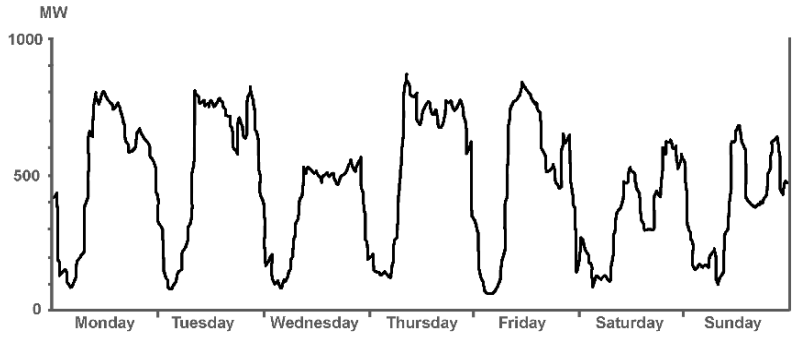

Fig. 19.2. Electricity generation (in megawatts (MW)) of the main hydropower company on the Kemi River during one representative week in September 2007. The pattern shows a stark increase of production in the morning and a sharp decrease during the night of each day, generally with two peaks during each day before midday and in the late afternoon. Hydroelectricity generation on Saturday and Sunday is less than on usual weekdays (based on Kemijoki Group 2008, p. 10)

In order to manage the river in this way, the power company regulates the discharge from all the eighteen major hydroelectric plants every day around the clock. Because the river's surface is frozen for about half a year and precipitation falls as snow which accumulates on the land and on the ice instead of draining into the river, its flow diminishes considerably over the year. Therefore, to continue electricity production all year round – particularly in the cold and dark winter, when demand is high – large reservoirs are filled over the summer and gradually emptied over the winter (Figure 19.3). Because in lakes and reservoirs, only the top layer is frozen over the winter, water can be easily extracted from underneath this ice layer, even at temperatures far below the freezing point. Efficient hydroelectricity generation seem thus to require both short- and long-term regulation, through power plants and reservoirs respectively. Short-term regulation of the river's flow enables the tuning of hydroelectricity production to electricity demand; and long-term regulation of the watercourse attempts to adjust the seasonality of the river to the seasonality of electricity use. To be able to accomplish this task, the engineers in charge have to know and continuously monitor the river very well. For instance they have to be familiar with the amount of time that the water takes to travel from one power station to the next. They can rely on a host of data that is available in their company's control room, but at times some of them prefer to obtain first-hand visual impressions and drive to various parts of the river to take a look themselves.

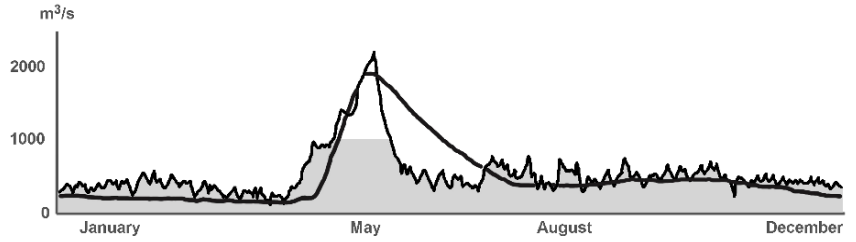

Fig. 19.3. River discharge (in cubic metres per second, m3/s) from one of the hydropower stations on the Kemi River's main channel in 2007. The black line indicates the actual discharge, the shaded area under the curve represents the amount of water that was used for electricity generation. The white area between black line and shaded area stands for the amount of water that was spilled past the turbines during the spring flood, when discharge exceeded the turbines capacity of 1000 m3/s. The grey line indicates the discharge that would occur at the locality without storing flood water in the reservoirs and daily regulating the flow (based on Kemijoki Group 2008, p. 10)

The large-scale harnessing of the Kemi River for hydroelectricity began after the Second World War, when Finland executed major infrastructure projects throughout the country and invested into the economic development of the province of Lapland, which had suffered severely during the war. Hydroelectricity was a major component of the development strategy, along with road construction and the settlement of small farms in the region. After a private company had built two power stations in the watershed, it ran out of money, which prompted the state to set up an institution that was solely meant to develop hydroelectricity on the Kemi River. This state-owned company built power plants along the main course of the river from the early 1950s and constructed large reservoirs during the 1960s. In the 1980s and 90s, the harnessing of water power was extended into a major tributary of the river. Plans to build a further large reservoir on the headwaters of the river were debated for decades until they were ruled out of order by the Finnish Supreme Administrative Court in 2002. Another large tributary had already been placed under natural protection in 1983, banning all constructions for hydroelectricity generation. Under the present legal and technical conditions, there is only a single location on the Kemi River that seems appropriate for the construction of a further power plant. The respective plans exist and hydroelectricity engineers point out that this power station will complete the infrastructure to regulate the entire main course of the river in one 'chain'.

19.3 Salmon Weirs on the Kemi River

When the first hydroelectric dam on the river was finished in 1948, its impacts on the ecology of the river and on the livelihoods of the inhabitants of its banks were

regarded as secondary to the goals of national progress and regional development[5] towards which it was seen to contribute. This was in spite of the fact that the dam was situated at the river's mouth and blocked migrating fish from entering the river from the sea. A few years later, the salmon population in the Kemi River – formerly one of the richest of the Baltic Sea – had ceased to exist. Salmon spawn and hatch in the oxygen-rich waters of a fast-running river stretch and swim to the sea as smolts when a few years old. In the sea they live for another couple of years, feeding plentifully and growing big. Then they return to the river where they were born, to spawn there themselves. Once this cycle is permanently broken, it is rather difficult to re-establish a salmon population in a particular river (Karlsson and Karlström 1994).

For centuries, salmon had provided a major source of nutrition and income for the inhabitants of the region, particularly along the lower Kemi River. A brief description of the technology and organisation of the formerly prominent way of salmon fishing on the river will shed light on the very different nature of this type of river management. Salmon fishing was not about managing the water's gravity, but about harvesting a particular quality from the river nonetheless. Salmon fishing weirs provide an illuminating contrast to the hydroelectric dams portrayed above: they were built also to regulate a certain aspect of the river, but interacted with the stream in a somewhat different way.

Each year, when the ice on the river opened in spring, salmon began to swim upstream from the sea and the farmers on the river's banks developed different techniques for catching the valuable and nutritious animals. Probably the most effective and impressive of those was a type of weir that was constructed from the shore far into the river[6] (Figure 19.2). The weir was made from wooden poles that

[5] Finland had just lost a war against the Soviet Union, and with it large territories and a considerable share of its infrastructure, including one third of its hydropower production capacity. The country had to re-settle over ten percent of its population from the ceded areas, and pay large reparations to the Soviet Union. Particularly the province of Lapland was seen as in dire need of infrastructure, as most of its bridges had been blasted and buildings had been burnt by German troops retreating after the Finnish-Soviet armistice in 1944. Hydroelectric stations on the Kemi River were considered a twofold solution: They served both as bridges and for electricity production. Furthermore, they conformed to the view – widely shared among the decision-makers in the far away national capital – that Northern Finland is a store of resources that must be harnessed for national progress and paying reparations (Massa 1994, pp. 200-266).

[6] It is worthwhile noting that these weirs almost completely disappeared from the Kemi River not because of the collapse of the salmon population after 1948, but because of the growing influence of the wood-processing industry throughout Lapland a few decades earlier. The industry was interested in using the entire main channel of the river for loose log floating, which at the time was cheaper than the previous practice of floating in rafts. Only in very few places – usually in secondary river channels – did salmon weirs survive until the construction of the first hydropower plant, after which also those sites had to be abandoned. In the meantime, however, salmon fishing had of course continued employing other techniques, like mobile nets, hooks, etc.

were fixed on the riverbed and connected by further poles above the water surface. Along these poles a net or a layer of brushwood was attached, so that the rising salmon were forced to swim along the weir. Into the weir was built an enclosure in which the salmon were trapped and lifted out of the water with large nets several times a day (Vilkuna 1975).

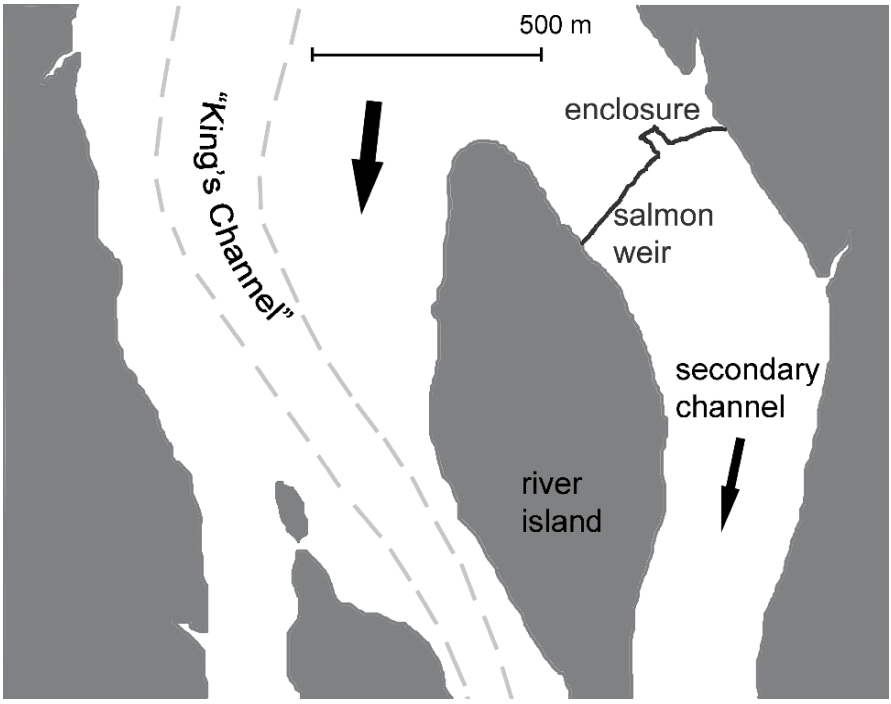

Fig. 19.4. The salmon weir of the village Muurola on the Kemi River in the 19th century: The weir was built across a secondary river channel, making salmon that rose through this channel swim along the weir, which led them into the enclosure where they were trapped. The deepest third of the river, the 'King's Channel' was left open, allowing sufficient numbers of salmon to escape and reproduce (adopted from: Vilkuna 1975, p. 220, Figure 84).

Because of the dimensions of this weir, individual families were not able to build or operate it on their own. Instead, cooperatives were formed that shared the material and labour inputs as well as the catch. During the winter, these cooperatives gathered the necessary construction material and after the spring flood had ceased, they built the weirs into the river. This was a cumbersome and challenging task, because the current was still rather strong at that time of year. Once it was completed, the weir was operated until the salmon stopped rising up the river in late summer. In many places and particularly during the richest catching period in late spring, the weirs were attended to around the clock by small groups from the respective cooperative. Small repairs had to be undertaken constantly and the nets in

the enclosure had to be hauled in and maintained. The catch then had to be cleaned and prepared for storage or sale, which mostly meant salting it in large barrels. In order not to compromise the quality of a particular catching place, the weirs were carefully deconstructed each year when the catching season ended. If rocks or pole stumps were left in the river, the water would not flow there the same way in the following year, which might deter salmon from choosing this particular route on their journey up the river.

Only particular places on the river were appropriate for the construction of a weir. These places were of course highly disputed and different arrangements were agreed to over the course of history. The more the interest and influence of the Swedish crown, and later the Russian Tsar and the Finnish State, grew in the region's salmon fishery, and the more the established fisher people saw their privileges jeopardised by newcomers, the more the fishing groups and the distribution of weirs and catching places was institutionalised. Whereas the weirs had been operated by loosely organised groups of inhabitants and seasonal fishermen during the Middle Ages, their organisation was somewhat formalised by the levying of taxes by the church from the 14th century onwards. In the early 17th century, membership in such groups was limited to local land-owners. The maximum catch allowed to a particular fishing family was set proportional to the tax they paid for their lands. In the second half of the 17th century, a system was introduced that rotated the operation of particular weirs on certain catching places among the now closed fishing groups. If a group would have fished at catching place *A* last year, they would move downstream to catching place *B* this year and construct their weir at place *C* next year.

Another important rule concerned the limits of the weirs across the river. One third of the diameter of the stream, where the river was at its deepest, had to be left open. Weirs were not allowed in this channel so that some salmon were always able to escape the nets, reproduce and ensure the durability of the fishery. When the influence of royal fishery regulations increased in the 17th century, this portion came to be known as the King's Channel. But even before, it could happen that upstream fisher people would destroy a weir that they deemed as a violation of this rule. Salmon fishing was – in spite of the abundance of fish – never a very peaceful or harmonious activity: there were continuous quarrels about the position and size of weirs, the ownership of fishing rights and the violation thereof, as well as about the taxation by Crown and Church. Fishing with weirs thus regulated the river, predominantly in terms of its salmon movements, and mediated the relations of the riverside population with the river, particularly in terms of access to benefits – in many ways similar to electricity generation with hydropower dams.

Although weirs represented the most elaborate fishing technique on the Kemi River, it was only one technique among many that were employed according to the time of year, the characteristics of the river at a particular locality and the concomitant behaviour of the salmon (Vilkuna 1975, pp. 35-39). In early spring, when the ice broke and the river flooded, short weirs were built by individual families on the shore in front of their houses. The current was much too rough and the river too broad for the construction of larger weirs. Additionally, the salmon preferred to swim close to the shore because the current was weaker there. Where possible,

people fished with a host of different nets, depending on whether they were fishing in a rapid, in a slowly-flowing stretch or close to the shore. When the salmon stopped rising upstream around the end of July, the large weirs were deconstructed and people fished predominantly with dragnets. Even later in the year, stationary nets were used that were spread on the bottom of quiet and shallow pools. When in early autumn the salmon would settle in particular places to spawn, fisher people would use fish forks to catch them. Finally, salmon returning to the sea in late autumn were caught in bow nets placed in rapids where the river would not freeze.

19.4 Degrees of Management

Salmon weirs and hydroelectric dams constitute two particular constructions that have been built across the Kemi River in order to harvest a particular quality from it. The former were meant to make the rising salmon accessible to humans taking advantage of their migration pattern, the latter are made to make accessible the power inherent in the river's water due to the elevation from the sea level and the slope of the stream. Both types of construction can be therefore referred to as 'regulators' of the river and their utilisations display many similarities. The relations of the respective actors with the river seem very different, however. While salmon weirs clearly represent a means of attentive engagement with the river, hydroelectric dams appear to embody an attempt to control it. The former appear to be an expression of the mutual influence of landscape and people; the latter a part of a regime of resource management.

A relation, where one side manages the other, presupposes a certain degree of sovereignty and control over the other side. Only if we are in a position to somewhat impose our ideas on something can we manage it. Imposing ideas on, or applying a ready-made plan to an environmental phenomenon implies that the actor has to command both physical and conceptual power over this phenomenon. On the one hand, the very material dimensions of the environmental event must be controlled; on the other hand, this intervention must concur with a particular image of the environmental phenomenon: what it is like, why it must be managed and how it is likely to react to this intervention.

Hydroelectricity production has often been portrayed as a means of effectively controlling a river. The very architecture and related symbolism of large dams epitomises human mastery over nature (Blackburn 2006, pp. 189-197 on dams in Germany; or Worster 1985 on water engineering in the US American West), or the "technocratic hubris of engineering and its claim to outwit and control nature" (Adams et al. 2004, p. 1932; see also McCully 2001). It is worth the while to investigate how far hydroelectric dams on the Kemi River actually conform to this claim.

The power company, according to this claim, has to control the Kemi River both physically, through dams, reservoirs, channels and floodgates; and conceptu-

ally, through pinning it down on maps, in data tables and through diagrams[7]. Hydrological data, precipitation data and available water at any one moment in time and for different scenarios, belong to such conceptual control. The control room in the headquarters of the company sports 26 computer screens, presenting electricity production targets, water levels at different places throughout the watershed, representations of electrical circuits, highly stylised maps of the river and a host of further data depending on the current decision to be made. There are six conventional telephones on the control desk and an additional cordless phone circulates through the room. With this level of information technology and with a watershed broken down into numbers, graphs, tables and single-purpose maps, the Kemi River does appear like a manageable object, a rather complex one indeed, but nevertheless under control.

Leaving the control room and looking at the immense structures of the hydropower stations on the river, this impression remains strong: From the reservoirs on the headwaters to the Bothnian Bay, water passes through up to 15 power stations in a row, flowing along a total of over 35 kilometres of concrete and earthen dams around the stations – not to mention the dozens of kilometres of embankments that have been constructed elsewhere along the river to deal with the hydroelectricity-related changes in the water level. At the power stations, the water falls between seven and 30 metres, thereby turning the huge turbines to generate electricity. Most often, the river is diverted from its former river bed into a canal downstream of the power station, in order to increase its flow away from the dam and thereby maintain a high falling distance ('head') at the power station. Particularly when observed from downstream, the dams and power stations are thoroughly impressive for their size and control of the water, a construction of earth, concrete and steel towers high above, and the wide river upstream is channelled through a single location – the power house – and released downstream sizzling and gurgling in a rather narrow but deep canal. During the spring flood, the engineers in the control room command over 40 flood gates along the river to channel some of its flow around the turbines working at full capacity. One can stand at a hydroelectric plant a few hours drive away from Rovaniemi and watch stunned the opening of such a flood gate, when suddenly a hundred or so cubic metres of water per second cascade from the steel and concrete dam – knowing that this magnificent show is the result of a mouse-click in the headquarters.

Thus, it seems that the hydropower company has achieved a considerable degree of control over the river. From the control room in Rovaniemi, the river's flow can be manipulated in large parts of the watershed and whatever happens of importance along the river seems to be visible on the screens in the control room. Physical and conceptual control of the Kemi River's flow allow the company to 'drive' the river as it suits their needs – mostly defined by the electricity market.

[7] Of course, also salmon fishermen had their own images of the river and information about its characteristics. In fact, they were crucial for successfully constructing and maintaining the salmon weirs. Such 'data', however, were of a somewhat different kind; not abstract and numerical, but grown from personal experiences with the river, the weirs and the fish.

19.5 Controlling a River's Flow?

Physical and conceptual control of a river go hand in hand, an increase in one facilitates an increase in the other; ultimately they really amount to the same thing. Also, physical-conceptual control inevitably changes its object, in this case the river. It first of all makes it a bounded object: it defines what the river is and what it is not; what belongs to the thing to be managed and what does not; and naturally assumes that it is a separate entity from those who manage it. Furthermore, it makes the phenomenon conform to the numbers and other representations that are used to describe and control it. If a map, for instance, depicts a particular layout of the river and the river shifts its course or inundates its surroundings, this is seen as a deviation from the 'real' river and measures are taken to prevent such deviations: more dams are built, flood-protection reservoirs are constructed and an increased number of meteorological stations are operated. Thereby, physical-conceptual control is predisposed to render the river a static thing, both in thinking and in material terms. In addition, resource management presupposes a degree of predictability, because particular actions are intended to yield particular outcomes. Data are gathered to know as much as possible about the river and to be able to predict which effects a management decision will have. Discharge and water level are constantly measured at a great many locations, precipitation and temperatures are assessed and forecast and a database contains the same information for many past decades. Not incidentally, the slogan on the power company's website reads: "Hydro power is generated from countless elements. We know them all."[8] Such an approach sees the river as the sum of a host of different details that only need to be known in order to properly deal with the river. Not only does this present the river as made up from many little, separate elements, it also believes that all of them *can be* known.

River water, however, defies such an approach in many ways. First of all, a river is essentially a flow, not a bounded object. This implies that what are often described as different parts of a whole, are in fact phenomena that could not exist without the other parts. More than from different separate elements, a river is made up from mutually dependent components. The salmon life cycle is only one case in point. The river's flow incorporates its source, the groundwater, adjacent bogs, the sea, the weather and different places, people and their activities. None of them is really a discrete 'thing' on its own. Objectifying the river as a separate entity severs all these relations and makes the very object meaningless (cf. Ingold 2008). Furthermore, trying to control a river is an endeavour against the river itself, because such an attempt can hardly deal with its inherent irregularity; seasonal variations, floods, changes in the course and the continuous processes of erosion and sedimentation make it very difficult to pin down what the river is and even more challenging to control it. The Kemi River's surface is frozen for about half a year and so is the ground around it. During the spring flood, the river's discharge is more that tenfold the amount it carries during a dry summer. And while

[8] http://www.kemijoki.fi/Kemijoki/kemijoki.nsf/indexLan2, last accessed on January 15, 2009

its swiftly flowing waters in summer, as well as its thick ice crust in winter provide an inviting arena for a host of activities by the region's inhabitants, the ice floes and frigid waters that make up the river in late spring and autumn are extremely dangerous for human beings.

Therefore it is not surprising that living on and with the Kemi River has for a long time been more of a cyclical process than an advancement in degree of control. Many structures on and across the river have long been – and some still are – temporary. Where a ferry links two parts of a village in the summer, an ice bridge is constructed in the winter, when the ferry is of no use. During the spring flood, neither ice bridge nor ferry connects the two shores, as the ice has been washed downstream and the ice floes on the river, as well as a highly increased discharge, prohibit the operation of a ferry. People cannot cross the river, but instead of getting frustrated about this, they attend to activities around their homes that do not require travelling to the other side. And lucky school children have a reason to miss class. For timber floating, temporary embankments were built over one hundred springs and summers and deconstructed in the fall. Over the winter, a great many bays in the river's shores were used to store the booms from which the structures for timber floating were reassembled anew each spring, when the ice began to weaken. During late spring and summer, the river was first and foremost a road for logs that made their way from the vast inland forests to the industrial centres at the seashore. Salmon weirs are only one more case in point and to the list can be added many more uses of the river. Such arrangements suggest that both social and ecological life is inherently seasonal (cf. Mauss 1979) and our recent obsession with powerful, permanent structures goes against this dynamic.

Hydroelectric dams, however, are essentially meant to control the flow of the river, rather than to flow with it. Dams impound reservoirs and regulate the level of lakes, they attempt to control the annual spring flood, influence the amount of discharge and determine the surface level along the river. Arguably, the hydroelectricity company has attained a considerable degree of control over the Kemi River. The flow of the river can be attuned to the demands of the common electricity market of the Northern European countries[9]. Apparently, the river is made to live according to the rhythms of modern human life – not vice versa.

In order to achieve this degree of control, however, substantial social and ecological costs have been incurred and a host of negative side-effects has been produced. The elevated water level made many shore-based farms unviable, because they depended on the annually flooded fields for hay production in order to feed their cattle over the long winter. With a higher water table, many of these fields became water-logged or were submerged (Massa 1983, pp. 108-125). Continuous changes in the water level, due to the daily fluctuations in energy production, continue to erode the river's banks to a much larger degree than has been the case before dams were built. People living on the river were displaced with them their life-styles and a part of Finnish tradition. Many ecological processes were dis-

[9] Finland, Sweden, Norway and Denmark are linked by a common electricity network and market, NordPool, which means that demands for hydroelectricity from the Kemi River arise not only in Finland, but even, for instance, in Denmark.

turbed, among which the disappearance of salmon[10] was only one, albeit probably the economically most significant. Other locally highly valued fish species, such as grayling and trout, need a river habitat with fast-flowing and oxygen-rich water at least during one crucial stage in their life cycle; exactly these habitats, however, are the very rapids that have to be dammed for hydroelectricity production. The vanishing of grayling and trout leaves the river to other species, that many people consider hardly worthwhile catching. Arguably, this is one of the factors why the inhabitants of the river's banks do not engage with its waters as much as they used to. Another reason for this might be that today the river is – in many places – absent from the acoustic environment: whereas a rapid is constantly present acoustically for the surrounding population, the pool that stretches for kilometres upstream from hydropower stations is mostly inaudible. Furthermore, the regulation of the river's flow regime changed the ice conditions along its course, thereby often compromising popular winter practices such as ice-fishing and moving on frozen watercourses by ski or snowmobile.

19.6 Challenges to Hydroelectricity Production

Regulating the river is necessary to adjust the rhythm of the river to the rhythm of electricity consumption. It has to flow more intensely during morning and afternoon peaks of microwave and electric light use. Its spring flood waters should be contained for electrical heating during the next winter. And – particularly in times where carbon dioxide emissions have to be curbed – every drop of water that is allowed down the river without turning the turbines is a waste of energy, or even a furthering of global warming. People have to manage the river, determine how it flows and thereby decide what is and is not to live there.

But, does the power company actually succeed in such a control? Can its computer systems and concrete masses really determine how the Kemi River flows? To what extent is such a view – that a river can be made to conform to a strategy thought out in a control room or determined by the electricity market – an illusion? In how far can solid structures and hard data control a river? Turning away from the stark impressions of the control room and the armoured concrete structures of the hydropower stations and focussing on the actual tasks of those engineers and other staff who actually make the decisions about how to produce a particular amount of electricity with a current state of the river, helps to qualify this issue. In many ways, of course, these actors do manipulate the river substantially: controlling generator intakes, floodgates and reservoir outlets with just a click on a computer gives them considerable power over some of the river's processes. But naturally there is more to a river than these mechanical structures. The state of the river not only depends on how far floodgates or generator intakes are opened or

[10] Damming the river's mouth led not only to the displacement of salmon, but of other migratory fish species as well, most notably – in terms of local use – white fish and lamprey.

closed, but on a host of other factors as well, over which the power company cannot have any influence: For instance, forests and swamps throughout the watershed keep changing their characteristics as they are deforested and the ground ploughed for reforestation, some areas are ditched to enhance wood or hay harvests, or abandoned ditches are eroding and the landscape reverts to a state as it might have been many decades ago. All this influences how much water is – and other substances are – in the river.

Another factor largely out of reach of the control room managers is the weather: How much it rains or snows, how quickly the snow melts, how much water evaporates or seeps into the ground is something the power company can only react to – not steer or control. Even the intricate forecasting technology that measures – among other things – snow depth, temperature and discharge across the watershed and combines these data with meteorological information to calculate scenarios for the state of the river, is insufficient for actual decision-making. Particularly concerning the marked seasonal variations of the river and its environment over the year, these climatic factors influence the river much beyond the reach of hydroelectricity engineers. Even those members of staff who fully trust in the flow-manipulation machinery are aware that the forming of an ice cover on the river in late autumn and the breaking up of the ice in spring are very sensitive periods, when hydroelectricity production must be subordinated to more pressing issues on the river. In autumn, it is important that a stable ice cover forms on the river as quickly as possible. On the one hand, this has to do with the demands of the riverside population, who are interested in using the river ice for ice-skating, skiing, snowmobiling and even playing 'ice golf', alongside the ice bridges that enable transport across the river in some places. On the other hand however, a reliable ice cover is essential for the very functioning of the hydropower stations. A continuous ice cover, preferably with some snow on top, acts as an insulator between the water in the river and the air above. The water will then never quite reach the freezing point, even if air temperature reaches minus 30 degrees Celsius or colder, which is not infrequent in a Lappish winter. If this ice cover is not continuous, however, the air will cool the river water below the freezing point, where it forms so-called 'frazil ice', small ice crystals in the water that readily stick to any surface the water touches. Thus, not only can the flow of the river be hampered when this frazil ice accumulates around rocks in the river bed, but it can also seriously damage hydropower facilities, like the turbine's rotor blades, should it enter a power station. Frazil ice forms particularly in river stretches with fast water movement, such as rapids, but also in calmer stretches, if no ice cover has formed due to continuous and pronounced changes in the water level – as created by hydropower generation. Therefore, in order to preserve infrastructure and good relations with the neighbours, manipulation of the river in late autumn is a very delicate matter for the hydropower company.

Similar observations apply in spring: When the snow melts and the river swells to a tenfold volume of its winter flow, the ice crust breaks up and heavy ice floes float down the river. The amount of water starkly exceeds the capacity of the turbines, so that floodgates have to be opened at the dams, to channel a large portion of the river water around the hydropower stations. On the one hand, because water

is so abundant during the flood, the turbines run continuously at full capacity, generating a large amount of electricity every day. On the other hand, because of the increased water volume in the river, the head at the individual power stations is reduced; hence they produce less energy per unit of water. Furthermore, by this continuous production, some of the regulatory capacity of hydroelectricity is lost. The special – and also financially highly priced – feature of hydropower, to balance out the daily variations in electricity demand by instantaneously adjusting production, is mostly absent during the flood. A rather complicated task at this time of year for hydroelectric engineers is to keep the water level along the river within the limits specified by their power plant operation licences. Every licence for running a hydroelectricity plant states exactly, how high or low the water table may be above its dam (Holm 1991, pp. 116-120) – during flood times, these limits are even more difficult to keep than during the rest of the year.

The most dreaded event during the spring flood, for hydroelectric engineers and other river-dwellers alike, is the formation of an 'ice dam', that is, the conglomeration of ice floes across the river, jamming its flow and causing the water upstream to rise. The water level during flood times is already exceptionally high, but when an ice dam forms and accumulates sufficient further ice floes, the water can rise to a level that inundates and damages not only roads and auxiliary buildings like barns and saunas, but also people's homes. Ice dams are prone to form on shallow river stretches with rocks close to the surface, like in rapids and on particularly narrow points along its course. Furthermore, they can occur when an upstream section of the river has already discharged its ice cover, while there is still solid ice on a downstream part, so that the floes get stuck on the edge of the persisting ice crust. This used to happen only rarely on the Kemi River, because its upstream sections lie northwards and north-eastwards from the downstream river, in colder regions thus, where the spring flood would set in later. Since the construction of hydroelectric infrastructure on the river, however, the latter kind of ice dam has become a real threat, because the ice cover does not readily leave the pools upstream of the power stations, where the current is slow. Thus, the power company tends to get blamed for many damages associated with the spring flood and ice dams. Arguably, during spring the river controls the hydroelectricity engineers more than they control the river, as their main occupation seems to consist of averting damages to their infrastructure and public image.

Such rather concrete threats are not the only factors limiting the hydroelectricity engineers' grip on the river. Changing climate patterns, for instance, make the reliance on data that has been collected over the decades less meaningful. Observations from the past are unlikely to be indicative of what happens in the future. Mild winters, wet summers and various unpredictable and extreme weather events are prone to considerably change how the river is – and can be – dealt with. This results in more of an 'experimenting' with the river, than a well thought out managing of it. For instance, it is projected that in the near future, precipitation in late autumn will increasingly be in the form of rain – instead of snow – which enlarges the river's volume. At this time of year, however, the reservoirs throughout the watershed are usually full to the brim, because they are anticipated to store as much water as possible for the winter. Therefore, there will be the risk of an 'au-

tumn flood', albeit with less overall discharge than in spring, but also with reduced capacities to mitigate it, as the reservoirs, that serve to buffer the peak of the flood discharge in spring, cannot be resorted to.

19.7 Dealing with a Flowing River

Such future scenarios, as well as the description of challenges around river ice, might give the impression that hydroelectricity engineers would be particularly worried during autumn and spring, or regarding the future. I have, however, not found this to be the case. Quite on the contrary, these periods of increased attention blend in smoothly with their work throughout the rest of the year. When dealing with the Kemi River, anything can happen – anytime. Part of a generator might suddenly break, some electrical equipment might malfunction, or a few rainy days might raise the water level at a particular reach to unforeseen heights. Even if nothing unforeseen happens, the engineers' grip on the river is never totally fast: no matter what they do, the river flows and if their dams are not opened according to this constant stream of water, reservoirs and river will overflow. The control room staff knows this and knows just as well that engaging with a river requires much more than sitting in the control room watching screens and pushing buttons. A leading figure of this staff, for instance, proposes to supplement the numerical data constantly flowing into the computers with more visual and acoustic information from the power stations. For example, it can be decisive to actually see the ice floes upstream from a power station, in order to sensibly decide how to work the flood gates so that potential damage is averted. Similarly, installing microphones at the turbines should enable engineers to find out what is going on at the particular plant more readily than – or at least complementary to – merely figures about electrical currents and circuits.

During winter, two members of staff regularly drive along the river throughout the municipality of Rovaniemi in order to get a first-hand impression of the quality of ice cover. This is particularly relevant during late autumn and early winter, when the ice is forming. For the public image of the hydropower company, the stretch of the river around Rovaniemi is especially important, as about one third of the entire population of the province of Lapland lives in this area. Here, direct observations of the river's surface can be more significant than data tables and computer models. If – as has been the case for several weeks during the rather mild winter of 2007-08 – the ice cover is too fragile or features too many open spots, all the hydroelectricity engineers can do, is to not manage the river very much at all: allowing the river to flow evenly and slowly is the best recipe for the formation of stable ice.

Also during spring, in order to better estimate the extent of the coming flood, hydroelectricity producers do not rely on figures and models retrievable on the screens in the control room. The same two members of staff who drive along the river in the winter embark upon a reconnaissance flight over the fringes of the watershed in spring. During the flight in a tiny propeller plane they closely watch and

photograph the amount of snow and water in the landscape, estimating from their observations the amount of water that will descend the river during spring, as well as gauging approximately when this will happen, or over which period of time. A moderate amount of snow, melting quickly during a sudden heat spell, can cause a much larger flood than a huge amount of snow that melts slowly because of low temperatures.

A further fact that precludes a genuine 'management' of the Kemi River is that the hydroelectricity producers' lives are interwoven with the river in many ways that have little to do with hydropower. They all live close to it and spend a considerable part of their leisure time at, on and in the river. Some even grew up along the river. The hydroelectricity company owns a number of cabins on the Kemi River and its tributaries, which employees can, and often do, utilize. Hydroelectricity producers thus know and experience the river not merely as a power resource, but also by fishing, skiing, swimming and living with it. Many of the engineers' ideas about the river do not come from books or hydroelectricity production, but from their childhood and leisure time experiences. To an extent, the river has become part of the engineers' personalities. Therefore, it is unlikely that the Kemi River figures in their work merely as an object of management.

Focussing on the practices of hydroelectricity production, instead of solely on the immensity of the dams and data employed, a rather different image emerges than that of a subjugation of the river. The people working in the power company have to know the river exceptionally well and they must constantly negotiate the energy demands of the electricity market with the actual state of the river. This relation is not adequately described with the concept of 'control'. Even 'management' – if understood as the manipulation of an environmental phenomenon according to a predefined plan – captures the reality of hydroelectric production only partially. In fact, hydroelectricity producers do not manage the river any more than the river manages them.

19.8 Conclusion: The Limits of River 'Management'

What is thus to be made of river management? Is it possible at all? Or does the very logic of a river – its flow, its seasonal variation and its unpredictability – preclude the idea of management, if not understood as a reciprocal relation of engagement? Is it useful to further the ideal of river management by increasing the amount of structures and data to tighten the grip on an ephemeral flow? Or would a fundamentally different approach do the river more justice – and thereby also work better?

Arguably, the actual practice of hydroelectricity production – as opposed to the ideal to which it is often stylised by both proponents and adversaries – can serve as a point of departure for thinking about such an alternative. With its pronounced elements of negotiating with the dynamics of the river, this practice is – at closer inspection – much more similar to that of constructing and maintaining the other type of cross-river construction, the salmon weir: These weirs were not built to

stop or fundamentally alter the river, neither were they constructed to cover the entire diameter of the flow. The flow had to continue, otherwise they were ineffective. They were constructed annually, when the conditions on the river were right, not triggered by an external signal such as the calendar date or a price increase. Later in the season they were carefully deconstructed again, trying not to compromise the quality of the fishing site. Other fishing methods were employed in other places along the river and during other phases in the season; the weirs were not designed to do all the fishing. Finally, measures were in place to ensure the sustainability of the activity, such as the closure against over-exploitation, the identification of specific fishing sites and leaving the King's Channel open. Of course, these two technologies cannot be simply equated; because they regulate and harvest different aspects of the river, their impact on the entire watershed has been very different, as has been their scale. However, both of them have to deal with the basic characteristics of a river in order to harvest something from its flow. This reveals more parallels than initially obvious.

Ideas and technology are two sides of the same coin. A barrier that harvests the river selectively and adapts to its varying characteristics presupposes a conceptual base that varies significantly from that of modernist environmental management11, which sets out to subdue and control environmental phenomena conceptually and physically. The example of the Kemi River shows that such control can hardly be entirely possible. Salmon weirs and hydroelectric dams both harvest a particular quality of the river and the operators of both types of construction have to know and respond to the river's dynamics. Even though hydropower development on the Kemi River has been, and to some extend still is, driven by modernist visions of harvesting controllable natural resources to suit particular needs, the actual operation of the system of power stations does not comply with the ideal of management as controlling a phenomenon in order to execute a ready-made plan.

Thus, if not even a technology that commands almost one million cubic metres of reinforced concrete, data collected during many decades throughout an immense area and a group of highly educated and experienced staff – if not even such a technology controls the Kemi River, the idea of river management in the traditional sense seems to be a conceptual illusion. A river cannot be managed, by imposing a rigid, predefined plan, but an engagement with its flow is always a reciprocal relation. This is not to claim that a river cannot be dealt with or used for human interests at all. Since it emerged after the last Ice Age, the Kemi River has always been used by humans and probably will be for a long time to come. But such uses have been – and necessarily will be – based on reciprocal engagement with the river's flowing characteristics. Only thus can they work.

[11] For a critical evaluation of environmental modernisation, see Chapter 18.

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20 Visualising Nuclear Landscapes: Visual Simulation in the Licensing for Finnish Nuclear Facilities

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20.1 Introduction

This chapter discusses the use of visual techniques for project simulation in planning procedures as part of the reflection on environmental management practices in Part III of this book. The problem that such simulation techniques attempt to solve is the perception of environmental changes, such as the construction and operation of nuclear power plants, before they are realised. The purpose of this chapter is to introduce phenomenological theories to the discussion of visualisation techniques in order to achieve a more critical understanding of management practices. It will be argued that sophisticated technologies, as employed in the licensing of nuclear power plants in Finland (section 20.2), enable realistic views on the changes in landscape while the implications of their increasingly prominent role in planning are discussed very little. Managerial approaches (section 20.3) enthusiastically highlight the possibilities for producing suggestions in a format that "everybody can understand" (section 20.4). However, it is argued in this article that personal perception of landscapes cannot be modelled by simulations, which are therefore of limited use when it comes to assessment of possible changes and informed decision-making. Phenomenological approaches (section 20.5) highlight the short-sightedness of environmental management practices. In the licensing procedure of nuclear facilities in Finland, visual simulations are employed rather often, while the frequent use of manipulated images is as such not subject to scrutiny. In this respect, a free hand is granted to the project developer, who naturally aims at a smooth assessment process and positive outcomes. Moreover, and despite showing the projected changes in the landscape, Finnish companies deliver a certain kind of image of nature conservation and social responsibility. The chapter concludes with comments and recommendations that could help improve the use of visualisation techniques in the Finnish licensing procedure (section 20.6).

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20.2 Licensing of Nuclear Facilities in Finland and the Use of Visual Simulations

Finland is the first European nation to build a new nuclear power plant for more than a decade. In addition to four existing units, a fifth unit is scheduled to start operation in 2012. Finland employs a world-wide unique licensing procedure for nuclear facilities, demanding a decision on the project by the Government and ratification of governmental decisions by the Parliament. Developers of nuclear facilities must provide an environmental impact assessment report in their application for a decision-in-principle. The candidate municipality retains an absolute veto right, and is to be consulted before a decision-in-principle is made. In order to ensure an unbiased process, the applicant is allowed to make investment decisions and publish a call for bids only after both Government and Parliament have decided positively on the project. Construction license and operation license must be applied for separately. In 2000, the Finnish Government decided on a final repository for highly radioactive waste, and became thus the first democratic nation to make this decision. Construction of the repository is underway, and disposal of spent fuel will begin around the year 2020.

Currently, applications for three further nuclear power plants or plant units are being prepared. In their environmental impact assessment reports, three companies – Teollisuuden Voima (2008), Fortum Power and Heat (2008), and Fennovoima (2008) – each suggest the building of a 1600 Megawatts plant or plant unit. Under the growing threat of climate change, political debates indicate a rather positive standing towards the expansion of nuclear power in Finland, and approval of at least one application seems likely. Additionally, the joint company responsible for the disposal of radioactive waste, Posiva, is preparing an application for the extension of the final repository in order to deal with the waste produced by the plant currently under construction (Posiva 2008). With every licensed power plant unit, disposal of waste produced during the unit's lifetime must be assessed and applied for separately.

Negotiations between power companies and local communities take place during the obligatory environmental impact assessment under supervision of the Ministry for Employment and the Economy and the Radiation and Nuclear Safety Authority STUK. Regional environment centres are asked to engage in the licensing procedure. Further, the Ministry of the Environment organises public hearings in the candidate municipalities. Guiding competences remain with the Ministry for Employment and the Economy and STUK, which both actively pursue the development of nuclear power.

During recent environmental impact assessments, all four companies requested help from one major Finnish energy consultant, Pöyry Energy. The assessments are usually organised by a company-consultant working group, and most involved consultants work on all four projects. This is highly visible in the publications, such as the environmental impact assessment programmes and reports. This paper will especially focus on one aspect of these reports, the visual simulation of nu-

clear power plants during environmental impact assessments. Images referred to in this paper are available in publication and for download (see list of references).

The consultant's long-standing expertise in energy consultancy provides companies with a certain set of proven practices. Presentations of assessments are thus rather similar across nuclear power projects. The consultant, for instance, suggests participatory elements for the assessment, and advises on the write-up of the report. Assessment reports of all three companies present an identical structure to the reader. Each report introduces a separate project logo. All issues are published in several languages and they look highly professional. Full-page aesthetic pictures require much of the publications' length. In Fortum's environmental impact assessment report (2008) there are 30 full-page photographs taken by a local photographer. Throughout the assessment procedure, visual presentations of the proposed project are distributed by the developer in environmental impact assessment programmes and reports, newspapers, leaflets, websites, exhibitions and oral presentations. With the help of computer software, the new unit or plant is fitted into photographs (aerials) of the considered site. Production of (manipulated) images, printing and binding costs must be considerably high, and are thus only affordable to major companies (cf. Al-Kodmany 1999; Lange 2001).

The reader of these publications is confronted with a peaceful, beautiful, healthy environment and happy people (see especially Fennovoima's online presentation). It is suggested that nuclear power facilitates protect nature without restrictions to comforts and living standards. The look of programmes and reports often resembles that of a sales magazine. A member of Finland's Green Party called the efforts of one developer concerning an earlier project a "commercial blitz" (Andersson 2002, p. 81).

In regard to project simulation, manipulated images look highly realistic and the observer is encouraged to imagine the effects of project implementation. Usually the picture shows the completed power plant from the sea side, from a bird's eye perspective. All developers provide pictures of candidate sites in summer time, decorated by clear blue skies. The horizon is visible in the picture, as is a wide area of the sea, and the power plant itself takes up only a little part of the whole image. The bird's eye perspective comes close to features of maps or GPS, and therefore enables an almost holistic view of the scene. However, for assessing the impacts of project implementation this view is also restrictive. It does not, for instance, allow an assessment of heights, and it is not clear how much of the plant is visible from different perspectives on the ground or at sea level. Fennovoima (2008, pp. 240ff.) is the only company to provide one additional picture for each candidate site where the power plant is simulated from a sea level perspective. Further, the presentation of the completed plant in summer time does not allow an assessment of effects of discharges into the sea water and thus effects on sea ice and fishing, nor does it allow an assessment of the visual landscape with leafless trees and snow on the ground. In general, many of the issues residents are concerned about are hard to imagine with the help of a manipulated photograph, such as increases in traffic, presence of around two thousand foreign workers, changes in the municipality's image and identity, and increasing municipal dependency on

the company. The construction site, which will prevail for some years, is not subject to visual presentation.

The given visualisations invite us to engage in the assessment in certain ways. We can conclude that manipulated and polished pictures direct attention towards visual assessment of the completed project, and at the same time deliver messages of nature conservation and social responsibility. Thus, the aerial view from the sea with clear blue skies and a visible horizon transports meanings that go beyond landscape assessment in regard to impacts of a single project. Moreover, the picture describes the energy company in heroic terms, where new lands are approached and new frontiers reached.

Finland employs a strong "polluter-pays"-principle, and it is mainly the developer who is in charge of carrying out the environmental impact assessment. Coordinating authorities are supposed to encourage nuclear development and do not take a critical stance towards assessment procedures concerning possible biases. Local and regional authorities have restricted themselves to the observation of assessments rather than active engagement. Thus, certain biases in the set up of the assessment including the making and presentation of simulations are easily identified. Since the environmental impact assessment report will be the main document for the following debates and decisions on the project, an analysis of the use of images is necessary. This article therefore focuses on scrutinising the possible benefits and restrictions born by the use of imaging technologies. We will start our analysis by reviewing the expectations and functions assigned to visual project simulation by practitioners and scientists as stated in major management journals (e.g. *Landscape and Urban Planning*, *Environment and Planning*) and monographs. Despite their eagerness to employ imaging technologies, many authors have voiced concerns about the use of images in assessment procedures, since biases are quite often obvious. Moreover, theories of perception do not agree that the high expectations of practitioners could be met by using imaging technologies. Based on a literature review, managerial aims to facilitate smooth procedures with the help of manipulated images and underlying assumptions about visual perception will be contrasted with phenomenological theories about the perception of the environment.

20.3 Practical uses of Imaging Technologies in Environmental Planning

Lange (2001) exemplifies the purpose of using imaging technologies by stating that planning disciplines "want to be better understood by the public" (Lange 2001, p. 179). The notion of improving the "understanding of people" has been described as the cognitive deficit model in research on public understanding of science. In the deficit perspective, it is assumed that people have a lack of knowledge which can be supplemented. Having received such lessons people are supposed to make the right decisions (see Wieser 2002, Lynch 2004, Irwin 2006 and Wynne 1992).

However, Lange (2001) points out constraints in the use of the produced images, in that "even the best simulation is only a representation of the real world. A virtual walk-through is not the same and will never be the same as a real walk in nature" (Lange 2001, p. 179). Nevertheless, Lange argues, visualisation techniques could support "better and more informed decisions about the spatial organisation of the landscape" (Lange 2001, p. 180) and facilitate "improved communication among experts and lay persons, i.e. among planners and the persons affected by planning" (ibid.). A critical point for Lange and other scholars is the timing of image distribution, since at that time project simulations were only published after public negotiations and environmental impact assessments took place. Lange argues that project simulation should be available from the start of the procedure (Lange 1994: 103). In the case of nuclear power licensing in Finland, manipulated images have been distributed through websites, bulk mail and newspapers from an early stage of the assessment procedure. In the case of the company Fennovoima, several candidate sites have been assessed, and all sites have been clipped in separate images. However, there have been no opportunities for residents to influence the choice of a site or the choice of plant design.

Al-Kodmany (1999) presents a rather different approach developed in small-scale urban planning. Al-Kodmany (1999, p. 38) agrees that "visualization is the key to effective public participation because it is the only common language to which all participants – technical and non-technical – can relate"[1]. However, he refers to a rather different use of imaging technology, when simulations are a result of collaborative planning rather than a pre-produced sketch to be fed into the process at some point of time. In his study, Al-Kodmany reviews several different visualisation methods applied in a collaborative planning scheme. He concludes that interactive planning with different methods (GIS, artist's free-hand sketches, and photo-manipulation using computer imaging) required a range of sometimes expensive technological devices, and their failures often slowed down the creative process. Nevertheless, seeing their own suggestions become visible almost immediately after proposing them encouraged residents to continue participation. Al-Kodmany concludes, "[t]he designs that were created by the planners and designers reflected the community's wishes and respected their cultural heritage" (Al-Kodmany 1999, p. 45). Notwithstanding these potential benefits, few project developments may be able or willing to include a procedure as presented by Al-Kodmany due to time, cost and personnel constraints.

[1] Merlau-Ponty (1989) discusses how blind people perceive the environment. In contrast to Al-Kodmany (1999), who does not mention the possibility of not being able to see, Merleau-Ponty uses the example of blind persons to support his argument of interacting senses.

20.4 Expectations and Concerns towards the Use of Imaging Technologies

Practitioners in planning have been enthusiastic about the possibilities visual simulation has to offer in regard to decision making.

> "People are good at understanding images, but they are bad at understanding information presented in other forms" (Lange 1994, p. 111)

Although more than a decade has passed since Lange expressed his view his claim still dictates practices in environmental planning such as the licensing procedure for nuclear facilities in Finland, where reports are stylised and comparable to sales magazines. Lange's phrase indicates the rhetorical power of images, and that they work differently compared to texts. The effects of visual representation have been described from a more critical perspective by Barry (1997) in regard to advertisement. Barry notes that "consumers read visual language more quickly and easily than verbal language" and that they "block out negative messages in favour of positive messages" (Barry 1997, p. 277). The manipulated images of nuclear power companies aim at similar effects, since the developer strives for implementation of the project.

In a more recent publication Cosgrove (2008) is concerned with the role of images in 20th century environmentalism and discusses how we read them. "The pictorial image veers towards the affective and sensuous rather than syllogistic and analytic, and in more than merely its aesthetic aspect. Further, the eye engages a picture as a whole, working across its surface in nonlinear (thus nonhistorical) fashion." (Cosgrove 2008, p. 1864) Cosgrove adds that certain combinations of "line, form, composition, colour and tone generate immediate sensual and aesthetic responses" (Cosgrove 2008, p. 1864). The composition suggested by the developer does not only deliver aesthetic values, but engages the viewer to understand at once what is otherwise only possible by endless reading through texts and interpreting cartographic material.

Aerial views from the seaside including distant horizons and a rather small power plant evoke certain sensations. Since very few residents have ever had the possibility to look at the locality from 200 metres above the sea, and are used to look at their environment from rather different angles, presented pictures aim to produce a good "gestalt"[2]. Van den Berg (2006) explains how expectations on compositions of images have developed over centuries:

> "Histories of photography [...] tell and show us to what extent photographers, since the very first beginnings of photography, have tried to imitate painted representations of nature that have been developed by painters since the 15th century. The German noun 'Vorbild' reflects two dimensions of this relation: on the one hand, it means the preced-

[2] Gestalt psychology discusses perception from a phenomenological perspective. It assumes the cognitive organisation of visual impressions in regard to good shapes (*"gestalt"*). However, this theory has been criticised for being descriptive rather than explanative.

> ing, the pre-existing picture and, on the other, it has a normative reading since the model claims to be followed." (Van den Berg et al. 2006, p. 43)

Due to the long process of production, painted representations are not just understood as representing an instant view of the landscape, but that much thought was devoted towards rules of composition. Regarding photography, the composition work is usually not given as much consideration, although we can expect most residents in western societies to know about possibilities to digitally manipulate pictures due to the distribution of home user manipulation software.

The training of landscape architects devotes much time to the teaching of aesthetic values, which are assumed to be measurable and usually studied in psychological surveys (cf. Daniel 2001). Reflection on decisions concerning the choice of locality, viewpoint, focus, and thus the discussion of ethical questions, is scarce. In that respect Sheppard (2001, p. 183) suggests "developing a code of ethics" and thereby establishing some sort of "guidance for crystal ball gazers". He concludes that the aim should be the production of an "honest and neutral visual representation of the expected landscape" (Sheppard 2001, p. 196). Therefore, he suggests five principles as a code of ethics for the use of visualisation technology, including accuracy, representativeness, visual clarity, interest, and legitimacy. Concerning representativeness, Sheppard claims that visualisations "should represent typical or important views/conditions of the landscape" (Sheppard 2001, p. 194). E.g. residents could be consulted to identify important viewpoints. In terms of "interest", the author states that "the visualization should engage and hold the interest of the audience" (Sheppard 2001, p. 194); however, current technologies are likely to produce over-stimulation and to carry metaphors. Further, errors and degrees of uncertainty should be disclosed. Sheppard's evaluation of incorporating ethics into the training of practitioners is yet pessimistic (2001, p. 192), especially because many of those producing visualisations never participated in any training and acquired their skills through self-education.

Following the approaches by Lange and Al-Kodmany, visualisation techniques enable stakeholders (and developers in the latter case) to understand difficult data on projects in the planning stage. As an expert in imaging software, Lange is especially concerned with the question of how to provide ever more realistic views on the landscape and claims that images should feed into the planning procedure at an early stage. Al-Kodmany's study showed the benefits of producing project simulations in collaboration with residents. These two approaches of using imaging technology in environmental planning are thus diverse. However, we can consider Lange's idea of feeding manipulated images into the planning procedure at an early stage as a normal case. This raises the question how images are actually produced if they are not a result of collaborative planning.

In her ethnographic studies, Büscher (2006) observes practitioners producing photographic material for visual manipulation. She describes the difficulties practitioners face when trying to identify and capture viewpoints suitable for the purpose of manipulation and how perception of the target area is bound to movement around the place. In the first case of her study, landscape architects and visualisation specialists preliminarily decided on possible viewpoints from maps and aerial photographs (from here on referred to as aerials). For instance aerials were under-

stood to provide only limited information of the place, since they do not give indication of height (ibid. 286). Practitioners then got to know the place by moving around the site in order to take pictures for visual manipulation. Büscher's second case presented in the same article reveals strategies used and problems faced by a landscape architect when actually figuring out the exact site for a windmill with the help of maps and GPS. Her discussion of findings reflects on the practitioner's movement around the place with reference to theories of environmental perception. However, in her ethnographic analysis Büscher is restricted to describing how practitioners gain a sense of place and she does not reflect on further implications of the work by landscape architects such as aesthetic judgements, in this case the decisions on views and the consequences of presenting certain views (but not others) in the planning procedure.

20.5 Perception of the Environment

Theories of perception in environmental management often relate to psychological or physical approaches with regard to bodily functions, usually limiting the description to visual perception. Aesthetic value judgements are observed as difficult, but still possible, to measure, and thus can be used as transferable indicators. In concurrence with this understanding, views of a landscape, such as provided by aerials, can be manipulated following certain culturally shaped aesthetic values. Another approach acknowledged in environmental management is the "theory of optic flow and affordance" (Bell 2001, p. 207) developed by Gibson in 1979, also known as the ecological theory of perception. Following this approach, and according to Bell's interpretation, we perceive our environment based "on our moving through a landscape so that it 'flows' around and past us" (Bell 2001, p. 207), thereby enhancing our spatial understanding. Consequently, Bell argues, visualisation tools should focus on producing a three-dimensional simulation "where we appear to be moving through the landscape" (Bell 2001, p. 210). Projected benefits would be great: "This [visualisation] technique also enables people to experience the landscape more fully and from whatever viewpoint they wish to choose for themselves, rather than one decided for them by the planner" (Bell 2001, p. 210).

Although Bell's presentation acknowledges the shortcomings of two-dimensional views, as introduced by aerials, there are different shortcomings in his understanding, as phenomenological theories of perception will show below. Nevertheless, it may be considered as a common reflection on environmental perception as proclaimed by technology enthusiasts. Bell (2001) assumes that it is possible to produce value-neutral visual representations. Sheppard (2001, p. 188) on the contrary argues, "[e]ven with the best intentions, any two preparers, using the same software and the same base-data, are likely to produce very different visualizations". Another shortcoming of Bell's argumentation is the interpretation of the "flow of the environment", bluntly translated into the need for three-dimensional simulation.

In the following paragraphs we will reflect on these approaches to environmental perception with the help of Merleau-Ponty's (1989) and Ingold's (2000) analyses. In the year 1945 Merleau-Ponty first published his analysis in which he relates the theory of perception to a theory of the body. It is not only bodily functions that enable perception, but the moving body in the environment perceiving with all its senses and with the awareness of its own body moving through the place.

> "Our own body is in the world as the heart is in the organism: it keeps the visible spectacle constantly alive, it breathes life into it and sustains it inwardly, and with it forms a system. When I walk round my flat, the various aspects in which it presents itself to me could not possibly appear as views of one and the same thing if I did not know that each of them represents the flat seen from one spot or another, and if I were unaware of my own movements, and of my body as retaining its identity through the stages of those movements. I can of course take a mental bird's eye view of the flat, visualize it or draw a plan of it on paper, but in that case too I could not grasp the unity of the object without the mediation of bodily experience, for what I call a plan is only a more comprehensive perspective: it is the flat 'seen from above', and the fact that I am able to draw together in it all habitual perspectives is dependent on my knowing that one and the same embodied subject can view successively from various positions." (Merleau-Ponty 1989, p. 203)

The view from somewhere is contrasted with the view from nowhere, produced by someone who has experienced different perspectives and who remembers these (see also Ingold 2000, p. 191)[3]. This idea has later been adopted by Gibson, who interprets perception of the environment as a constant flow, and the moving body as constituent of perception (1979). Gibson (2002) argued that the possibility of moving around from one point of observation to the next differentiates space from environment. "The points of geometrical space are abstract fictions, whereas the points of observation in an environment are the positions where an observer might be stationed." (Gibson 2002, p. 85) Another notion, again picked up by Gibson, is the affordances of environment and a person's attention to it. A person's attention is directed towards certain things in its environment. People perceive the environment differently, because they received a "different education of attention" (Ingold 2000, p. 190). Ingold illustrates this argument through the example of a novice hunter who "travels through the country with his mentors, and as he goes, specific features are pointed out to him" (2000, p. 189), which (s)he would not have noticed otherwise. Further, the landscape is constituted of past events and people having dwelled in it, thereby leaving "something of themselves" (Ingold 2000, p. 189). "To perceive the landscape is therefore to carry out an act of remembrance, and remembering is not so much a matter of calling up an internal image, stored in the mind, as of engaging perceptually with an environment that is itself pregnant with the past" (Ingold 2000, p. 189).

[3] Haraway (1991) criticises the common understanding of perception from a slightly different angle by stating that neutral vision is impossible, and interprets the adoption of a god-eye perspective as masculinist domination. Haraway further argues that vision is both bodily and socially shaped (see also Chapter 23 on sustaining waste in this book).

Ingold further argues that in perceiving a landscape we assemble a list of tasks that must be completed; in that we see a garden which needs to be maintained, corn to be harvested, and houses to be built. These perceived tasks, and active engagement in the following, are "the constitutive acts of dwelling". Ingold terms this ensemble of tasks the "taskscape" (Ingold 2000, p. 194ff.), which is not a stable condition, but underlies temporal alteration. Following Merleau-Ponty, the perception of the environment is not restricted to visual fields, and requires the moving body with all its senses. Vision, sound and colours, smells and touches all relate to perception.

> "It has been wrongly asserted that the edges of the visual field always furnish an objectively stable point. Once again, the edge of the visual field is not a real line. Our visual field is not neatly cut out of our objective world, and is not a fragment with sharp edges like the landscape framed by the window. We see as far as our hold on things extends, far beyond the zone of clear vision, and even behind us. When we reach the limits of the visual field, we do not pass from vision to non-vision: the gramophone playing in the next room, and not expressly seen by me, still counts in my visual field." (Merleau-Ponty 1989, p. 277)

Practitioners of environmental management may argue that an environment, including its specific smells and sounds, could be simulated with some sort of future technology, as for instance performed in the science fiction TV series Star Trek. In three-dimensional simulations on board of a space ship members of the "next generation" are able to rebuild their favourite environments in a highly realistic manner for leisure purposes.

Driven by the idea that people could make better informed decisions about changes in their local environment, planners today aim at ever more realistic simulation in order to facilitate "real experiences". However, we can object that experiences of simulated and existing environment cannot enable similar perceptions, since a person would be aware of the artificiality. Further, it is hard to imagine that people would be able to spend a longer period of time in the simulated environment, experience seasonal changes, to permanently dwell in it, work with it, and use it without being aware of it, in the sense of an "attentive involvement" (Ingold 2000, p. 207). What is more, perception of a familiar environment might not be feasible. The producers of simulations may direct their attention towards very specific details in the target environment, whereas residents would probably depict a different set of features. Landscape architects moving around a particular site in order to get "good views" and take pictures for visual simulation perceive the environment by spending time in it. However, their "taskscape" and therefore their attention towards particular things differ from residential taskscapes and their particular attentive involvement.

Büscher's ethnographic study on the work of landscape architects concludes by referring to Ingold (2000) that landscape architects were provided with "views from nowhere" through maps and plans, but that in their work preparing the visual simulation of projects they gained a "view from somewhere" (Büscher 2006, p. 294). Practitioners therefore get to know the candidate location as other visitors to the place would. Büscher describes landscape architects as being emphatic in employing some kind of imagined local perspective to the field. However, the mean-

ing of the place, with regard to seasonal and historical changes, and different activities ("taskscape") does not unfold to the landscape architect and the resident in the same way.

20.6 Conclusions and Recommendations

Visual simulations receive a high status in environmental planning; however, expectations are revealed to be unrealistic. As shown in this article, an ordinary perception of the target environment and changes within it cannot be achieved by the manipulation of images. A better or even full understanding of prospected changes – which is a declared goal of practitioners – and consequently informed evaluation and decision-making turns out to be a fallacy. Phenomenological approaches show that it is our own bodily movement and successive discovery of things in the landscape that will form our perception of the environment, which unfolds historical traces and certain tasks, depending on the individual's personal needs and experiences. Further, the flow of perception is not restricted to sight, but employs all our bodily senses, including smell and taste, touch and hearing. As the notion of flow indicates, perception is governed by temporality and not an instant moment of time, condensed in a picture. In addition, the environment is always viewed from somewhere, knowing that things can be explored successively. On the contrary phenomenologists argue that aerial views or maps do not offer a view from somewhere, but a view from nowhere,.

In the licensing of nuclear facilities in Finland, visually manipulated aerial views are employed rather often during environmental impact assessments. Only in the latest environmental impact assessment report of one developer have a couple of simulated views from the ground been introduced. However, the use of images and visual simulations of power plants is not reflected upon by involved actors. On the contrary, we can assume a strong demand for visual material by decision makers and the public, and we can sense why so little attention is drawn to quality control of current practices.

The analysis of Finnish nuclear power projects has further shown that visually manipulated images of landscapes have metaphorical character, and that they aim to presenting beauty rather than reality. International research provides evidence that although biases in project simulation have been identified by many scholars, their reflection is seldom part of practical training. Ethics and guidelines are called for (see Sheppard 2001), but technologies tend to develop faster than these can be elaborated.

From a phenomenological viewpoint we can argue that the goals of visual assessments cannot be achieved. Finnish residents will not be able to imagine the projected changes and impacts on their livelihoods by looking at simulated nuclear power plants on paper. Ever more sophisticated technologies may not depict impacts on movement in the vicinity of the power plant, changes in the sound (e.g. construction noise, absence of birds) and smell (released e.g. by chemical substances during construction), touch (e.g. sensing the fragile sea ice during winter)

and taste (e.g. of fishes drawn to the warm discharge waters of a power plant). Visual simulations are thus more of use in rather abstract assessments of landscapes and visual representations for tourism purposes and the like.

As a general conclusion of this article, practices like the use of visualisations in the licensing of nuclear power plants in Finland do not only need further guidance in training, supervision in practice, and thus ethical reflection throughout application, but also a critical evaluation of what visual simulations can offer in regard to a "better understanding by local people", and which priority should be assigned to their use in a planning procedure when compared to other methods of assessment. It is likely that technology enthusiasm in environmental management continues to overlook the pitfalls in focussing on visual assessment which does not enable the user to *perceive* environmental changes in advance. Thus, it is less an informed decision-making promoted by environmental managers, but the delivery of a positive image about a company's activities and consequently a smooth siting process. Alternative approaches such as presented by Al-Kodmany (1999) should not be expected to enable citizens to perceive or understand "better", however, collaborative production of visual representations allows individual interpretation and engagement. Instead of being swamped with beautiful images, people could directly participate in the process of visualisation, learn about uncertainties and contingency, observe experts dealing with computer failures and explore their environment on foot in the quest for a "good view" of their environment (as those landscape architects in Büscher 2006). Practitioners would aim at an "attentive involvement" (Ingold 2000, p. 207) of residents in the assessment rather than the distribution of finalised information.

In order to achieve such a participatory development of visualisation, I propose the following points for consideration.

- Environmental legislation should specify assessment practices in general, in particular regarding the use of visual material and visual simulations.
- Industries should be encouraged to commit themselves to a more reflective use of visual material and to provide open information with regard to the production and aims of simulations.
- Main documents like the environmental impact assessment programme and report should include a section disclosing information on visual material, such as a description of the uncertainty and arbitrariness of visual simulations.
- Authorities should supervise the assessment procedure and guarantee quality control.
- Decision makers should be made aware of current practices and possible biases in the documents they are dealing with.
- Public participation should be aimed at with regard to the making of visual material. If this is not feasible due to technical and time constraints, an information campaign could put the production and use of simulations and aesthetic photographs into a wider and reflective context.

Although these points refer to the Finnish case study, recommendations may be generalised and applied to other country cases and international environmental impact assessment practices.

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21 Outsourcing Emissions: Clean Development Mechanism (CDM) as Ecological Modernisation

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21.1 Introduction

Ecological Modernisation (EM), which emerged as a major theoretical perspective in environmental sociology and politics during the last decades of the twentieth century, addresses the advanced industrial development and the ecological crises associated with it. Besides playing a significant role in the discussions on state, production and consumption within the environmental social science academia, the perspective is highly influential in both strategic environmental planning by governments and the restructuring of production by manufacturers (Mol and Spaargaren 2005; Murphy 2000).

Closely integrated to the neoliberal ideas of economic organisation, the Ecological Modernisation 'theory' aims to analyse how contemporary industrialised societies deal with environmental crises (Mol and Sonnenfeld 2000). As an 'improved' synonym for Sustainable Development, EM proposes that environmental problems can be sufficiently dealt within the framework of continued modernisation of capitalism and the application of modern experimental sciences (Buttel 2000) and presumes that economic growth and environmental protection can be symbiotic. It is claimed that the malleability of EM with the institutions and technological capabilities of industrial capitalism, particularly in the wake of the political challenge posed by radical environmentalism, is a significant aspect behind its emerging prominence (Buttel 2000). As an approach that presupposes unplanned social change (Mol 1995) EM identifies economic actors and entrepreneurs as among the most important constituents who bring forth transformation (Murphy 2000) even though the perspective upholds the need for macro economic structural changes. However, the discursive realm of EM can not be restricted to the ecological and economic interrelations, rather it revolves around the economic, political and social processes that integrate the ecological phenomena to moderni-

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sation process (Mol 1995). As a whole, the proponents argue that EM is ultimately a *political-sociological* perspective and, an advanced theory of EM

> "must ultimately (be) a theory of politics and the state- that is, a theory of the changes in the state and political practices (and a theory of the antecedents of these changes) which tend to give rise to private eco-efficiencies and overall environmental reforms" (Buttel 2000, p. 58).

This article examines Clean Development Mechanism (CDM) of the United Nations Framework Convention on Climate Change (UNFCCC) as a prescriptive illustration of EM perspective and argues that the increasing counterpoints raised against CDM, both as systemic flaws and as potholes of implementation, are inherent to EM framework. This article, set within the backdrop of calls for explicit environmental governance, discusses the formulation of CDM in conjunction with the basic tenets of EM before looking in to the criticisms pitted against the CDM. Subsequently, it elaborates how certain fundamental presumptions of EM can produce such outcomes.

21.1.1 CDM in Global Environmental Governance

Environmental Governance, defined broadly as attempts by governing bodies or combinations thereof to alleviate recognised environmental dilemmas (Davidson and Frickel 2004), varies drastically in the formulation of the issues, organisation of governing bodies and prescription of solutions at different scales, particularly in geopolitical frames. A very significant trend in the late 20th-century environmental governance, according to Davidson and Frickel (2004), is the framing of environmental problems and solutions in the global context. The prominent features of this emergent shift include, but are not restricted to, a) new forms of institutionalising the environment, b) the emergence of transnational institutions, c) the legitimation of science and expertise in environmental discourse, and, d) the polarity between north and south in articulating environmental problems and devising solutions. These often mutually inclusive features permeated through multivalent forms of interplay between diverse actors on different platforms constitute the discursive terrain of present-day global environmental governance.

21.1.2 Emergent Global Environmental Governance

The first feature of global environmental governance is the perforation of scales. The emergent practices of institutionalising environment began to appear with the perforation of erstwhile (predominantly national) scales leading to new forms of scalar configurations and scalar politics (Amin 2002; Bulkeley 2005). At one level, this led to reframing the 'moral- technocratic construction of global environmental change' (Taylor and Buttel 1992) by prioritising the focal attention on specific environmental issues. At a different level, it altered the ways of *how* institutionalising is done. The market based environmental regulatory instruments in

the case of EM measures (Sonnenfeld and Mol 2002) or the specific ways of constructing new geographies of environmental conservation (Zimmerer 2006) are examples of this process.

Secondly, the global environmental governance is marked with the emergence of transnational institutional arrangements, particularly as a result of the 1980s and 1990s spurt of interest in global environmental problems and the capacity of global frameworks for solving them. In this context, organizations, groups, and governments began to think of desirable environmental futures in new ways (Buttel 2003). These institutional mechanisms are networks with organizational parameters for dealing with knowledge claims. They also have policies and specific norms. They function on the basis of legitimacy claims codified through operational procedures and instruments (Ninan 2009). Simultaneously, these institutional mechanisms co-construct the political space for transnational movements as response to their activities.

Thirdly, science and expertise play a special role in the emergent global environmental governance. Besides having a central role in defining what is counted as an environmental problem, scientific expertise plays a central role in the governance of the networks. It is viewed that any reconstruction of science and politics in environmental governance must be a multifaceted process wherein both scientific and social are bound together in interpretations and actions,

> "jointly reinforced by the formulation of problems, the tools available, the audiences being addressed and enlisted to act, the support (financial and otherwise) elicited, and so on" (Taylor and Buttel 1992, p. 413).

The fourth significant feature of the global environmental governance is the north-south tensions in the framing of environmental problems and political priorities. The northern and southern countries differ very much on how and what to perceive as significant knowledge claims and the modalities on how to form institutional mechanisms. These differences of perceptions have often culminated in polemic negotiation between parties[1].

21.1.3 Emergence of Climate Change Regime

Though there have been scientific warnings since at least the 19th century, when colonial environmentalists pointed towards the significant implications of climate variations (Grove 1996)[2]; the organised international efforts to mitigate global warming – a process wherein excessive presence of green house gases (GHGs) in the atmosphere results in a progressive increase in temperature on earth's atmosphere with detrimental implications – only started in the late 1970s. The World Meteorological Organization's (WMO) first World *Climate Conference* in 1979 expressed its concern over anthropogenic 'regional and *even global changes*' of

[1] See Johnson 2003; Kulkarni 2003. See also Agarwal and Narain (1999) for elaboration of this point within the climate change discussions and negotiations.

[2] I am grateful to Ingmar Lippert for bringing in Grove's references to climate change.

climate (emphasis added). The US National Academy of Sciences' (NAS) *Ad Hoc Study Group on Carbon Dioxide and Climate Report* in the same year and NAS' assessment report called *Changing Climate* in 1983 also had major international impacts on policy initiatives. Consequently, the *Conference on the Assessment of the Role of Carbon Dioxide and of Other Green House Gases in Climate Variation and Associated Impacts* was held in 1985 in Villach (Austria). Sponsored by United Nations Environmental Programme (UNEP), WMO and the International Council of Scientific Unions (ICSU), the conference brought together 89 scientists from 23 countries across the world to form an international panel interfacing science and policy. To pursue the recommendations of the Villach conference, follow up studies and conferences were held. The Toronto conference in 1988 called *the World Conference on the Changing Atmosphere: Implications for the Global Security* marked the beginning of high level political debate on the risks of anthropogenic climate change (van der Sluijs et al. 1998). It recommended 20% reduction in the worldwide CO_2 emissions by 2005 (from a 1988 benchmark). Simultaneously, independent of the Toronto Conference, the WMO established the Intergovernmental Panel on Climate Change (IPCC) with the support of the UNEP in 1988 to assess the scientific, technical and socio-economic aspects of anthropogenic climate change. In 1990, the scientific Working Group of IPCC brought out a comprehensive report that was accepted by the second *World Climate Conference in Geneva* as a vital scientific basis for international negotiations on climate change. The said efforts culminated in the conception of the UNFCCC, which was adopted in 1992 at Rio de Janeiro and came in to force in 1994. It remains as one of the most widely supported international environmental agreements with 193 countries currently party to it.

The decision making body of the UNFCCC is the Conference of the Parties (CoP), which meets annually. The major agreement reached at the third CoP in Kyoto in 1997, called the Kyoto Protocol and operational since February 2005, under the broader framework of UNFCCC, forms the legal basis for international climate change mitigation policies and programmes. The Protocol stipulates the mechanisms of regulation to operationalise the GHG[3] abatement process through specific commitments and other functional requirements. The mechanism, which is intended to stabilize atmospheric GHG concentration to prevent detrimental anthropogenic effects to the climate, is based on the scientific understanding that industrially advanced countries (termed as the Annex 1 countries in the parlance of the Protocol) bear the historical responsibility for the present state of excess concentration. Consequently, Annex 1 countries ought to devise legally binding commitments to reduce their carbon emissions. These commitments are in the form of controlling emissions to within stipulated permitted levels of emission over a period of time. While the countries with commitments to limit GHG emissions are directed to meet their targets mainly through national measures, the Protocol has created three market-based mechanisms as additional means of meeting

[3] GHGs regulated under the Kyoto Protocol are Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and Sulphur hexafluoride (SF_6).

the targets transterritorially, primarily to attain these targets 'cost-effectively'. As an effect, it is mainly through these mechanisms that the climate change regime operationalises the functional requirements of mitigation in a major way. These mechanisms constitute what has been referred to as the carbon market (MacKenzie 2008) and has evolved to be the key tool for reducing emissions worldwide with transactions worth 30 billion USD in 2006.

These instruments, called the Flexible Mechanisms, aim at reducing GHG emissions and are defined on the basis of the geographical location of the parties. Through these instruments the parties engage in collaborative actions resulting in emission reduction as defined by the scientific and policy norms of the Protocol. By fusing the scientific understanding that the GHG emissions, or the reduction of emissions anywhere on earth, affect the atmosphere uniformly with the economic rationale of differential operational costs across the different parts of the globe, the climate change regime constructed a tradable commodity in emission reductions so that the different actors in the regime could transact particular values of emission 'currencies' across the market. These units, over the 2008-2012-commitment period, expressed as levels of allowed emissions, or 'assigned amounts' are calculated in terms of tonnes of CO_2 -equivalent emissions.

Among the flexible mechanisms, the Emissions Trading (ET) is an instrument, used between the parties with commitments to accepted targets, for limiting emissions over the said commitment period. Through ET, the Protocol permits those countries with emission units to spare to sell this excess capacity to countries that have exceeded their targets. The Joint Implementation (JI) is a project-based mechanism directly linked to the carbon market that enables industrialized countries to carry out joint implementation projects with other developed countries. The JI is based on discrete emission reduction units that could be credited to an investor country for reduction projects realised in a host country based on actual, project-based avoidance, reduction, or sequestration of GHGs. Third among the flexible mechanisms – the CDM – forms a transterritorial instrument between the developed and the developing countries. Like JI, CDM is a project-based mechanism and involves investment in projects that reduce emissions in developing countries. The CDM is intended to make the GHG abatement process economically more feasible for developed countries, while simultaneously assisting developing countries to set a sustainable development trajectory through investments and technology transfer. With the emission targets for the first commitment period (2008-2012) set and different institutional and operational mechanisms in place, large number of CDM projects[4] have already begun to generate *Certified Emission Reductions* (CERs) – the exchange unit of CDM projects as per the Protocol – and CERs are being transferred across the territories.

[4] As of on December 12, 2008, there are 1261 registered CDM projects across the different developing countries. Among them, India has the largest number with 375 projects, followed by China and Brazil with 323 and 146 projects respectively. Among the investor parties, UK and Northern Ireland invested in 475 projects followed by Switzerland with 350 projects. Scale wise, the large projects are only marginally higher (with 54.64%) than the smaller projects though the CER potential is far higher with the large projects.

21.2 Clean Development Mechanism and Ecological Modernisation

Proceeding from the previous section, this part of the article seeks to comprehend how the CDM can be understood in terms of EM. First, it considers the viewpoints of Huber (2008) regarding Kyoto mechanisms and then proceed to explicate that CDM can be seen as a prescriptive illustration of EM by showing how the central notions of CDM are keeping abreast with the key propositions of EM.

21.2.1 Huber on Kyoto Mechanisms

Joseph Huber, who is considered to be the founder of EM perspective, in a recent article (Huber 2008) dealing with the theory and policies of EM, puts forth the role of 'pioneer countries' in the global diffusion of environmental innovations. He presents six theses in this direction:

- Advanced technology as the pivotal component of EM;
- Stringent regulation as the most important precondition for eco-innovation;
- The significant role of the lead markets of pioneer countries in environmental innovation;
- The notable preponderance of pioneering countries over the global environmental regimes;
- The central role of internationally active companies in the creation and global diffusion of eco-innovations, and;
- The difficulties involved in trickling down the environmental innovations (including leapfrogging and tunnelling-through) to 'the hierarchy of world-system'.

While Huber's article focuses specifically on the role of pioneer countries in global diffusion of environmental innovations, it is significant beyond its immediate purview on at least two grounds. First, it clearly throws light on the direction of scientific exploration within EM and the emerging convictions (like the role of pioneering countries, regulation, international companies etc) within the perspective. Second, and important with regard to this article, it highlights the specific ways in which disciplinary boundaries are negotiated and constructed. The basic argument against Huber here is that, though the idea of CDM is in accordance with the underlying arguments of EM, it is put aside (perhaps) on the basis of this rather recent thesis of preferring 'pioneer' countries to global regimes. This does not, however, mean to argue that the role of the nation-state or the national cultures in ecological sensitivity were insignificant in EM. Nevertheless, here the emphasis is on the depiction of contrasting postures of national and transnational regulatory mechanisms. While this could be an issue of emphasis when addressing theoretical understanding and specific sociopolitical processes between the first and second-generation literature within the EM perspective (Mol and Sonnenfeld 2000), it is necessary to deal with this translation process more clearly. It should

be noted that Huber's specific case, as stated earlier, is not directly concerned with the case of Kyoto Mechanisms. Rather it is explained as part of an illustration of the preponderance of national regulation and national markets over the international environmental regimes in environmental policy and technological innovation. However, it is interesting to consider his rendering of the Kyoto Mechanisms in general, to depict CDM as a prescriptive illustration of the EM perspective.

Huber primarily points out that the impact of this UN-organised multilevel approach to global environmental governance is more formative than effective, as it is neither being supported by the newly industrialised countries, nor ratified by all advanced countries; even those who did ratify have implemented it poorly. On the eco-innovation front, Kyoto mechanisms are particularly uncertain in their effects as they lack an explicit innovation strategy on how to curb GHGs – whether by consumer sufficiency approach, by increasing the eco-efficiency within the existing production mechanisms or by improving metabolic consistency of production and products. With regard to instruments like ET, JI and CDM, Huber opines that while these economic instruments are thought to foster allocative efficiency, their effects on technological innovation are not clear. He contends that the differential national reduction targets set by the Kyoto Protocol do not represent general performance standards. Further he points out that the free granting of emission rights along with many exemptions made in the process of implementing ET is counter productive. Similarly diverse political conditions, institutional arrangements and the real world experiences in the cases of JI and CDM lead to the break down of the model-worlds of the economists.

21.2.2 CDM within EM Framework

Notwithstanding Huber's points, which are particularly appropriate with regard to eco-innovations strategies, this part of the article proposes to take up the case of one of the Kyoto instruments – CDM – to argue that the underlying premises of CDM are intrinsically fused to EM in conceiving the problem and devising the solutions.

Basis on Liberal Capitalism and Market Mechanisms

One of the underlying tenets of the EM perspective, particularly articulated in the first generation literature, is the emphasis on the institutional capacity of capitalist liberal democracies to reform their impact on the natural environment to achieve improved ecological outcomes (Buttel 2000). According to the EM perspective, capitalism is sufficiently flexible to incorporate ecologically sustainable practices. It postulates that the urge to modernise is an inherent compulsion in capitalist market economies that leads to a continuous acceleration of technological innovation. The task of EM is to change the direction of these technological innovations into an ecologically sensitive path so as to facilitate 'ecological-economic "win-win" solutions' (Jänicke 2008, p. 558).

The Kyoto instruments are the quintessence of a prescriptive assimilation of EM ideals, with its emphasis on commodified nature and technological mediation in environmental relations, where the linkage of economic rationale and non-environmental goals are synchronised (Glover 1999). As an essential feature of the ongoing transformation in environmental governance, the increased role of market-based regulatory instruments is argued to facilitate an interplay of market actors and political institutions that allows environmental considerations, requirements and interests to become increasingly institutionalised in the economic domain (Sonnenfeld and Mol 2002).

Method of Problem Identification and Conceptualisation

As indicated in section 21.2 of this article, the identification and problematisation of climate change as part of the UNFCCC regime is very much a rigorous scientific project. While the exercises of negotiating different knowledge claims can itself be a highly contested process with diverse representations (Boehmer-Christiansen 2003; Ninan 2008), it is on the basis of certain specific scientific understanding that instruments like CDM emerge. The scientific and institutional emergence of CDM does not specifically contradict with the framework of EM either in terms of knowledge claims or methods of problem identification. Both EM as a framework and CDM as an instrument are mediated through the special relationship between environmental science and politics, as Taylor and Buttel (1992) argue, whereby a certain course of action is facilitated over others in the problems chosen, categories used, relationships investigated and confirming evidence required. As they further maintain, politics, in climate change as in any other *global* environmental problems, is not merely simulated by scientific findings, but *woven into* science.

Technological Optimism

While the proponents of EM reiterate that it does not represent a 'technomaniac attitude', the reliance on technology and emphasis on technological advancement is one of the essential theses of EM (Huber 2008; Jänicke 2008; Murphy 2000)[5]. EM is understood as a

> "readaptation of industrial society within the global geo and biosphere by modern means such as scientific knowledge base and advanced technology in order to upgrade the earth's carrying capacity and make development more sustainable" (Huber 2008, p. 360).

[5] Though York and Rosa (2003) tend to suggest that technological optimism of EM has become more subtle as time passed by, even the very recent literature from the major exponents demonstrate that they still throw their weight behind technological optimism while recognising that technological practice as a socially embedded process (Huber 2008).

On the same lines, the conception of CDM is fundamentally based on the optimism that mitigation of, and adaptation to climate variations can be achieved through technological solutions. It envisions that the systematic deployment of environment-friendly solutions in the form of cleaner technologies in the existing system of production processes and in the augmentation of the same in industrial proliferation through a network of actors can effectively address the climate change problem. It is very much in line with the approach of EM that focuses on environmental improvements through resource efficient innovation (Jänicke 2008), particularly the incremental improvement of technology. Incremental improvement, according to Jänicke (2008), denotes the application of cleaner technologies for different dimensions of efficiencies such as material intensity, energy intensity, transport intensity, surface intensity and risk intensity whereas the radical innovation is understood as the market introduction of a new technology that enhances the life cycle of a product. Thus, CDM is in harmony with EM with regard to its technological optimism coupled with its inherent predisposition to the potential of industrial capitalism to overcome the environmental problems created as part of the industrialisation process.

The form of technological optimism in EM, particularly that of super-industrialisation, is very close to technological determinism, which considers technology as value neutral autonomous process with an innate capacity for logical progression, thereby black-boxing the social processes that construct technology – a point that is thoroughly challenged by the Science and Technology Studies (STS) on the basis of the contextually and ideologically contingent nature of knowledge and instrument creation.

Commodification of Nature

The commodification of nature is one of the essential operational prerequisites for EM. Drawing from Mol's 'economization of ecology' as an introduction to economic concepts, mechanisms and principles to environmental policy, Murphy identifies that this process may involve

> "placing an economic value to nature with the general aim of encouraging economic actors to take the environment into consideration" (Murphy 2000, p. 3).

This goes in line with another postulate of EM where environment can be seen as an increasingly autonomous arena of decision making (Buttel 2000). The proposition for commodification of nature in the EM perspective is derived from the fundamental conviction that the market can be more effective and efficient than the state in dealing with ecological problems. On the other hand, in reference to Kyoto mechanisms, it is argued that by creating economic and emission-reduction accreditation schemes the climate change regime has sought to create market tools for trading the commodity of GHG emissions, which points to the capitalistic identification of new resources and the commodification of the atmospheric commons (Glover 1999). This is one of the ways in which, as referred to by Sonnenfeld and Mol (2002), environment is institutionalised in the economic domain.

Negation of Radical Change and Politics

Closely linked to the neoliberal economic understanding, EM eschews radical political options from its schemata by emphasising the macro structural changes that bring forth transformation in the relation between state and society. Buttel (2000) points out that the rise of EM has more to do with its role as a response to the radical environmental politics of 1980s that stood for overhauling capitalist industrialism through deindustrialisation, decentralisation and localisation by advocating significant decreases in fossil energy usage, reversal of tropical forest destruction and biodiversity loss and by demanding for strict regulation etc. Thus, while the negation of radical politics is inherent to EM, its overarching faith in the prevailing forms of liberal capitalism to lead to sustainable environmental practices by merging the economic and ecological rationalities forecloses the possibility of any radical systemic changes from within its purview. By adhering to the market instruments to address climate change mitigation, Kyoto mechanisms very much stand within the basic understanding of EM and do not incorporate the possibility of any radical change in the interplay of ecological and economic actors or in the framing of climate politics (directly).

Regulatory Issues

While the proponents of EM consider that the 'command-and-control' model of state regulation is outmoded, inflexible and inefficient (Buttel 2003), stringent regulation is argued, particularly of late, to be an important precondition for the emerging technological regimes (Huber 2008). They envisage *smart regulation* where knowledge embedded instruments is intrinsically part of the emerging regulatory capitalism (Jänicke 2008). At the same time there is a plea to reinvent and strengthen the role of government to establish rigorous environmental standards for industrial innovation in the context of multilevel governance (Jänicke 2008; Murphy 2000). The national targets of the Kyoto mechanism that combine the demanding, calculable and dialogue oriented policy style economic instruments at one level with the broad but integrated actor configuration in a framework at another, according to Jänicke (2008), is an advanced and sophisticated policy approach to EM.

21.2.3 Clean Development Mechanism as Ecological Modernisation

The previous parts of this section attempted to contextualise how the principal presumptions of CDM concurrent with the theoretical premises of the EM perspective. Though Huber (2008) shows his scepticism about the Kyoto mechanisms by citing them to be formative (rather than effective) and marred with operational limitations, in principle, it can be argued that CDM as an instrument of climate change mitigation conceptually emanates from the discursive boundaries of EM framework. Huber's contentions discussed above, as clearly indicated, rather revolve around the practical schemes of implementation beside the supremacy he at-

taches to the *national* endeavours of environmental standards setting and spearheading innovation policies. The next section delves into a critical review of CDM in the light of EM to probe whether these issues of contention can be defined exclusively within the operational limitations of the transnational regimes.

21.3 A Critical Review of CDM

This section looks into a few of the contentions raised about the systemic and functional aspects of CDM to find how these issues are located within the larger setting of the emergent form of environmental governance in general and EM in particular. Though mostly articulated either as systemic limitations or operational flaws, in a closer analysis it can be found that these issues are not as clearly distinguishable as they are often made out to be, particularly because the process of noncompliance (in the case of operational flaws) itself is very much ingrained in the system. Most of these issues ranging from the potential and real outcomes of CDM, questions about the categories and definitions, emphasis on production processes, issues around incremental change and pollution to technification of politics, began to crop up simultaneously with the emergence of the CDM regime and remained with varying hues as CDM evolved.

21.3.1 Outcomes of CDM

The CDM, as an instrument in the climate change regime is, politically and economically, a significant mechanism beyond its immediate functions of creating carbon credits and facilitating sustainable development. Wara (2007) and Werksman (2002), for instance, consider that engaging developing nations in the climate regime was one of the major political stumbling blocks in the initial phase of climate negotiations and that CDM has become an effective means of engaging the global South into the process. However, the same process is not uniformly understood unilaterally as it is also viewed as a relationship between unequal parties even to the extent that it is denoted as ‘carbon colonialism’ (Agarwal and Narain 1995; Bachram 2004). At the same time, on a more concrete level, the twin objectives of the exchange of carbon credits and facilitation of sustainable development themselves have generated diverse reactions.

CDM as a Market Instrument

The suitability CDM as a market instrument is challenged on conceptual and operational grounds. Primarily, as Wara (2007) points out, despite being one of the major vehicles of emission reduction, CDM is considered to be highly inadequate to deal with the scientifically projected amounts of emission reduction. It is indicated that the Kyoto mechanism as a whole is performing below its own targets (Christoff 2006). The estimated annual emission reduction through the CDM pro-

jects, which amounts to 278 million tonnes of CO_2-equivalent GHGs, is a small fraction of the annual global CO_2 emissions, calculated as 26 billion tonnes in 2003 (Wara 2007). If the timescales for negotiations and implementation is also taken into account, it is argued that at least thirty Kyoto Protocols are required to address the climate change problem as it is understood today (Malakoff 1997). However, beyond its limitations with regard to the inadequacy of scale, the points raised about the mechanism and its operational parameters are varied and significant. The creation of a market instrument to tackle climate change variations is questioned on the basis of the capability of the market to enable sustainable environmental relations, particularly from an environmental justice perspective where the critics argue that issues of equity, access to resources, balanced distribution etc are beyond the operational priorities of markets (Bachram 2004; Roberts and Parks 2007; Byrne and Glover 2000). Even within the functional parameters of the CDM procedures the market induced reformulation of projects concentrated on specific GHGs, as in the case of HFC-23, has distorted the very market process (Wara 2007; 2008). Furthermore, there is another set of contradictions that is pointed out in the process of market formulation where there are no clear demarcations that distinguish consultants, verifiers and monitors, who in turn can be the same set of actors (Bachram 2004; CSE 2005). The proliferation of private actors in the central governance of CDM projects raises not only questions about accountability, but the diffusion of political authority as well (Lövbrand et al. 2007).

Kulkarni (2003) argues similarly, that relying on the market mechanisms to deal with mitigation in the form of carbon credits results in environmental stewardship mostly around end-of-the-pipe solutions where sustainability and equity could be compromised globally with investments made in the quickest and easiest emissions reduction options. Moreover, it is argued that market is not a level playing ground among the stakeholders, where the dominant players, mostly the powerful buyers, can set the terms of trade (Nelson and Jong 2003). The criticisms against the operational parameters of the clause of *additionality*[6], particularly, for instance in the case of carbon sinks where a generations old rainforest would not qualify the emission credits while a monoculture plantation can qualify (Bachram 2004), run on the same lines where the market become instrumental in defining the terms of inclusion and exclusion.

CDM as a Channel for Sustainable Development

The CDM as a vehicle for sustainable development is problematised mainly on two grounds. Firstly, since the concept of sustainable development generally encompasses a variety of meanings and strategies in development discourses (Hopwood et al. 2005; Luke 2005; Redclift 2005), the conception and definition of sustainable development in CDM projects are subjected to variety of mediations in definitions, tools and analyses. Further, the different actors in different locations in the same regime could define sustainability or regime requirements within their

[6] Additionality is a clause wherein the emission reduction is calculated as the amount of planned reduction from the baseline counterfactual rate in the absence of the project.

local contexts that need not necessarily subscribe to the larger understanding of sustainability (CSE 2005; Kim 2004).

Secondly, in operational contexts, CDM as an instrument that combines the dual objectives of attaining cost effective GHG reductions for the advanced industrial countries and accomplishing sustainable development in developing countries, is referred to both as a source of synergy and conflict (Olsen 2005). There is a trade-off happening between these twin objectives (Lövbrand et al. 2007) where the actors exert different strategies to appropriate the mechanism according to their interests. After reviewing quite a few studies that deal with this conflict, Olsen (2005) points out that the aim of cost-effective GHG reductions overruns the sustainability priorities significantly. The projects with higher social equity features are progressively decreasing not only because of the higher investment/operational costs but also due to the lower volume of carbon credits they generally fetch. This market pressure in turn leads the host countries and their DNA (Designated National Authority) to define[7] competitively lower standards for sustainable development criteria within their territorial limits to attract more CDM investments. Thus, the sustainability standards are set as per the prevailing market situations of the carbon transactions, due to the global scope of CDM and the wider choice of location for the investors (Olsen 2005).

21.3.2 Analytical Categories and Definitions of Problems

While conceiving the problem and operationalising the remedial courses, the climate change regime has constructed an elaborate network of actors and charted out the specific modalities of interaction. These network prescriptions and categories in turn regulate and govern the actors by placing them in specific locations of specific significance. The issues around the analytical categories and problem definitions have been some of the widely contentious domains in the case of CDM. However, the difficulties with analytical categories and definitions of problems can be rather broad (see Grundmann 2006; Pielke Jr. 2005; van der Sluijs et al. 1998).

National Emissions against per Capita Emissions

Emissions measured on the basis of the country levels, and not on the basis of per unit of population, is an issue argued to be disproportionate and against the values of equity and ecological justice (Agarwal and Narain 1999; Byrne et al. 1998). Byrne et al. (1998) argue for a per capita emission-based stabilization objective that they consider to be equitable as every individual has a common share in the potential emission to the common atmosphere. While the present emission levels show a huge disparity between people belonging to different regions, the problem

[7] DNA of the specific developing country is the agency to define the specified sustainability standards that are applicable to that particular country.

is still deeper on the basis of reference points on which the disparities are accounted even within a region or in a production or exchange system.

Developed and Developing Countries Categories

The categorisation of developed and developing countries poses several inherent problems with regard to the CDM's operational guidelines. The arrangement is problematic because of the inherent spatial organization and standards of the regime wherein the North-South dichotomy obfuscates the differential vulnerability, accessibility and adoption capabilities among the different countries/regions in the South (Kulkarni 2003), and Central and East European Countries (Muhovic-Dorsner 2005) and overlooks the broader categories, classes or communities within a category. There are studies that demonstrate how some categories of population, particularly the affluent sections in developing countries emit on a par with the highest emitters in the advanced world and hide behind the poor without conceding to any restrictions (Ananthapadmanabhan et al. 2007). Again, with regard to investment pattern, as cautioned by Agarwal and Narain (1999), the ongoing trend of CDM indicates that the more advanced among the developing countries are drawing more resources and effectively exacerbating the disparities among the developing nations. As an instrument stemmed from EM, the transterritoriality of the climate change regime may also foster the analytical complexity of CDM further, since some regions may lack the cultural endowments of industrially advanced western societies that Cohen (1998) attributed to EM.

Category of emission units

The general standard of emission units, as in the form of CER in CDM, is calculated as CO_2 equivalents and has the inherent predisposition to classify emissions of all kinds in to a standard technical category without taking into account the broader production, distribution and consumption practices, differential access to resources and prevailing inequalities in production and distribution processes. Thus, there can be a mismatch between *luxury emissions* by some with the *survival emission* of others, which is one of the long-standing contentions of the developing countries (Agarwal and Narain 1995).

Environment as against Development

The framing of the climate change varies among the different actors at different levels of the regime and they integrate themselves to the regime through ascribing contextual values to their specific acts (Kim 2004). As Olsen (2005) suggests, there exists a well-explored line of conflict between north and south; in the north the focus on climate change as a global environmental problem whereas in the south it is more focused on as a development problem. Consistent to that are the approaches devised to tackle the focal issues too. The priorities of the nation-states with regard to CDM can inherently pose a conflict of interests where the twin objectives of the mechanism could be tilted accordingly.

21.3.3 Emphasis on Production and Related Issues

The climate change regime in general, and its instruments like CDM as a whole, emphasizes intervention in practices that mostly encompass production. The regime, set according to the understanding of EM, overtly presupposes that the sphere of intervention for ecological sustainability is logically centralised around the production practices. The discussion on consumption in EM revolves around the agency of the citizen-consumers for greening of consumption (eg. Spaargaren and Mol 2008) which tends to delink the structural processes in which the consumption is embedded. EM mostly renders the different aspects around consumption, access to products, equity in resource allocation etc to lesser significance. Consequently, this perpetuates the existing hierarchies in political and economic arrangements of resource utilisation and sets aside the complex processes of production and exchange.

It also presumes that the action performed at a specific point of the process entail direct correlation to sustainable practices and detaches the network of processes in which this specific action could be embedded. As York and Rosa (2003) argue, EM does not ensure that the industries or the firms, that are reducing their direct impact on the environment, are not facilitating the expansion of negative impacts by other industries or firms. Furthermore, the emphasis on production processes focuses on the achievement of a high degree of end-use efficiency that, as suggested by Kulkarni (2003) by citing the experience of the developed countries, need not necessarily mitigate the emissions. Rather, these processes intensify the demand and dependence on the prevailing systems of production. Similarly, the transfer of technologies to developing countries can induce overall increase in emissions as the technologies could engender life style changes that demand increased resources or energy consumption (Kulkarni 2003). Thus, a CDM project can potentially be detrimental to its own objectives within the current parameters of operation.

21.3.4 Commodification of Atmosphere

The operational aspects of the climate change regime commodify atmosphere through technically mediated standards, which give rise to two immediate issues of analysis. Firstly, commodification embeds the atmosphere in new economic relations and opens a domain for the market to operate within parameters that are rooted in the ‘politics of market design’ (MacKenzie 2008). It is argued that by creating economic and emission-reduction accreditation schemes, the Kyoto mechanisms have sought to create market tools for trading the commodity of GHG emissions, which points to the capitalistic identification of new resources and the commodification of the atmospheric commons (Glover 1999).

Secondly, commodification of the atmosphere is symbiotically connected to technification of politics in the climate change regime, where representation of collective interests is entrusted to experts or large organizations alongside the states (which in turn rely on experts). The carbon market tends to marginalize the

non-corporate, non-state and non-expert contributions toward climate stability (Lohmann 2006). However, the effective engagement of other stakeholders is confined not only because the performance standards are set in scientific terms that are decipherable only to experts; it is also because of, as Lövbrand et al. (2007) identify, the arena in which local stakeholders may provide input, which is generally confined to host governments and DOEs(Designated Operational Entities), is mediated on a technical level.

One of the operational translations of commodification of atmosphere is the institutionalization of emission in the form of cap and trade scheme, where the polluters are effectively entitled to pollute at permissible levels. By making carbon fungible (MacKenzie 2008), wider possibilities of exchange become possible; where, as Bachram (2004) argues, a polluter can invest in emission reduction projects and earn credits, keep the unused credits for future or sell them to another polluter in the open market. On the other hand, a emitter can exceed the 'allowed emissions' by purchasing additional credits. Thus, the process of *outsourcing emissions* does not inherently ensure aggregate emission reduction.

21.3.5 Problem of Incremental Change

The climate change regime and its instruments facilitate incremental changes rather than radical alterations in addressing the mitigation of climate variations. The process does not curtail the ongoing industrial practices; rather, it focuses to augment the current practices. Thereby, it is argued that it leaves a possibility of perpetuating slow and continuous pollution through environmentally friendly technologies (MacKenzie 2008).

As the incremental changes within the larger framework do not alter the existing systems of production, distribution or consumption that are at present designed based on a high reliance on fossil fuels, it is also argued that the emphasis on clean-coal technologies could lead to a locking in with the fossil fuel economy (Kulkarni 2003). On the other hand, the option to externalize emissions from the industrialized countries through CDM projects may result in the intensification of ongoing operations, which could result in worse cumulative emissions. Similarly, Kulkarni (2003) further points out that the cheaper abatement of emissions elsewhere may prompt firms in developed countries to avoid any action at home, and in effect the abatement in the developed countries is nullified by the increasing emissions at home.

21.4 Conclusion: CDM as Outsourcing Pollution

The article is an overview of the current discussions about CDM in the light of the EM perspective to see how this emergent mechanism in the climate change regime illustrates one of the prominent trends in the present direction of environmental governance. In the initial part, it analysed how CDM as an instrument for GHG

abatement conceptually emanates from within the discursive boundaries of the EM framework on the basis of its roots in liberal capitalism and technological optimism. This is beside the identical methods of problem conceptualization and the orientation towards politics and regulatory issues. In this context, the following part indicates how most of the aspersions made on CDM are inherent to the EM perspective itself, with both systemic and operational aspects intertwined within.

While the commodification of atmosphere has far reaching implications; from the very initial analyses onwards, CDM is observed to be subverting its sustainability objectives by its role as a market instrument. Similarly, EM's preoccupation with production practices as a main domain of operation enables mechanisms like CDM to quarantine themselves from other potential effects that the processes can have on other points in the product cycle or in another industry. At the same time, the overwhelming reliance on incremental change, and negation of radical solutions, may result in more environmentally disastrous outcomes in the long run. On the other hand, CDM's analytical categories and problem-definitions, both on functional and theoretical postulates, entail systematic methods of inclusion and exclusion, whereas it explicitly upholds the 'level playing ground' of market and 'objectivity' of science.

Externalising emissions, as similar to other capitalist production or consumption processes, from its location of generation is one the fundamental features of GHG abatement efforts of the climate change regime. This process of *outsourcing pollution* is mostly formulated through technoscientific mechanisms and operationlised through transterritorial market instruments like CDM. The complexities involved in the politics of market and science make the process of outsourcing pollution a locus of multiple negotiations and appropriations of diverse interests. In this process, as noted in the previous sections, EM and its operational manifestations like CDM are inherently predisposed to certain specific ways of dealing with environmental problems, which may ingrain socio-political values antithetical to equity and justice on different geographical and political scales.

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22 Sustaining Waste – Sociological Perspectives on Recycling a Hybrid Object

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Abbreviations

ANT	Actor-network theory
EM	Ecological Modernisation
EMT	Ecological Modernisation Theory
OPP	Obligatory Passage Point

22.1 Introduction

Recycling is a concept, normally taken-for-granted within academic approaches to environmental management. Recognising that recycling should be preceded by reduction of waste and re-use, the science of recycling usually addresses its object as an activity which needs optimising, rather than questioning. My take on recycling differs from the standard one: I focus on possibilities to conceptualise an agent who was responsible for implementing a recycling scheme for her[1] organisation. By way of drawing on sociological theories (especially Bourdieu's theory of practice and Actor-network theory) I point to significant problems in approaching sustainability. The empirical data consists of ethnographic field work which illustrates societal implications of thinking about transforming organisations towards sustainable conduct: by constructing a recycling scheme the waste manager of the organisation ensures that the organisation does not move towards reducing or altering resource consumption. Rather, she stabilises an unsustainable trajectory and inhibits societal transformation even beyond her organisation. Thus, sociological theory allows for problematising and better grasping of the societal implications and limitations of environmental management.

In this paper I am concerned with an everyday set of activities to protect the environment: recycling. Recycling is a ubiquitous social practice which in general

[1] In order to break with the ascribed masculinity of agency, this paper refers to agents in general as female, while the case study revolves around a male actor.

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is taken-for-granted as contributing to ecological sustainability. Western environmentalists, both governments and many grassroots activists, share the common sense of 'the more recycling, the better'. However, recycling is merely *one* moment of materialised social relations between humans and things, in Western societies characterised by capitalist production and consumption. The aim of this paper, then, is to focus on the social context of this very moment and, therefore, we ask: how can social theory be of help to problematise environmental management practices and technologies, including their social and environmental implications? To make this practically relevant I focus on theories that may illuminate the role of the actor, i.e. the environmental manager. By far the most influential discourse on recycling seems to be *Ecological Modernisation*. Its paradigm is one of greening the state and industry by more efficient industrial production enabled by all-encompassing capitalist markets. However, both critical academics as well as ecologically oriented social movements argue that, in fact, the hegemonic paths of greening are sustaining 'unsustainability' (Blühdorn and Welsh 2007). To uncover the relevancy of social relations embedded in recycling practices I draw on a case of an environmental manager of a small organisation who set up a recycling network for a nightclub. I encountered this case during ethnographic research on environmental managers in Germany, Austria and the UK between 2006 and 2008. The method used, ethnography, is increasingly deemed useful for research on (environmental) management[2].

Three theoretical approaches serve to frame this set of practices which bring about a recycling network. First, the hegemonic approach to conceptualise greening of organisations, *Ecological Modernisation Theory*, enables us to understand how recycling can easily be thought of as use- and meaningful. Second, *Actor-network theory*, a relational method developed to scrutinise the enacting of science and technology, illuminates the social context in which recycling is socially and materially constructed as necessary and which is embedded within recycling. Third, a Bourdieusian approach, i.e. one drawing on the writings of the French sociologist *Pierre Bourdieu*, problematises the societal conditions under which recycling is use- and meaningful. This engagement with conflicting theoretical approaches, a kaleidoscope of social theory, allows us to question everyday waste and one of the prime technologies to handle it, i.e. recycling.

By sketching this kaleidoscopic view it becomes possible to imagine the complexity of recycling reality. A single theoretical approach alone would risk drawing too nice and neat a picture of recycling. In the following, therefore, I will outline the case and, thereafter, apply the three theoretical perspectives to it to illustrate the myriad social aspects of recycling. The discussion of these perspectives points us to limits of manageability. Finally, by way of summarising, the conclusion argues that recycling may sustain unsustainability both materially and socially. Thus, inspired by Keller (1998, p. 290), recycling emerges as a useful object to question the social technologies which Western societies are based upon.

[2] Cf. e.g. Howard-Grenville et al. 2008, Hassard et al. 2007.

22.2 Situating Recycling in Practice

The practice of recycling is intrinsically linked to the creation and management of waste. Societies of all kinds, cultures and ages had to deal with both the disposal of no-longer needed materials and the gathering of those bits which could be used directly or after processing (Keller 1998, p. 61)[3]. By now, it seems common sense in policy discourse that "industrial operations should be encouraged that are more efficient in terms of resource use, that generate less pollution and waste [as well as on those] that are based on the use of renewable [...] resources" (Brundtland et al. 1987, p. 213). Corporations claim to green themselves and in the course of that they introduce recycling schemes. However, the limits of recycling remain to be scrutinised. To situate the limits of managing recycling in the social[4] a case seems adequate.

The case revolves around Julian Berger whom I met in 2006 during my ethnographic fieldwork. I spent a day with Julian[5] at one of my frequent meetings with students and staff involved in 'greening' universities – somewhere in Western Europe[6]. Julian was employed by the student union of his university to co-ordinate environmental projects and the environmental management of the union. Before this part-time job he had been taking a course dealing with environmental issues. His work consisted, amongst other things, of communicating with authorities and firms to organise recycling within the university and other facilities within the union. At the same time he was responsible for the recycling of the union office waste. Other topics he dealt with were energy saving and mobility.

I joined Julian at his work to study his practices. For his work he was constantly communicating with others: he needed them to fulfil his tasks, he tried to convince them, they directed him and he served them. Julian was telling me that it was his aim to implement structures within the student union that would help it to become 'green'. During this day it became obvious to me that he was part of many social relations. He made this explicit by talking about what he was doing: "(I)

[3] For a definition of recycling see Simonis et al. (2003, p. 167).

[4] Within the paper, 'the social' is not conceived of as a sphere, neatly separated from other spheres. Rather, the social signifies the all encompassing presence of societal relations, practices mediating between us, involved in all human reality including the knowing of any kind of reality.

[5] During this day I undertook ethnographic fieldwork (Agar 1980; Thomas 1993; Burawoy 1998; Graeber 2004) which was part of an engagement with Julian lasting about 10 months. My prime role was being an observer, and occasionally I helped Julian to carry out his tasks. All data from this day is based on field notes. My use of field notes has been inspired by Emerson, Fretz, and Shaw (1995). The analysis aimed at problematising an instance of his practices and do neither represent Julian's intentions nor the wider micro-political setting in which he acted.

[6] I have been involved with 'greening' universities from 2001 till 2007. In this time I met all kinds of university members who dealt with this issue in Austria, Belgium, Germany and the UK.

force him to have an appointment with me", but also "people are avoiding (me)". These relations were a significant medium to achieve his tasks. What were 'his tasks'? Actually, I found it was not easy to differentiate between the tasks he set for himself and the ones his job required. Or, did his job require him to set his own tasks?

In the early afternoon we went through the offices of the student union to gather materials and bring them to recycling points. At one of the points he recognised that the recycling container was 'polluted' with matter which was not supposed to be there. So he got the matter out and brought it somewhere else. Was this a required task? It probably was not part of his job description, but of his stance towards environmental issues: Julian had – and used his – *agency* to change this detail to improve the environmental situation. Later that day he was talking with his boss about energy saving in one of the clubs of the union. The boss made clear where Julian's agency ended: "night clubs (are) designed to waste energy". Four years later, Julian remarked in a written comment on this paper: "Exactly! It is not the remit of an environmental manager to close down the organisation for which he works for".

In my analysis of the day I became particularly interested in Julian's agency in setting up a recycling network. He had the task to organise glass recycling for one of the facilities of the student union; a task which he approached by getting in touch with recycling companies. From them he learned that the amount of glass 'waste' was not enough for the recycling companies and hence they would not come 'just' for the student union facility. In this situation he could have said: "Well, I don't get enough glass and therefore recycling does not work." Instead, however, he got in touch with other producers of glass 'waste', pubs, and managed to get them into a joint glass recycling scheme. In Bourdieu's terms (which I will sketch below) he would do this if it is reasonable to him. Whether something is reasonable depends on the situation consisting of inner stances and external circumstances. I aim to open up whether his setup of the recycling scheme can be considered as Ecological Modernisation (EM). The rationale of Julian's action will remain unknown. What we can investigate, however, is how he used the agency he had at hand. Hence, we shall turn towards approaches of social theory to describe his action, what it encompasses and its limits.

22.3 A Kaleidoscope of Social Theory

The aim of this section is to introduce three perspectives which seem useful to problematise limits of managing the environment. On the one hand Ecological Modernisation Theory is good at sketching the rationality underlying hegemonic discourses and practices of environmental management. On the other hand the partially conflicting perspectives of Pierre Bourdieu and Actor-network theory allow situating management practices in their relations. I do not give full analyses of ei-

ther of these theories[7]. Rather, I aim at *illustrating* a possibility to problematise Julian's construction of the recycling network.

22.3.1 The Green Lenses of Ecological Modernisation Theory

Julian's job, greening an organisation, is normally considered by sociologists as within the paradigm of Ecological Modernisation. Ecological Modernisation is conceptualised by sociology as Ecological Modernisation Theory[8] – and EMT prevails[9]. Here goes the story-line:

Modern industrial societies created and experience ecological crises. The idea that 'greening' the institutions of industrial society can solve the global ecological crisis[10] has been called Ecological Modernisation (EM). The theorists Arthur Mol, Gert Spaargaren, Martin Jänicke and Joseph Huber[11] suggest(ed) that industrial societies provide a *role model* for mitigating and preventing further deepening of the crisis. Their approach became widely known as Ecological Modernisation Theory (EMT). EM claims that industrialised societies can reach a balanced relationship with nature by engaging with the latter *more techno-scientifically and in ways more mediated by the market economy*.

This claim, however, is also the focus of fundamental critique. According to critics the claim can be categorised as ideological because it is sustained by techno-corporate élites without taking into account well-known critiques which convincingly point out that the ecological crisis has been created systematically and inherently by those structures which EM aims to modernise. Thus, a slight 'greening' of the economic order, i.e. capitalism, cannot constitute a suitable substitute for abolishing this economic order as it also fundamentally constitutes an ecological order in which profit is always more important than nature[12].

Nevertheless, EM as a rationality, i.e. people believing in and practising it, exists. Julian provides a case of someone who believes that EM is part of solving the environmental crisis. Opponents of EM, however, recognise that EM fails to understand what is necessary for the realisation of 'green' goals for all. Therefore,

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[7] For a more detailed discussion of the theories in relation to the case see Lippert (2010).

[8] Cf. York and Rosa (2003).

[9] Cf. e.g. Blühdorn and Welsh (2007), Jänicke (2008).

[10] Summaries of the ecological crisis can be found e.g. in Carvalho (2001, p. 70), Haque (2000, pp. 5-8) and Dingler (2003, p. 4).

[11] Sonnenfeld and Mol (2006), Mol (2006), Jänicke (2004), Mol (2001), Mol and Sonnenfeld (2000a), Mol (2000)

[12] This has been shown by many academics, i.e. Benton (2001) and Pepper (1984). More specifically, see the critique known as the Treadmill of Production thesis (e.g. Schnaiberg, Pellow, and Weinberg 2000), the concept of Passive Revolutions by Gramsci (as in Li and Hersh 2002) and the theory of Metabolic Rift (von Liebig, Marx and Foster) together with the Jevons Paradox (as in Clark and York 2005).

they suggest that a solution to the crisis needs to be searched outside of either capitalism, industrialism or both[13].

The social existence of EM and its work in and on reality are reason enough to look more closely at what EM rationality assumes. Two claims can be identified: (a) reactive technologies are and ought to be substituted by proactive technologies and (b) the government shall enable the market to allocate environmental goods *efficiently*. Implementing these moves would lead to *win-win solutions*. The EM rationality goes together with the discourse of Sustainable Development. The latter can be seen as a form of EM and has become the key discourse through which environmental problems are discussed since the 1990s[14].

EMT reflects upon EM and asserts that nature and capitalism (including its institutions) can and are in the process of being *reconciled*. Proponents of EMT argue (wrongly) that the environment is becoming autonomous from the economic sphere[15]. 'Green' states – they are postulated by EMT – cannot become a reality without abolishing the capitalist mode of production. The trap into which EMT falls is that it construes instances of tiny considerations of the environment as 'green societies' becoming true[16]. Such instances might be analytically distinct from ignoring the environment altogether but are clearly not enough to change the essence of capitalism[17]. The gain of EMT is that it provides a quite good conceptualisation of the rationality of EM. The theory implies that EM has agents who put it into practice. Unfortunately, EMT does not explicitly theorise its individual agents, i.e., the individual meaningful actions.

Does Julian's construction of the recycling network fit into the rationality of EM? We find that Julian in fact enlarged what one could conceptualise as a green market; he drew other business actors into the recycling market in order to comply with his task. Thus, this aspect of construction meets the rationality of EM. Furthermore, this way of constructing a recycling network not only increases the market but also approaches the recycling issue qualitatively in market terms. With EM we can conceptualise the situation preceding recycling as one in which the material 'glass waste' was not integrated as a resource into the market[18]. EM suggests that such waste merely has to be processed (technically) and henceforth can be brought into use again. Thus, the construction of the recycling network also constitutes an approach to solving problems technically. Overall, then, Julian did a good job in terms of EM: he reformed his organisation (such that it started recycling) and induced similar changes in other organisations (integrating them into

[13] See e.g. Enzensberger (1996) or Pepper (2005).

[14] Cf. i.e. Redclift and Benton (1994), Benton (1996), von Weizäcker (1999), Mol (2001).

[15] See e.g. Mol (2000) vs. Pellow et al. (2000).

[16] Schnaiberg, Pellow and Weinberg (2000, p. 15)

[17] Marx (1968, see especially Chapter 4 and 5) showed that capitalism is inherently expansive and exploitive. More recently this has been re-discussed by i.e. Li and Hersh (2002, p. 196) as well as Clark and York (2005, pp. 406-407).

[18] The history of glass had included re-use and recycling. In the situation preceding Julian's activities, glass along with all other materials out of place were transported to landfills.

the network) both on the base of integrating waste materials into the market and rendering waste into resources through a technical process. Thus, EMT conceives Julian's recycling network as useful to society and its environmental effects as meaningful to Julian himself.

22.3.2 A Fresh and Flat Perspective through Actor-network Theory

Latour, Callon and Law study science and technology as *actor-networks*. Their approach is usually called Actor-network theory (ANT)[19]. Fasten your seat belts! ANT uses lots of concepts which need to be introduced. Crucial to this approach is that they break, like Haraway (1991), with the culture/nature dualism. In ANT an actor can be anything that acts, i.e., human beings, institutions, and hybrid objects, i.e., those which are shaped by society through technology or discourse (consider e.g. a genetically modified animal). This claim is necessary for Actor-network theorists in order to avoid false assumptions about which actor has how much power. Thus, their approach is based on an ontology[20] which does not discriminate between humans and non-humans. For ANT, all those who act or are subject or object of relations of representation are called *actants*; and they are mapped principally in symmetry. The actor-network is not assumed to be asymmetrical from the outset. Rather, who has power is a matter of empirical study. Power derives from networks which actants control. What does this mean?

Key authors of ANT, Callon and Latour, agree with many sociologists that the fundamental problem of society is agent's interest in more power (1981, p. 293). In order to win, i.e., to increase power, an actant, say Julian, aims to arrange other actants such that they provide power to him. This activity is called *enlistment*. How does this work? Julian would put elements into a black box, such that they are not considered anymore by other actants. An element can be anything. ANT proposes, he "makes other elements dependent upon [himself] and translates their will into a language of [his] own" (ibid., p. 286). Actants are constantly engaged in controversies and struggle. The use of ANT is to investigate how controversies are black-boxed and by that the actants who sits "on top of the box" (ibid., p. 297) gains power[21].

The process of *translation* is of prime importance to ANT. ANT, as studying translation (Law 1992), identifies "the simultaneous production of knowledge and construction of a network of relationships in which social and natural entities mu-

[19] In this account I am focussing on Callon and Latour (1981), Woolgar (1991), Law (1992), Callon (1995), Strathern (1996), Callon (1999) and am informed by Fairhead and Leach (2003), Michael (2000) as well as Bijker (1995). Law and Hassard (1999) became aware of many short-comings of ANT meanwhile and sophisticated it significantly. Within the scope of this paper I focus on original formulations of ANT.

[20] *Ontology* refers to what is. Different ontologies make different assumptions about that. Cf. Mutch (2002, p. 485).

[21] Strathern (1996, p. 523) points us to the fractal logic within the box: networks can be traced into depth without limits.

tually control who they are and what they want" (Callon 1999, p. 67). According to ANT, to gain power Julian has to establish himself as an *Obligatory Passage Point* (OPP) such that others need him. He would construct *obstacle-problems* for others, i.e., make them believe a) that they have a certain aim, b) that such an obstacle-problem is in their way and c) that he is/provides the solution. Thus, by constructing an obstacle-problem one creates problems for others. In this process entities/elements/actants are *enlisted*. To enlist them they need to be interested. To bring this about Julian interposes himself between their obstacle-problem and their aim. To actually mobilise actants one creates new, rather than pre-existing, roles in which they are put. This is called *enrolment*. Callon (1999) postulates that the actants need to be willing to be enrolled[22]. If Julian, who enrols other actants, is successful and establishes himself as an OPP then he can represent the others. In his representation he construes himself as speaking and acting for the others. If the others do not participate in these processes they become dissidents and, by that, destabilise the network which Julian aims to construct. The processes which are necessary to construct the network successfully, i.e., to shape other actants such that they support a network, are called translation. With this Callon refers to two aspects of the processes: a) the other actants are displaced and b) the constructor, i.e., Julian establishes himself as a spokesperson. Through translation "social and natural worlds progressively take form" (1999, p. 81). To exercise the sociology of translations it is necessary to provide a "symmetrical and tolerant description" (ibid), starting with a clean slate (Law 1992), of complex socio-natural processes and by that one explains how *some* obtain the right to represent. Of course the constructor is in conflict with other actants who also want to gain power. Hence, to become stronger a constructing agent needs to enrol others and disassociate the black boxes of others such that the agent can enlist their elements. Callon (1995) points out that translation is not about truth. What ANT does seems to be a translation of the strategies of the actants. Let us see how this analytical approach works in practice. ANT takes all interaction between written marks (inscriptions), technical devices and embodied skills as translation.

This is, taking an ANT perspective, how Julian tried to construct a glass-recycling scheme: First, Julian established himself as an OPP by construing glass waste as an obstacle-problem. By this move he connected all actants, i.e., himself, the glass waste, the recycling company, his boss, the club, other glass waste producers and a governmental authority. He pointed out to them that the glass waste constitutes an obstacle-problem for them (problematisation) and hence they should

[22] In his famous study *Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of Saint Brieuc Bay*, Callon (1999) looks at a situation in which scientists try to make themselves necessary to problems which a fishermen's community supposedly has. In the course of his study we come across several actants: fishermen, scientists, and scallops. According to his sociology of translation, for enrolment to be successful the scallops need to want to be enrolled: "To negotiate with the scallops is to first negotiate with the currents" (1999, p. 74). Thus, he suggests that the scientists try to communicate with natural objects (which he, of course, sees as social). I will criticise this later on.

move into an advantaged position by dealing with the glass waste. These advantages were construed by pointing out what was at stake for each actant: For example, the recycling company could earn money and needed to pass the obstacle-problem 'glass waste as potential source for profits', the authority could reach its environmental policy goals better by giving financial support for recycling of 'glass waste'. By showing this, Julian established himself as representing their interests: he translated his interests into theirs with the result that his organisation of the glass recycling scheme constituted acting and speaking on their behalf. Thus, Julian tried to enrol the other actants in order to get his job done. ANT says that Julian's enrolment had the aim to black-box the actants. Actors outside, then, would take the black box for-granted, rather then questioning its configuration. This implies he controlled the actor-network 'glass recycling' consisting of several human and non-human entities. It included 'glass' as a *hybrid* of culture and materiality. This means, with ANT, 'glass' emerges as an entity which was significantly shaped by humans. Human actors: first construe glass through a socially shaped process of understanding and recognition and second inscribe culture on the materiality of glass. Some of the relevant actants and their relations are shown in Figure 22.1. To summarise, Julian's aim was the translation of actants and the establishment of himself as a spokesperson[23]. The ANT reading suggests that he negotiated with all the actants and that each of them either wanted to participate in this actor-network or not.

The main problem with ANT is its construal of agents and agency. Many have pointed out that not all entities are actors[24]. Indeed when Callon (1981, p. 299) claims that "(i)t is no more difficult to send tanks into Kabul than to dial 999" it becomes obvious that their analysis of power is not in touch with reality: it is neither possible for me to send tanks into Kabul nor can I imagine how my cup of tea, which helps me a lot in writing this text, should be able to dial 999. Hence, ANT cannot convince totally. Nevertheless, ANT helps to recognise *how significant entities can be as conditions under which we act*. For analysis we need to appreciate this approach to break up 'taken-for-grantedness' regarding the relevancy of materials.

The discussion of Julian's set up of the recycling scheme reveals how it is meaningful to see it as a network which was stabilised through the various humans involved and their material and virtual products. While Julian emerged as acting as a key person to co-configure and stabilise the recycling network, with ANT we have to wonder: how is the agency to alter the network configured? If ANT's interpretation of agency is too broad then we need to move on to another sociological approach which may problematise the agency we have in affecting realities.

[23] In order to construct this overall translation aim he also engaged with 'minor' translations like: *job task* to *email 1* to *Governmental authority* to *Public/private organisation* to *communication 1* to *Recycling company* to *collecting glass waste*. The length of this paper does not permit to open this black box as well.

[24] Cf. e.g. Sibeon (1999, p. 322).

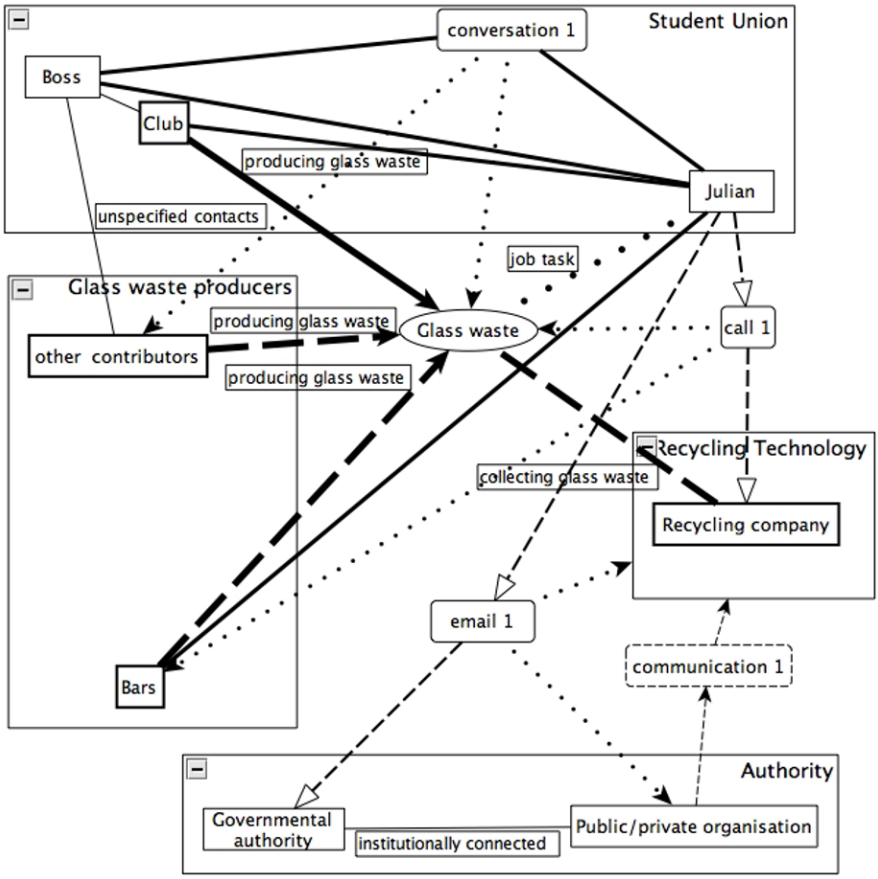

Fig. 22.1. An ANT mapping of actants and relations. *Notes:* thinnest dashed lines: wished-for relations; dotted lines with black ending arrow: references to something; medium dashed lines with white ending arrow: observed communication; thick lines (dashed indicates 'wished-for'): material connections with glass; simple black lines: existing contacts (redrawn from Lippert (2010, p. 76))

22.3.3 Considering Agency of Environmental Managers with Pierre Bourdieu

In order to discuss whether Julian could act otherwise, I introduce the approach of Bourdieu[25]. It is apt to use Bourdieu because he transcends the dichotomy between structure and agency. Thus, by following his thinking we are likely to find results which are not bound to the dualist framing – in the sense that either the agent can

[25] To introduce his approach to social theory I draw on Bourdieu (1989), Bourdieu and Wacquant (1992), Bourdieu (2001).

solve all problems or only structural change will help. Rather, we will develop an understanding of how humans influence others both directly and indirectly. His account is similar to that of Giddens (1986).

Bourdieu uses an open set of concepts to theorise members of society and their agency. He views us as existing in social space, a *field* which comprises all social relations. We are positioned in this field. We cannot know any absolute position but must imagine our positions relative to each other[26]. What we can enquire about is the relation between our positions. The forms of relations are manifestations of our access to the *capital* which is relevant in the field. Through this also power relations are expressed. At my position in the field I encounter the world from this very standpoint. Nobody can have a Godeye's view. Standing at my social position I repeatedly experience similar situations: as a researcher I repeatedly come across situations in which I discuss with so-called experts. These repeating experiences, which are based on situations which vary but have some common characteristics, form my *habitus*. The concept habitus refers to a system of preferences, perceptions and practices which shape and channel how we go through the world.

How can we apply this approach to the day with Julian? The student union in which Julian worked was a social field in which a kind of capital was decisive. The position of Julian within the field, his access to capital and his relative power, influenced, rather than determined, his practices. His position let him repeatedly experience similar situations, which formed his habitus. This, along with his relative position, shaped the way Julian used capital, acted and perceived the world. Let me explain the relation of field to habitus and its implications for agents and for questioning Ecological Modernisation practices in depth.

Fundamental to an understanding of Bourdieu (1989, p. 15) is his "intention [...] to overcome" the opposition between *objective* and *subjective* structures which "stand in dialectical relationship" (1988, p. 782). The objective can influence people independent of their consciousness and will. An example of objective structures would be the upward mobility of peasant women through marriage in Béarn, Bourdieu's childhood village in southwestern France, in the 1960s (2004, p. 589). Subjective structures are those through which we perceive the world and make sense of it, e.g. the dualisms black/white, female/male. He puts forward that to understand actors we need to grasp them in terms of both kinds of structure. Thus, the social fields which we move in comprise both objective reality as well as agents' perception of it.

Such a social field can be imagined like a game. The players know the rules; they take them and what is at stake for-granted. Only those with the characteristics (i.e. access, knowledge of rules, etc.) can participate in the game, be an agent of the field, try to win what is at stake. Rather than talking about interest, Bourdieu uses the concept *illusio* to refer to such an attitude of an agent to the game in which the agent is trapped and lost. This happens when the stake is important to the agent and is not questioned. Bourdieu uses the concept of capital to refer to what is at stake. The capital of a field allows the player to exercise significant in-

[26] I recognise, of course, that social positions are always contested and changing: positioning is an ongoing process.

fluence in the field. Capital is anything which allows such an influence. Therefore players compete over all kinds of capital. Thus, the field structure can be described in terms of the distribution of capital, which refers to the same as the relations between players. Therefore, Bourdieu constructs fields as independent from individual access to capital: as long as the distribution of capital has effects on us, we are part of the field. If a capital is no longer effective, we are in a different field. Within the field, the capital lends power to the agent, over rules and regularities, over material and incorporated means of (re-) production. Hence, a field is much more dynamic than a game: Based on some, but never a complete and objective[27], form of understanding their position players can try to increase their capital as well as to alter the rules or to change the boundaries (2006, p. 129). These moves can be actualised, e.g. by introducing access barriers like certificates, or incorporating others with a different set of capital such that one's relative position is changed. To describe agents we need to understand their position relative to those of others, i.e. to describe the relations between agents who show the structure of the field. How would such a field look in Julian's case?

From my ethnographic field notes it is possible to draw together the field 'work'. Some of the effective forms of capital in it were: (a) institutionalised hierarchy (i.e. the boss could order Julian around), (b) means for getting the work done (this included material means, like a computer, as well as Julian's motivation) and (c) constructions of the *raison d'être* of work (the student union paid Julian as an environmental expert who, therefore, had some power to define what the work was about). Thus, several forms of capital were effective in this field, which implies that there were complex and multiple relations between the positions. These capitals were somehow distributed. Julian had some control, his boss had control and the environmental discourse had significant effects as well. At each position in the field, actors had different access to capital and hence developed a different habitus, specific to the position.

While the field is constructed through objective relations the agents experience it subjectively. The habitus mediates the objective with the subjective. Usually we meet situations which are normal to us, which shapes our perceptions and our practices. By experiencing situations which are alike, and usually they are because of our relative position in the social field, we repeat the experiences, repeat using the same categories successfully, again and again. Under this condition what were singular perceptions and rational practices become a scheme of dealing with the world. This sense is durable and can be conveyed even over generations. With this, the habitus enables us to deal with situations and is actualised situationally. Thus it is a system of potentialities and virtualities. What happens in a situation is not predictable; while most experiences are repeating and thus being strengthened, we can also experience new and different situations. Through learning and reflecting the habitus changes. Thus, it is an open and historical product at the same time. "It is durable but not eternal!" (Bourdieu)[28] Thus, our habitus is contingent.

[27] Thus, for Bourdieu so-called rational choice or a rational actor does not exist (Bourdieu 1988, p. 782).

[28] In: Bourdieu and Wacquant (1992, p. 133)

Reflexivity allows the distancing of oneself from habitus. Habitus is most constraining when the actor is not acting consciously[29]. Enlightening reflexivity can thus help to change how one is influenced by dispositions. This means that Bourdieu conceptualises action as neither mechanistic reaction nor deliberate, free and rationally planned moves. The field influences our moves and at the same time we influence the field. An actor can *emancipate* themselves through reflection and changing their practices. Nevertheless, this subjective acting is societal and therefore unlikely to *easily* change.

Relevant to the patterning of our perception, then, is Bourdieu's idea that the field configures the habitus. The habitus then, helps to understand and create the field as a meaningful world in which investing is worthwhile. The world is shaped by human actors and thus, the social world exists both as habitus and field as well as in things, bodies and minds both within and external of actors. The social world becomes part of the actor and produces the categories which the actor uses to understand the world and therefore the world seems self-evident to the actor. This is relevant in two respects: First, all interactions are also power-relations and if power-relations are not recognised we will be unconscious accomplices in actualising theses relations. Second, if our perception of the world is never all encompassing but relative to our position, which makes us take at least parts of the world as self-evident – a *doxic* stance, then one cannot speak of the actor as using strategies referring to purely intentionally and rationally acting. Bourdieu uses the concept 'strategy' to refer to practice which makes sense, thus is reasonable or rational, in certain constellations of the field[30]. Habitus explains why people are not necessarily stupid although they do not make conscious plans all the time. The habitus is a conditioning to deal with the situations which the agent is *likely* to meet. The concept helps to explain why dispositions/tastes are so durable.

To illustrate, let us visit Julian's work place, get an idea about what he was doing and how he talked about his work: In the beginning he told me about a meeting he would have later the day, "[t]he rest of the time [he] would be phoning and responding to emails"[31]. And in fact, he called a number of actors, looked up contact information on his computer (e.g. visiting a governmental website). Several times he got in touch with authorities. One time he let an official know that his "job is contingent on having *'these things in place'*[32]". In this situation he referred to the environmental management system of the university.

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[29] This implies that actors can act more or less consciously. The less conscious an actor is of her actions, contexts, her habitus and the field structure, the more grip the habitus has on her (acts).

[30] Some might wonder how Bourdieu conceptualises reason. For him, the economy of practices relates to any kinds of ends and functions. Practices can serve these functions or meet these ends without being consciously reasoned; nevertheless they can be reasonable.

[31] From a fieldnote

[32] Quote from Julian

Overall, we find that Julian took things for-granted, he followed routines and one can find patterns of how he perceived the world. Some of his routine activities were as follows: he perceived the world much through the computer and used it to organise information; he had to rely heavily on authorities for his work and seemed to take this for-granted; and furthermore, he perceived it as necessary to do the recycling of the student union offices and he carried it out routinely, although he did not enjoy doing it. This means, doing recycling (whatever this means, a care for the environment or just getting the job done) was more reasonable for him than not doing it. As already pointed out, communicating was of high importance to him. He communicated a lot, using all kinds of technologies. In terms of his work's content, his work place organisation included several items which carried messages like "making business sense of climate change" and an environment & money leaflet. As it was his work place organisation, these items could be interpreted to express content which he took-for-granted to be relevant. In terms of schemes of perception it was striking that he interpreted it as worrying when a communication partner forgot his name: *"Adam. Why is she calling me Adam? That's a bit worrying"*[33]. He had the perception that people avoided him and that he needed to use force to make people actually interact with him. Listen to this: *"people are avoiding you"*, *"you have only a certain time chasing people"*, *"force him* [the person he is calling] *to have an appointment with me"*[34]. With Bourdieu, Julian's perceptions and motivation can be considered part of his habitus. The latter makes much sense in terms of Julian's position in the field: he was working in an environmental job with little in the way of job requirements. Much competition existed for such jobs. Hence, if he was not motivated and did not sustain his motivation it was likely that he would have been replaced. At the same time, fitting to his position in an 'unpolitical' context[35] was his acceptance of mainstream propaganda on environmental issues (like the "business sense of climate change")[36]. To play the game of Ecological Modernisation well it was probably more than just helpful to be convinced of its value and being committed allows a seemingly strong position in the field. His habitus was to see small institutional improvements of 'greening' as significant successes and for this reason he contributed pragmatically his own resources to his work – sometimes even beyond job requirements and at other times against his liking.

To sum up, while thinking with Bourdieu emerges as an apt method of situating an environmental manager in terms of her habitus it remains to be discussed in more depth how technology and materiality can influence the actor.

[33] Quote

[34] Quotes

[35] Officially, his job was executive, rather than political. The student union had an officer who was responsible for environmental politics.

[36] If he had ethical/political problems with this message it seems it would have been easily possible for him to dispose it: taking away a sticker, commenting it, hiding it.

22.4 Discussion: Limits to Manageability in a Hybrid Field

Bourdieu (1981, p. 307) urges us to disclose how powerful agents conceal the struggles within their field. As alluded to above, such a stance implies breaking with sticky notions of the everyday and questioning how we could construct our object usefully. Let us take a closer look at whether or not the suggested *epistemological break* can be used for analysing glass recycling. To do this, let us return to Figure 22.1. If we look at it we find the central item 'glass waste'. While Bourdieu does not emphasise the role of material items, Actor-network theory renders them as potentially decisive actants. For our theory to be actually useful for conceptualising environmental management it is doubtless relevant to discuss how a Bourdieusian approach can account for technology and materials which influence social action.

Sterne (2003) focuses on this very issue. He suggests that technology is part of the habitus, i.e., part of the way we move, a socially organised form of movement. Reading Sterne implies a move towards conceptualising technology relationally. What does this mean? In the relational logic things exist relative to each other rather than having absolute characteristics. Schinkel (2003, pp. 78-79) sees this logic as having critical potential: Bourdieu's "analyses are *unmasking* and *demythologizing*. This is a direct consequence of his anti-essentialism"[37]. If one takes this anti-substantialist, non-naturalising stance one contradicts those who believe in the essence of things and their natural meanings. The non-naturalising stance assumes that one deconstructs these meanings as ideology/ignorance. Using such a relationalist approach Sterne suggests:

> "Technologies are socially shaped along with their meanings, functions, and domains and use. Thus, they cannot come into existence simply to fill a pre-existing role, since the role itself is co-created with the technology by its makers and users. More importantly, this role is not a static function but something that can change over time for groups of people." (2003, p. 373)

This moves Sterne to view technologies as points at which practices *crystallise*.

> "They are structured by human practices so that they may in turn structure human practices. They embody in physical form particular dispositions and tendencies – particular ways of doing things." (ibid., p. 377)

Thus, using Bourdieu, one can construe technology as ontologically non-special. Therefore I suggest conceptualising our habitat as *hybrid*. It is both given and socially constructed, technologically and textually. Sterne (2003, p. 386) brings out "technologies (as) just particularly visible sets of crystallised subsets of practices, positions and dispositions in the habitus. They are merely one sort of 'sedimented history'."

This hybridisation take on Bourdieu and how to use his work for analysing technologies, provides the ground on which to revisit Julian's construction of a recycling network. By considering technology as part of habitus, rather than some-

[37] I read essentialism as a synonym of substantialism.

thing ontologically different, a new understanding of Figure 22.1 develops: we are seeing habitus, positions, dispositions and fields. Recycling is a technology which is habitus. Whose habitus is it? The technology, as sedimented history, is shared. Recycling is an artefact of the social technology at which practices crystallise. The practices which crystallise are distributed over various fields, which we can analytically differentiate, i.e., the work field of Julian, the field of the recycling business and politics, the field of capitalism in general. If we look at what, according to ANT, is the common obstacle-problem, glass waste, then the Bourdieusian approach opens novel perspectives: What *is* 'glass waste'? How can we break with the substantialist, sticky idea of the everyday that 'glass waste' is simply glass waste? By applying the notion of habitus to it, we can construct glass waste as part of habitus. The habitus refers to embodied schemes of perceptions and practices. 'Glass waste' (of a night club) is part of our practices of drinking. Agents drink and produce 'glass waste'; in the night club agents are disposed to drink. The habitus generates drinking and putting the bottle somewhere. 'Glass waste' is something we habitually deal with. It is sedimented history, a cultural product of how one normally deals with empty bottles. Around the artefact 'glass waste' practices crystallise which are attuned to the game of drinking, to the position of drinking in the social field 'night club'.

What is Julian faced with and what is he doing? He is organising a recycling technology. By organising recycling he works on the symptom, i.e., an instance of the habitus of the drinking folk. He can 'carry away' as much glass as he wants (by using the shared recycling practices which are taken-for-granted in his field) and, yet, 'glass waste' will not change. To change 'glass waste', one needs to approach its cause, the habitus which generates practices which produce 'glass waste'. Of course, these practices are distributed. 'Glass waste' is not only part of the drinking folk's habitus but also of Julian's, the re-sellers', sellers', producers' and of all the other intermediaries' habitus. Herewith it comes into view that 'glass waste' was part of relations which extended from, in this case, the night club to Julian's office to the global sources of silicon dioxide molecules which were needed for producing glass and to firms which encompassed world-wide cultures of drinking as well as to all those who shared and reproduced the culture of drinking. Julian was situated amongst all these relations. To approach one of them and their relations, i.e. those who drink and put the bottle somewhere, we must not substantialise them. Also, the everyday idea of 'drinking folk' is tenacious. To tackle the 'glass waste' problem one would need to consider changing the fields which stabilise a kind of habitus, which generates practices of producing 'glass waste'. The Bourdieusian take presents the case as a relational issue: a focus on changing symptoms of multiple relations, as in 'glass waste', does not promise changing the relations themselves.

Are then, Julian's management practices determined through the structure of the social field? We find that Julian creates constrains for himself and his organisation through an organisational policy document on 'environmental conduct'. By co-designing such a document he aimed to bring about objective products at which his desired practices would legitimately crystallise. Thus, Julian had some agency and his practices were not totally determined. Nevertheless, whilst he designed

such constraints for his organisation others, within the organisation as well as without, i.e. state bureaucracies and public discourses on the environment, constructed constrains for him. Julian was faced with many relations which affected his work practices and his position provided little power to influence them. In our case, the symptom 'glass waste' was a site at which various constraints intersected; to name but a few: economic, cultural, legal and organisational. This site was stabilised through these multiple relations and it was not easy to alter them. Any 'greening' exercise will have to deal with such constraints.

Comparing this discussion with thoughts presented above makes obvious that the construction of a recycling network is not clearly a ground for developing a sustainable human-nature relationship. Rethinking the case – with Bourdieu, Actor-network theory as well as Ecological Modernisation Theory in mind – indicates that recycling naturalises 'glass waste' and that this technological so-called solution carries the taken-for-grantedness of waste and therefore processes it in a proper EM rationality. This rationality produces a lock-in of having to have more, rather than less, glass waste. The recycling network has to ensure sufficient glass waste to sustain itself. However, for humans involved it seems rational in order to ensure having sufficient waste to ensure rather more than less waste produced. Thus, this analysis suggests that *in the course of Ecological Modernisation practices, unsustainability can be sustained.*

Having recognised this, we should now turn the critique to consider where change could come from. This requires consideration of both the tendency of change and the inert character of social order. By using Sterne's work we recognised that the 'world-making' which Bourdieu (1989) refers to can be extended, in that we make the world by both construing and constructing it[38] – symbolically and materially. However, this 'we' needs to be differentiated. The power of world-making is unequally distributed. Some have more access to forms of capital than others. Consider 'glass waste'. It was part of many actors' habitus. 'Glass waste' served as a crystallisation site of many habitus, i.e. of Julian's, the recycling company's agents', the bottle producers' as well as the 'drinking folk's'. Among these actors the bottle producers, I assume, have most agency in shaping the social phenomenon 'glass waste', albeit they have no monopoly in it. In a market economy the consumer has some say and in our example the agents of the social technology recycling can transform the phenomenon as well. Needless to say, neither the material glass nor its constituting entities, like silicon dioxide molecules, have agency in how they become the site of history being objectified; the real/actual aspects of glass merely effectuate how the social can be inscribed on it (Sayer 2000); my cup of tea has effects, rather than agency, on me writing this paper. However, the same aspects of glass structure not only the room for configurations of habitus but also wider fields. If glass became scarcer, it would become expensive and recycling might be substituted by returnable bottles. Of course, a bottle and the specific fabrication of glass are a hybrid between the social and the natural and through them agency can be exercised. An analysis which construes 'glass waste' as a given, naturalises it.

[38] Cf. Fairclough et al. 2002

The construction of a glass-recycling scheme by Julian constructed a world in which more glass was needed, rather than less. Such symbolical and material naturalising, a co-construction of the social and the natural (Irwin 2001), goes hand in hand with drinking. The 'glass waste' was a site at which several habitus intersected – among them drinking. "Drinks construct the world as it is" (Douglas 1987), Julian's 'glass waste' presupposed drinking in bars and drinks are central to Western European cultures. Agency can be increased as well as limited with drinks. To illustrate: for Julian, drinks, as objectified history, allowed him to become a central actor in devising a social technology. Julian's agency was constrained by his culture, in which recycling had become a ritual, and at the same time he co-constructed a culture of drinking which sustained his job. Nevertheless, such agents have some say in – and beyond – their job. In the case provided in this paper Julian could have easily turned the issue of 'glass waste' in a political problem and by that might have allowed other actors, i.e., political green agents, to participate in interpreting and thereby shaping the issue. Thus, if a critical understanding of the issue is developed it is more likely that sustainable pathways will be recognised and, hopefully, used.

22.5 Concluding Thoughts

In this paper I told a partial story about Julian Berger, who co-ordinated environment-related activities for his organisation, and visited his construction of a recycling network. His story is woven into an introduction to two major bodies of social theory: Actor-network theory and Bourdieu's thought. Together, it became possible to problematise the Ecological Modernisation practices of Julian Berger as well as to highlight limits of manageability. Thus, the paper shows possibilities of how social theory can be of help in the study of environmental management. We learned that in the course of constructing a recycling network actually a social lock-in was created; rather than ending up with a social structure (of the recycling network) in which reduction of waste or alternative consumption patterns became the focus the actual network required the production of *enough* waste. If the production of waste decreases more waste will be required to sustain the recycling network!

Furthermore, we found a variety of social implications of the network. Both approaches, ANT and Bourdieu, stress relationality. With this emphasis we demonstrated that the management practices are embedded in a variety of relations – material as well as social. The recycling network was designed to be successfully embedded in a variety of hegemonic relations – amongst them capitalist and technological ones. This complies very well with the paradigm of Ecological Modernisation which states that problems are approached by way of integrating them into capitalist market mechanisms and finding technical solutions. The construction of the recycling network meets these postulations. As we have shown, however, it is precisely the stabilisation of the material and social relations which renders the network a problem. Hence, the story of Julian Berger illustrates how the set-up of

a recycling network can lock a social network into a trajectory of 'unsustainability' (Blühdorn and Welsh 2007).

To sum up: recycling naturalises, rather than reduces, 'glass waste'. That is to say, it stabilises the symptom of multiple relations which go hand in hand with diverse problems: environmental destruction (using up more resources) and economic exploitation (through capitalist relations). Both these problems are silenced through the naturalisation of 'glass waste'. This should provoke further thought. Of course, it can be seen as a mishap that we live in a contradictory world in which the theoretical insights about 'glass waste' cannot be easily put into practice and I recognise that the recycling practices are interlocked with wider environmental policies and culture. The agency to change recycling is distributed within and among social fields. Various agents, including Julian Berger, take part in shaping the issue. I identified 'glass waste' as a site at which history has been and is being objectified. Therefore, an analysis of (glass) waste would see the wasted objects as social. To deal with them, solutions are needed which take into account the historical, social and political dimensions. These dimensions are integral, rather than external, to the objects. Thus, waste is socionatural – *attention to the waste problem requires including, not merely adding, critical takes on the society of which waste is part of.*

What needs doing now – a task for further research as well as for practical experiments by environmental managers – is to investigate how agents can counter the unsustainable trajectory of Western capitalist consumerism and production. Such questioning should aim at a negation of *practices* which produce undesired social and ecological effects. This focus on practices goes beyond only considering *ideas*[39]. To turn this conclusion into the positive and being inspired by Pepper (2005), I propose that practitioners engage with experiments to change the social situations which hitherto resulted in more, rather than less, waste (Krivtsov et al. 2004). For such an aim they would surely find as partners researchers and other social agents who are aware of social and ecological justice and the problems with unsustainable ecological modernisation practices.

22.6 Postscript

Four years afterwards, Julian provided a friendly comment on the preceding analysis[40]. He stressed the meanings his practices had at that time. His prime aim was one of "instituting a social norm" of "good housekeeping" within the organisation. This was supposed to induce a sense which would lead "to further recycling of other waste streams". He assured the reader that implementing the recycling scheme did not increase the amount of waste. As a trickle down effect, Julian

[39] Practices have to change and the change of ideas might be only a tiny step of the path to that. In that respect see Howard-Grenville (2005, p. 573) who discusses the ideas which environmental managers hold and how they seem to be stable.

[40] The quotes in this part are sourced from his written comments on this article.

hoped that recycling would "open doors to new commercial opportunities which would constitute green jobs rather than the norm which is to base useful work on extractive highly damaging industries".

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