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Enacting things through numbers: Taking nature into account/ing

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Abstract

In this article I make use of a combination of actor-network-theory, governmentality studies and feminist studies of science to show how nature is done or enacted within politics and administration. In particular I show how it relates to the theories and practices of economics and accounting. I explore the process by which the 'critical limits' of nature under the impact of acidification was created as a part of the politics and negotiations about acid rain. I demonstrate that even though the outcome was not 'Nature' as such, understood as a form of moral high-ground, the effect of this process was to produce 'a nature as a whole', in a process of unification. This I argue can only be understood relationally: 'Nature' is taken into account by way of accounting. In doing this I engage with Latour's work on the politics of Nature and argue that nature is not necessarily such a deadly tool to politics as is sometimes taken for granted. Before we throw Nature out with our empirical studies of sciences, natures and politics, in the plural, we need to look first at how Nature-wholes emerge, are enacted, and take part in politics.

Keywords: Accounting; Actor-network-theory; Science-studies; Economics; Governmentality; History; Norway and Europe; Politics of nature

1. Introduction: Undoing nature

We no longer believe in nature, at least not Nature with a capital N. Nature as such does not exist, and even if it did, we would not have wanted it to. This is the main argument of *Politics of Nature* by Bruno Latour (Latour, 2004 [1999]). The argument, although provocative and counter-intuitive to some, has become common-place within a certain version of social studies of science. Within this tradition the disrupting of cherished 'wholes' is flourishing. For example, what Latour is doing for Nature, Annemarie Mol has already done for the body or the patient. The patient as a whole does not exist, we learn from Mol. On the contrary, the patient was erected only as a normative standard, as 'a philosophical dream' against which actual practices could be measured and discarded (Berg and Mol, 1998, p. 6; Mol, 2002). This ongoing disrupting of wholes is being done for the benefit of multiplicity, or rather complexity, for a multitude of practices, as well as for the subjects and objects which are being enacted as the outcomes of these practices (Law, 2004): natures, patients, and to an increasing extent also economies – in the plural (Barry and Slater, 2002; Callon, 1998; Gibson-Graham, 1996; Hinchliffe et al., in press).

This article takes these discussions, these versions of creative disruption, as its point of entry.[1] Absolute Nature linked to a metaphysic of totality, Nature as the moral high-ground against which actual practices can be measured and discarded, does not exist. Nature cannot be grasped independent of its modes of production. Nature becomes knowable through the intermediary of the sciences; it has been formed through networks of instruments; it is defined through the intervention of professions, disciplines, and protocols; it is distributed via databases; it is

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provided with arguments through learned societies (Latour, 2004 [1999], p. 4). Ecology has no direct access to nature as such.

Empirically, the article explores a specific form of out-thereness in the making, namely the emergence of a new Nature-whole, a nature-whole which was the outcome of the European 'critical load project'. The critical load project is an ambitious mapping exercise that has played a major role throughout the last two decades of negotiations and policymaking in dealing with the European problem of acid rain. The project represents an effort to map the critical loads of nature, to quantify how much pollution is acceptable, and how much should be reduced – to map "what Nature can withstand" (Bäckstrand, 2001). The critical limits of nature are thus the thresholds beyond which nature cannot recover or adapt. This mapping exercise is usually interpreted as a success (Lidskog and Sundqvist, 2002; Wettestad, 2000), and it has without doubt had a tremendous impact and made a deep impression on both negotiators and activists: Finally, nature was taken into account.

The purpose of exploring this case as well as its institutional context and history is precisely to demonstrate the rich confusion in the making of a specific version of out-there-ness, an out-there-ness which, literally, may be said to have been the result of this endeavour. This was not Nature, the moral high-ground, separated from interests, negotiations and conflicts, a neutral ground on which policy should be grounded. On the other hand, there is more to this Nature than local or single natures, *this* river, *this* invertebrate (Latour (1999) 2004). What if there are Nature-wholes made real, and what if these "Natures-made-real-as wholes" matter? What if there are Nature-wholes made real in relation to, as well as a consequence of, other practices, wholes and entities?

Before we throw Nature out with our empirical studies of sciences, natures and politics, in the plural, we need to look first at how Nature-wholes emerge, are enacted, and take part in politics. Accordingly, what I am after are processes of unification (Marres, 2004) and their significance to politics and administration. Nature does not always trump politics. Nature is not necessarily the deadly tool to politics that Latour's philosophical argument tends to presuppose. Thus this article interferes and engages with Latour's overall objective in his Politics of Nature – namely doing away with Nature for the sake of giving space to politics.

My approach to this argument is twofold. First, I explore the emergence of this new Nature-whole as part of a series of historical transformations. By treating it empirically and historically, I turn the philosophical argument of Latour on its head: Nature is not the starting point, but rather the outcome – a consequence of a series of practices and transformations. Here, I draw not only from Latour, but also social theories on the politics of nature which argue that what is characteristic of contemporary environmental problems is the ways in which 'nature', can only be grasped indirectly, through the intermediaries of science (Beck, 1992). This is not new, I argue. What *is* new to politics and administration of the environment, at least to the politics of pollution, is "Nature", transformed and grasped into a reality "out-there", a vulnerable albeit governable entity.

I then take a closer look at the relations from which this nature-whole has emerged. An integrated part of the historical approach is to trace the ways in which the enactments of nature and the enactments of economy go together. Nature is grasped as a relational effect of its relations to economy, or rather accounting and economies, in the plural. Thus in order to explore the ways in which Nature is taken into account, I look at Nature in its relations to accounting.

What this implies is that the article is part of what can be described as the 'second turn' in social studies of science. This is the shift 'outwards' to empirical studies of politics, of markets, of finance-systems and 'the economy' (Callon, 1998; Callon et al., 2002; MacKenzie, 2003; Muniesa, 2000), not least in the way this turn takes the form of a contact point, an intersection of resources from actor-network theory, feminism and governmentality studies (Barry, 2001; Barry and Slater, 2002; Barry et al., 1995; Miller, 1994; Miller and Rose, 1990; Power, 1994; Rose, 1999) that stem from the lectures on governmentality by Michel Foucault (1991).

What these resources allow for is an irreductionist approach to the conduct of government. Following Foucault, government is not reduced to the question of the state, but rather treated as a set of practices and technologies of governing that operate across distinctions between state and market (Barry, 2001, p. 174). The focus on practices rather than institutions was precisely the intervention of Foucault in relation to political theory (Gordon, 1991; Veyne, 1978).

Along the same lines, actor-network studies allow us to be irreductionist about the materiality of government. Government relies not only on the conduct and properties of *persons*, but also on the actions of a whole array of technological objects and scientific entities (Barry, 2001, p. 175). Taken together, the consequence is that science and politics cease to be two distinct or separate spheres of knowledge and practice. What becomes the focus of attention are not only the ways in which science and politics are the outcome of ordered co-productions (Jasanoff, 1996; Wynne, 1996), but also the ways in which the heterogeneous materialities and practices of science and politics produce the relevant entities and objects which accordingly take part in public and political life. Thus what calls for our attention are the technologies of politics (Asdal, 2004) – the way in which an imbroglio of science, technology and politics takes part in producing, rendering real and visible, its object of intervention – while taking politics, that is, the practices of bureaucracy or administration, as the main site or entry of study.

Other scholars have been pursuing similar strategies in relation to 'the economy': strategies of national economic

management have been made possible through the construction of a vast statistical apparatus through which the domain of 'the economy' could be inscribed, visualized, and compared (Rose, 1999). Strategies of nature management have to a large degree followed comparable tactics and procedures. It is not exclusively the realities of the *social*, of society, that numerical technologies help constitute. The same goes for nature.

What I am after, however, are the ways in which the enactments of nature and the enactments of economy go together. In grasping nature as an effect of its relations to economy, I draw from a distinct feature of governmentality studies and actor-network theory: the concern with relations. To Foucault, human practices are possible only within relations (Foucault, 2003 [1963]; Gordon, 1980). In the words of Paul Veyne, Foucault is a philosopher of relations who does not ontologize Power. The State, for instance, is the simple correlate of a certain specifically dated practice (Veyne, 1978).

As for the question of government and the issue of resistance, Foucault suggests understanding government as a 'contact point,' where techniques of power or domination and techniques of the self interact (Burchell, 1996; Barry et al., 1995). Thus it is not a question of acting *on*; it is a relational affair. Likewise, actor-network studies and laboratory studies rely on a philosophy of practice in which scientific objects and the realities they take part in producing are seen as outcomes or effects of their relations (Latour, 1987; Law, 1986, 2004).

The question that has been raised by feminist scholars of science and technology in relation to the works of both Foucault and Latour is the extent to which such a relational program has been undertaken in practice (Martin, 1994; Ong, 1995; Star, 1991). In exploring the politics of nature, however, a relational perspective is difficult, indeed almost impossible, to circumvent. What empirical studies of politics and administration demonstrate is that the politics of nature are very seldom about only one will. More often it is about conflicting interests and the confrontation of wills. The politics of nature and its objects, including its quantified objects, have come into being through their encounter with other entities, such as the factory or 'the economy'. These clashes or confrontations have helped shape both the politics of the state and the shifting configurations of 'nature'.

Thus, the way in which I relate to the relational program of Foucault and actor-network theory is by drawing attention to a particular site of politics and administration in which nature and the economy get linked together. More precisely, I build on a research project on the emergence and transformations of the Norwegian Pollution Control Authority from the early post-war period up until the present. [2]

[2] Detailed references to material and archive resources can be found in Asdal, *Politikkens teknologier. Produksjoner av regjerlig natur*. (The technologies of politics. Productions of governable nature, Asdal, 2004.)

What we tend to call politics very often turns out to be another science, and by studying politics and administration empirically, we can explore natural science in its co-production, its relation, to 'the economy'. Indeed, if we look closely, different versions of 'economy' can be found just about everywhere, not least within and in relation to the critical limits of Nature.

In the next sections, I will touch upon a range of places and discussions in which 'nature' and 'economy' coincide or confront each other. I present a cluster of selected stories to show how a new governable entity called 'critical limits of Nature' emerged as a new object. The following section presents the 'politics of nature' before 'nature' was even a relevant category. Thus the intention is to present the material and historical setting through which a new nature-whole was to emerge. The last section of the article will return to the question touched on above, namely what Natures *does*, or *does not* do to politics.

2. Before nature

It seems natural that the relevant object of management for a national agency for pollution control would be Nature. In exploring the documents and practices of pollution issues – or 'smoke damage' as it was labelled in Norway in the 1950s in reference to the smoke from the chimneys of the developing aluminium industry – what is striking is the extent to which this was *not* the case. In relation to the crucial events which eventually led to the establishment of a separate administrative body on the increasing problems of 'smoke damage', the issue was instead a matter of concern for *agriculture*. The issue was made relevant by and to the farmers as their animals suffered and died. The damage to the animals was linked to the emissions of fluorine from the aluminium smelter in the immediate surroundings. What was at stake was not an external 'nature', a nature 'out-there', but rather two forms of economic life, two ways of living, in confrontation with each other.

These events formed a source of unrest (Law, 2000) in relation to the factory. This was a source of unrest with lasting effect, as it subsequently took part in re-inventing state politics by creating a new national, governable and abstract space (Rose, 1999) – a space of 'emissions'.

Thus numerical technologies helped produce a governable space of 'pollution', a governable space which then lent itself to political intervention. As I have demonstrated elsewhere (Asdal, 2005): If the emissions could be measured and found to be too 'big', then this meant that they could also be made smaller – be reduced – couldn't they? Hence, objects of nature could potentially grow in size and significance, to the extent that they could touch upon and interfere with the factory – the factory that was already in place as part of another story, one of industrial policy, export income, numerous jobs and the promise of a new and prosperous land. In a very concrete and material sense then, politics of nature emerged in relation to industry and the factory.

Inherent to this abstract space was a detachment from 'agriculture', replaced by a new space, *outside* the factory walls, but nevertheless detached (Callon et al., 2002) from 'nature', that is, a ground in which pollutants have an effect or the bodies in which polluting emissions interfere. Thus, what was enacted was an abstract space (Lefebvre, 1991 [1974]) in quite a literal sense of the word. This transformation however, which implied distinguishing between inside and the outside the factory walls, served as a precondition for 'the management of pollution' in the form of a separate administrative body for a politics of emissions.

From what I have argued so far, it is tempting to agree with Latour that nature with a capital N does not exist. Even in the 1970s, looking into the daily practices of the Pollution Control Authority, you would rarely, if ever, find questions about Nature, or even natures in the plural. In the words of Latour, it is always '*this* invertebrate, *this* part of the river, *this* garbage dump or *that* land regulation plan' that is the object of concern, protection, criticism, or political protest (Latour, 1998, p. 222–223), and what you would find within the Pollution Control Authority is close to the same. Not only did this imply that Nature with a capital N was lacking, not even natures in the plural were part of the vocabulary. Instead, what was made present, real and visible were 'the rivers in the southern part of the country', 'water-quality', 'surveillance-units' and so on.

And moreover, this particular site of politics and administration not only *practiced* politics of nature in this manner, it was incorporated in its theories as well. Not even in its theories did Nature emerge as a relevant category of activity. Thus apparently the statement of Latour fits perfectly, possibly almost too perfectly, as no imaginary Nature seemed to exist, not even Nature as a modernist dream.

'I did not deny history, but held in suspense the general empty category of change in order to reveal transformations at different levels', Foucault (1972 [1969], p. 200) argued in *The Archeology of Knowledge*. Neither 'Nature' nor 'the Environment' are timeless categories existing before material, semiotic and political practices. What I aim to do here is to link the argument of those who state that Nature, or the Environment, do not exist (Latour, 1999; Lascoumes, 1994) to particular sites of politics and administration coupled with the attention to historical transformations.

What I argue through the next section is that there was a rupture, a break with these earlier practices and governable objects. Nature consequently emerged as a relevant object of intervention and imagination. This was the result of nature-objects being collected, made present, visible and imaginable through a set of heterogeneous material practices. Crucial in this was a whole series of relations with accounting and 'the economy'.

3. Grounding emissions, tracing effects

The kind of abstract space to which I referred above did not restrict itself to national territories. A version of the same structure, although not linked to the individual factory, was initiated and extended to a trans-European level. The reason why this materialized is intimately linked to the acid rain issue, so important to European relations, (not least between Norway and Great Britain) environmental research, policy and history (Bäckstrand, 2001; Hajer, 1995; Lettel, 2002; Munton et al., 1999; Olsson, 2002; Patt, 1998; Underdal and Hanf, 2000).

Within the European monitoring program EMEP (the Cooperative Program for Monitoring and Evaluation of Long-Range Transmission of Air Pollutants in Europe), Norwegian research environments attained a role as centre of calculation, thus enabling a shared abstract space, in which the science of meteorology was decisive (Friedman, 1989; Lettel, 2002; Ottar, 1994).

These monitoring practices acted as conditions of possibility (Foucault, 1972 [1969]) for the critical load approach within the European negotiations on acid rain. In this vast European accounting system, Norway and the other Nordic countries emerge as net-importers of pollutants. Thus a particular form of accounting system served as a crucial condition for tracing the ones who were to blame for the effects of acid rain.

Within the Pollution Control Authority, this programme was coupled with another comprehensive monitoring program on the effects of acid rain, including its effects on the fish stocks of Norwegian surface waters. Hence the 'air part' and the 'water part' were to an increasing extent intertwined. The acid rain issue thus contributed to the occurrence of an important linkage: the link between atmospheric emissions and the tracing of their possible effects in the ground.

These were crucial events because the invention of the abstract space of emissions did not produce what was expected: Emissions did not decrease the moment they were rendered present through quantification. And why should they? In not focusing on the effects, there were no ground(s), no other story to contrast 'the industrial story'. Within pollution control, 'Nature' was to be the ground(s) for which emissions should decrease. A first and simple condition for this nature-whole to appear at a national level was the relation to political decisions in the form of budget-space – that is, increasing budgets.

4. Enabling a nature-whole: the budget relation

In the early 1980s it was *this* particular river and *that* unique recipient, which predominated and hence served as the object of intervention. This was partly linked to the financial situation: Budgets were limited. Accordingly, the rivers within range for monitoring and control were limited. Moreover, this range was decreasing, which threatened the expulsion of waters from the monitoring program. As the water researchers serving the Pollution Control Authority complained: 'We can handle the budget cuts by removing six more rivers from those left in the program, so we will be left with 10 rivers. These six rivers should probably be rivers

along the western coast, as the rivers in the south obviously suffer from acidification'.

The scientists were concerned that this would mean they would be unable to register future changes in water quality caused by sulphur and nitrogen compounds in Europe. This illustrates what studies of science have shown in a range of settings: the detailed daily practices of inscription, collecting and ordering procedures that are necessary to enact scientific objects (Latour, 1999; Law, 1994).

However, a particular relation that is important to underline is the one linked to accounting systems in the form of budgets. Without a budget, nature could not be monitored, and thus made real, visible and *known* – in the sense scientists, administrators and politicians were after. However, in the second part of the 1980s this changed radically. Over a four-year period, funds for environmental research were doubled. Consequently, in the mid 1980s the number of bodies of water within range of the water researchers increased radically. The water researchers set out to collect and compile samples from as many as 1009 rivers all together. In a very concrete and material sense, increased budgets helped transform *this* river, *that* river, into Norwegian surface waters, and thus Norwegian nature. The collection of analysed water samples, the written document, and the dotted maps that were the result of this mapping exercise, 'The 1000-river survey' (Henriksen et al., 1987), were crucial in increasing ambitions to rename what this monitoring program comprised, namely mapping the critical loads of 'nature': what started out as a few dots on the map, consequently became a map with dots all over. These maps were so densely populated with dots that they were about to qualify for nature as such. Or rather, these were data bases, material conditions of possibility for starting to conceive of these as a unity; an anonymous nature out-there – and not as before, *this* river on the west coast and *that* in the south.

This transformation to an emerging 'nature-whole' was expressed again in relation to political documents: In the late eighties the new concept 'critical loads of nature' emerged as a new concept in the national budget, together with increased funds to secure the emergence, and so the monitoring and governing of this new nature-object.

5. 'Nature' in confrontation with 'Economy'

The collecting and mapping of Norwegian nature was intimately linked to strong ideas and ambitions within Norwegian and Nordic environmental ministries. This aim was to persuade 'the big polluters of Europe' to reduce the pollutants that the monitoring programs had traced back into Nordic and Norwegian waters and soil – where they ultimately harmed and killed fish, and most likely caused forest-death. However, the intentions and ambitions on the part of Norwegian environmental management and politics were not only to map the critical loads of nature to use them as a persuasive tool in relation to other nation-states, 'the big polluters of Europe'. Critical loads were also meant to be used as tools within the state, within Norwegian government. They were coupled with specific intentions and ambitions to make Norwegian nature a real, visible and obligatory entity in confrontation with the abstract space of 'the Economy'. Indeed, not only should nature be made real to economy, but nature ought to have the strength or power to overrule economy. In this confrontation ecology played a crucial role:

'Ecology must govern the economy – not the other way around!' This was the message about the critical-load project within environmental-administration. What was achieved through the international negotiations on acid rain were agreements that saw to it that every country reduced its emissions proportionally. It was, however, pointed out that these agreements would be more or less devoid of meaning in the long run 'if the natural resource base on which we depend is nevertheless destroyed'. Mapping the critical loads of different species and eco-systems was thus introduced and presented as the most viable solution to this problem. The idea was that these should be used to govern and direct the use of nature and social development.

Ecological science did not become a crucial factor in the concrete mapping exercises within the critical load project in the end. Even if the logic of mapping critical loads of nature implied an ambition to map *all*species, and *all*different nature-localities, this was for all practical reasons abandoned. However, as the credo of the nature-administration suggests, ecology played an important role in enacting a specific whole, in relation, competition and confrontation, with another abstract space, namely the economy. Thus the mapping of the critical loads of nature was part of an ambition to make nature a real, visible and obligatory entity, and thus able to overrule economy.

Thus it is tempting to read this as the kind of strategy that (Latour (1999) 2004). in his work on the politics of nature condemns: a strategy to short-cut politics by referring to nature. However, as the intention is to move slowly in these matters and to discuss politics, nature and the sciences simultaneously, there are reasons for exploring this issue more carefully. Despite its references to the rules or laws of nature, at the same time nature managers took care for not to simplify the issue. What is more interesting, however, is the way in which the critical-loads approach was co-produced in its encounter with the economy, thus framed as a 'robust' (Olsson, 2002), 'scientific' and 'closed' entity.

The process parallels in interesting ways what Brian Wynne (1996) has demonstrated in relation to the climate issue, namely the way in which science as an ordered activity gets transformed in its relation to politics and the expectations to have 'the correct answer', a scientifically proven foundation, in order to act. What my own case points to, however, is the way in which the same process occurs *between sciences* (although *within* administration). Expanding on this, what I would argue is that what tends to be labelled 'politics' is often in fact another science. In this case, as it most certainly is in many other cases, this science is economics.

This certainly proved to be the case as the critical-load approach was accepted as a premise for the international negotiations on acid rain. 'A crucial breakthrough for the principle that ecology will govern the economy, and not the other way around', it was noted within environmental administration.

These clashes and confrontations should be understood in their historical context as well, that is, the ways in which similar discussions and experiments had been taking place in other points in history, or rather the way in which events of the past fold themselves into the present (Roberts, 2002; Serres and Latour, 1995).

As early as in the mid 1970s, a new Ministry of the Environment challenged the authority and position of the Ministry of Finance as the unquestioned "super-Ministry" – and the point through which all government must pass – by launching an alternative accounting system (Asdal, 1998; Jansen, 1989). An accounting system for natural resources was to replace the budget system of financial resources for which the Ministry of Finance had hitherto been responsible. However, these efforts failed, partly because economists did not accept a conflict between natural resources on the one hand and financial resources on the other. Accordingly, economists within the Ministry of Finance saw themselves as the appropriate resource managers, regardless of whether the resources were physical or financial (Asdal, 1998).

The new minister of the environment, later prime minister of Norway and leader of the UN-commission Our Common Future (1987), Gro Harlem Brundtland, did not succeed in attaining for her ministry the executive office of resource management and accounting. The abstract space of the growth-driven economy, increasingly materialized through a system of national accounting in the post-war period (Lie and Roll-Hansen, 2001; Miller and Rose, 1990) enacted another, and conflicting, story. A competing national space of accounting had already formed the centre within government.

The nature-whole that the critical loads project took part in establishing in the late 1980s was in this respect only a more restricted and modest version of the one of ten years earlier, which then comprised an overall notion of resource management and posed a profound challenge to the existing accounting system.

6. A calculating machine

As I have indicated already, the imaginary whole which ecology represents did not come to play a crucial role within the critical load project. A broad ecological approach simply was not feasible in practice, not least given the time-schedule of the negotiations. Thus in practice ecology was replaced by a combination of the material technology of the map and a chemical model for surface-waters, the so-called ANC-model. The grid-map came to replace ecology in performing a nature-whole. The ANC-model came to ensure that the nature represented by the map was scientifically sound, thus sufficiently real and robust to be part of the trials of strength in international negotiations over the need to reduce the problem of acid rain. For the purpose of this article I will focus predominantly on the water-chemical model, so crucial to the project of mapping threshold values: the critical loads.

In the late eighties the link between the lack of fish in southern Norwegian surface-waters and acid rain – that is, sulphur and nitrogen compounds – was established as a matter of fact. Thus it was accepted that the critical load of acids was already exceeded in large parts of the country. But to what extent? To what extent should acid compounds be reduced to restore fish-stocks? The chemical model on which the notion of critical loads was built served as a precondition for making these judgments quantitatively. It has been pointed out that the notion of critical is two things: On the one hand, nature is conceived of as fragile. On the other, nature is conceived as robust (Olsson, 2002) – that is, governable. The model implies that nature is able to withstand a certain and quantified load of pollutants.

In the case of surface-waters, the precondition is that most surface waters have a certain weathering capacity, or more precisely, an ability to neutralize acids (Henriksen and Brakke, 1988). Thus, the critical load is an estimate of the quantity of pollution nature can tolerate without damage (Henriksen and Buan, 2000, p. 6). To put it simply: only to the extent that this weathering capacity is broken down, or 'exhausted', will detrimental effects occur. Or, as the notion was defined more openly and modestly in the early negotiating phase of the concept: 'A quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge' (Nilsson and Grennfelt, 1988, p. 8) In determining this capacity, the Acid Neutralizing Capacity (ANC) model was crucial. The trick then was to decide, thus quantify, this critical load – or as it was called, 'the ANC limit'.

Built-into the model of the ANC limit was the assumption that nature is a flexible entity. The weathering capacity could be reduced, however, only to a certain limit (that is, the ANC limit). Reducing the buffering capacity would, accordingly, reduce nature's ability to 'resist' acids. Thus a calculation of risk was built into this. So the question was which ANC limit to 'choose'.

The answer to this question was crucial, as the status of Norwegian nature varied tremendously – depending on the ANC limit that was set. If an ANC limit of 0 was chosen, then 30% of the natural environment in southern Norway had exceeded its critical loads (Henriksen et al., 1990). However, if the choice was an ANC limit of 20, then as much as half the southern part of Norway had exceeded its limits. For Norwegian nature as a whole, the outcome was 36%. When these figures were transferred to the grid map, as part of the overall European monitoring program, Norwegian nature emerged as even more vulnerable to acid rain: Transformed to the map, the outcome with a ANC limit of 20, close to half of Norway (as a whole) had exceeded its limits to acid rain.

No matter which ANC limit which was chosen, Norway stood out as a vulnerable country – with a natural environment that had very little tolerance to acid rain. And the result, with a chosen ANC limit of 20, made an enormous impression. As one of the analysts who followed the process put it, 'The most fundamental effect that critical loads had was to shift the nature of the public debate…away from determining who the bad guys were, and towards determining how vulnerable each party was to acid rain' (Levy, 1993). The vulnerable nature, the outcome of these calculations, also performed well in negotiations. It acted as a powerful nature-whole in convincing 'the others' of the need to reduce sulphur-compounds drastically, and to a much larger extent than before.

The green movement met this new nature-whole with enthusiasm: 'In effect, we entered a scientific dialogue with the environment – and the environment has given us answer. Nature says "I am still suffering – 30 percent is not enough" (…). This April, at a meeting in Oslo, they (a group of scientists) reached a scientific agreement on the loads of pollutants, which are critical to nature. (…) This is new. It changes the whole debate, the whole basis for action. These are not arbitrary figures or political notions. These are reductions actually needed to protect our nature, safeguard our heritage, our health and our economies' (Elseworth and Ågren, 1986 referred in Bäckstrand, 2001).

The representatives of the green movement were right: These were not arbitrary numbers. However, they were the effect of negotiations, the calculations of risk, uncertainties and discussions – in between scientists as well as between science and administration and between nation-states. Which numbers to feed into the calculating machine? These discussions did not reach the larger public and was not part of public debate.[3] Thus, in public, nature emerged as a stable entity 'out-there', a ground which, finally, had been made present and real to everybody – to other nation-states as well as to industry and economists who worried about the costs of taking nature into account. What I will demonstrate in the following section, however, is that this version of nature did not belong to natural science or the green movement alone. It also to an increasing extent belonged to economists and economic theory.

7. Critical loads as cost-efficiency

When economists began to show greater interest in environmental issues in the late sixties and early seventies, the concept of a 'self-cleaning capacity' in nature was of fundamental importance (Asdal, 1998). The notion is intimately tied to the concept of cost-efficiency, so pivotal to economics. The implication here is that because resources are scarce they, natural resources included, should accordingly be used efficiently. Not using nature's capacity to use resources efficiently equals a waste of resources. The chemical model on which the critical loads project was based comprised a parallel way of reasoning:

The model on which the critical load strategy was based had a certain set of presuppositions built into it. It presupposed that nature had a weathering capacity, that is, an ability to 'handle' by itself a certain amount of pollutants. Thus, the critical load strategy of tracing the precise effects of pollutants in nature was open for interpretation: On the one hand, it was a strategy to demonstrate the vulnerability of nature to pollutants. On the other hand, it could be a strategy to ensure that resources were not being used ineffectively – that is, making sure that pollutants were not being reduced more than necessary (because not using resources effectively within economic reasoning equals a waste of resources).

In initiating the critical load project there was never any doubt regarding the overall strategy: to reduce pollution, perhaps even radically. In demonstrating and quantifying the precise effects of pollutants, the strategy was to do this in a more rational, scientific and convincing way. Thus the project took form as a rhetorical device to convince 'the others', to convince other nation-states that Norwegian nature suffered and was worthy of protection. This harmonised with the established strategy within environmental administration: to promote the principle and use of best available technology (BAT).

Economic reasoning and modelling played, however, an important role within the international negotiations (Bäckstrand, 2001; Patt, 1998). In Norway, economists to an increasing extent came to interfere with and reformulate environmental politics through the 1990s. Their concern was not the least a concern with cost-efficiency (Asdal, 1996). This also came to affect the way in which the critical load approach was reformulated: Not so much a strategy to *reduce* emissions, as a strategy to take the effects into account, thus accounting. A consequence was that Norwegian negotiators stopped promoting the principle of BAT. This was a principle that, in economic terms, was understood as a waste of resources and in *conflict* with the critical load strategy – that is, the critical load approach as an effect-oriented strategy. Thus the vulnerable land, the impressive nature-whole was delineated as 'a recipient', a 'container' into which pollutants could be filled, up to a certain point.

Within the Pollution Control Authority this was explicitly expressed as a concern. Utilising the best available technology should be a prerequisite, it was urged. Setting critical loads should not result in allowing polluters to 'fill up' nature to the limits set by the environmental administration.

Seen from the outside, this battle was lost. It became apparent that a radical change was taking place in the Norwegian position in the acid-rain-negotiations, a 'turn-around' in environmental policy (Laugen, 2000; Munton et al., 1999). Alarms went off in the green movement: 'Norway is blocking the negotiations on sulphur-dioxide'. This

[3] This became, however, part of the debate within the negotiations. See for instance Bäckstrand, 2001.

referred to Norway's recent and complete unwillingness to let the principle of the best available technology (BAT) into the framework of the acid-rain negotiations. The obvious reason was the risk involved in reducing pollutants more than necessary, and thus wasting resources.

Thus paradoxically, it was not only a new and overarching Nature-body that emerged within the Pollution Control Authority. The same was true for a specific economic reasoning. Surprising as this might sound, there is, as I have tried to demonstrate above, nevertheless a logic to this. The strategy of making real and present an overarching nature-whole for the purpose of taking nature into account inevitably also implied taking nature profoundly into accounting.

8. Revisiting nature in its relation to economics, politics and administration

Callon (1998) suggests that sociologists ought to rethink their relation to economics. Instead of criticizing economics for not capturing reality, culture, the way actors *really* behave, they should rather examine the role of economics in its constitution of the economy. In the words of Barry and Slater, 2002: 'Instead of viewing economics as bad science it would be better to view economics as a set of technical practices that have a stronger relation to real economies than sociologists have often imagined'. They argue that the concepts of economics should be understood broadly to include not just academic economic theory, but all the institutions, techniques and professional practices that serve to make actions and objects calculable (Barry and Slater, 2002). This can be fruitfully combined with Latour's argument.

'The economists alternate between excessive modesty and excessive pretension: if one praises the intensity of their influence on the economy, they humbly claim to have no responsibility in that matter, denying any performative role in the formatting of connections; conversely, they assert with assurance that even if economics did not exist, the thing to be described, the economy itself, would exist as such. If they are to be a bit civilized, they will have to recognize their power (the economy arises from the practices of economics) and its limits (the economy extends no farther than the network of its instruments' Latour, 2004 [1999], p. 275–276).

I have aimed to show that the instruments and practices of economists do indeed have a long reach. Not only do they take part in enacting markets, consumer behaviour, and national accounting systems for financial resources, they also take part in producing new objects, thus transforming the meaning of old ones (Porter, 1995, p. 17), even Nature. Nature is not only made present and real through the instruments and materials of nature-parts and natural science, of politics and administration. Systems of accounting, ways of economic reasoning, also take part in these practices – and in essential ways.

'What properties would nature have if it no longer had the capacity to suspend public discussion?' asks (Latour (1999) 2004 [p. 18]). This is a pertinent question also in relation to the Nature which was the outcome of the strategy of mapping critical loads. What I want to suggest, however, is that nature does not have the capacity to suspend public discussion in the way we often think. In practice it takes hard work to end, indeed even to *start* a debate or negotiate over nature. So maybe we should attend to this more as how Barry (2001) has suggested elsewhere and for another nature-object: the emergent nature-whole simply worked to open a political space, to break a space open, thus allowing it to become a subject of negotiation.

It should be recognized, however, that the messy relations of which the critical loads was the outcome was only to a very limited degree part of the public debate. And as I have demonstrated through this article, there is little risk involved in criticizing the project for not being what the activists (and the environmental administration) proclaimed. This was not Nature! Scrutinizing how the concept developed, it is easy to see politics and negotiations, not least economic relations, all the way through. In addition, the notion of critical loads, its cornerstones (Latour, 1998), was never grounded in nature as such, but the fish-stocks of Norwegian surface waters. Thus it was fish that became 'big', and increased in sign and significance in the transformation from the water-quality of localized, single waters to an overriding Nature.

The strategy behind this article has been to pursue a different strategy. What I have wanted to demonstrate is the opposite. A Nature-whole did come to exist, to be real. However, it was made real through a set of relations to accounting and economics. Through these practices an impressive, though extremely vulnerable nature became visible. This performed as a moving and convincing rhetorical strategy within negotiations over acid rain. However, this should not be regarded as the end of the story. What was enacted was a form of out-there-ness, a nature-whole which neither natural science, environmental administration nor the environmental movement 'owned'. The practices through which this nature-whole was made real also came to support a specific economic argument. This was an argument not for protecting nature despite the costs of it, but of not protecting too much, because of the costs.

In rounding up, one could argue, against Latour, that Nature-wholes are not such deadly weapons to politics as we tend to think they are. Nature is not such a powerful entity to politics. For this conclusion to come about, however, Nature and natural science should be studied in relation to its relations to another whole and another science: The economy and practices of accounting.

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