

This is the final, uncorrected version of the paper: "Obstacles to sustainable development: The destabilisation of climate change knowledge" in *Sustainable Development* (2009). <http://onlinelibrary.wiley.com/doi/10.1002/sd.431/full>

Author: Marianne Ryghaug, Department of Interdisciplinary Studies of Culture, Norwegian University of Science and Technology (NTNU), Dragvoll, N-7491 Trondheim, Norway. Email: marianne.ryghaug@ntnu.no

The final, corrected version: *Sustainable Development* (2009) Published online in Wiley InterScience (www.interscience.wiley.com)

<http://onlinelibrary.wiley.com/doi/10.1002/sd.431/full> DOI: 10.1002/sd.431

Please, cite as: Ryghaug, M. (2011), Obstacles to sustainable development: the destabilization of climate change knowledge. *Sust. Dev.*, 19: 157–166. doi:10.1002/sd.431

Obstacles to sustainable development: The destabilisation of climate change knowledge

Keywords: environmental policy, climate change, media, co-construction

Introduction

Climate change is one of the most important techno-scientific challenges that the world is facing. None the less, it is not yet clear how different groups of actors are appropriating and handling knowledge about anthropogenic climate change and whether or not they are domesticating the knowledge in such a way that it will contribute to maintaining order and supporting sustainable development. This may be related to the nature of the problem, the characteristics of the climate sciences, policy procedures, media representations or a combination of these factors. In this paper, we shall look more closely at the appropriation of climate science into policy in a Norwegian context. Based on this analysis, the overall ambition of the paper, is to say something about the policy implications of the appropriation of climate science generalized to other settings while contributing to the theory development within the field of sustainable development by pointing to needs that are to be developed. 'Sustainable development has been subject to a vast number of definitions and interpretations (Giddings et al., 2002, Hoopwood et al 2005). It is however, commonly assumed that changes

in the behaviour of individuals, institutions and organizations are a prerequisite for sustainable development (Dobson 2007). Following, this it has been a common approach to study sustainable development in one of these domains at a time. Some studies focus mainly on individual behaviour related to sustainable development (see for instance Dobson 2007, Williams and Dair, 2007), some focus on organizations and in particular the businesses and specific industries contribution to sustainable development (for instance Moon 2007; Baumgartner 2009) while other studies focus on institutions (including policy institutions). This article argues that it is important to study these intrinsically dependent factors together as concurrent processes to a greater extent than what have been traditionally done within the literature on sustainable development. In doing this, the article draws on perspectives within Science and Technology Studies (STS) which tend to look at how the development and behaviours of individuals, institutions and organizations are often co-dependent and are being 'co-produced' (Jasanoff 2004). Thus, these perspectives may be useful for analysing sustainable development in different contexts and contributing to the theory development within the sustainable development literature.

Climate change can be viewed from a myriad of perspectives – biodiversity, agricultural productivity, land use, demographic patterns, energy production and consumption, public health, material wealth, economic development patterns, etc. – and each of these ways of looking at the problem involves a variety of interests and values. Accordingly, each perspective calls on a body of relevant knowledge to help understand and respond to the problem (Sarewitz, 2004). Thus, a lack of scientific knowledge is not necessarily the impediment to reach a mutual scientific understanding of what climate change 'means' and what human actions should be taken. Rather, the real obstacle is the huge bulk of knowledge whose components can be legitimately assembled and interpreted in different ways to yield competing views of the problem and of how society should respond to it (Sarewitz, 2004). Climate science and its relation to society may be better understood when referring to the concept of Modus 2 (Gibbons et al., 1994) where scientific experts often share the field of knowledge production with non-experts, such as stakeholders, media professionals and even theologians or philosophers (Jasanoff and Wynne, 1998). This article examines the stabilisation and de-stabilisation of climate change knowledge within the context of Norwegian climate policy controversies.

Norway's situation is unique with respect to energy, given the country's considerable oil, gas and hydropower resources (IEA, 2001). The economic dependence on oil and gas, its cold climate, as well as a long-standing tradition of cheap energy supply from hydropower, creates a situation that could effect the appropriation of knowledge about global warming. What has been the Norwegian response to the increasing international consensus regarding the climate change issue (as promoted by the IPCC)? Has the international view been overlooked, transformed or is it helping to produce political consensus in Norway? Have other processes or actors other than those related to climate science been interfering? The answers to these questions will increase our understanding of how climate science has been incorporated into public policy and which forces that may be important to consider when aiming for sustainable development. Before looking deeper into these questions it is necessary to outline the traditional way of understanding the relationship between science and policy, as opposed to the perspectives coming from science and technology studies that will inform this study.

Perspectives on the relationship between science and policy

The role of science in political environmental decision-making has long been acknowledged. The traditional way of understanding the relationship between science and policy is what has been described as “the linear-technocratic model of policy-making” (Grundmann, 2006; Jasanoff and Martello, 2004) in which science and policy are two separate domains where science provides authoritative and “neutral” solutions in the face of competing interests (e.g. Lasswell and Kaplan, 1950; Price, 1965; Habermas, 1970). This view is often accompanied by a linear notion of “information transfer” from science to policy by which reduction of uncertainty will lead to clearer policy guidance (Grundmann, 2006). A common assumption has been that environmental decisions would improve by ensuring more and better input from science-based knowledge. Science should enlighten decision-makers and increase public awareness, and this increased awareness should lead to informed and rational political decisions so that conventional wisdom will be spread (Jasanoff and Martello, 2004).

Empirical observations have undermined the validity of the linear model as it has become clear that more science does not necessarily lead to better and more well-informed decisions. It has not been scientific knowledge as such that has produced collective solutions to environmental problems on the international arena, but rather coalitions of normatively and discursively joint actors. Thus, the “speaking-truth-to-power view of science” has been challenged by a number of scholars (see e.g. Jasanoff 2004, Funtowicz and Ravetz, 1993, Herrick and Jamieson, 1995). The power of science has appeared as limited in many political controversies. Instead of believing that science, unlike every other form of social activity, is subordinate to its own unique norms (Merton 1973 [1942]), there has been an increased awareness of the fact that socially embedded interests and connections are as critical in the creation of scientific consensus as in any other area of human activity (Jasanoff et al, 1995). Through historical and ethnographic investigations of scientific practises, researchers have demonstrated that ordinary negotiation processes and trust building are essential to the production of trustworthy scientific knowledge (Collins, 2001; Shapin, 1994; Latour and Woolgar, 1979). These scientific processes are largely parallel to the processes involved when producing responsible political decisions. Thus, it has become increasingly obvious that neither science nor politics has a monopoly on truth or power, and that material facts, institutions and discourses constitute hybrid mixtures of facts and values (Miller, 2001). This article pursues the emerging idea that natural and social order is co-produced through an intertwined intellectual and social process. Since the assumption that politics may be given legitimacy by calling upon an autonomous, independent science has been proven wrong, it is important to develop an alternative understanding that utilises the insights from co-production studies. This will also contribute to our understanding of how it is possible to advance sustainable development, as the appropriation of scientific knowledge about climate change and environmental problems is likely to be significant for sustainable development.

The idea of co-production is well suited in order to understand the emergence and stabilization of new technoscientific objects and framings, like climate change. Co-production offers a new way of thinking about power, as it points out the often-invisible role that knowledge, expertise, technical practise and material objects have in the formation, maintenance and transformation of authority relations (Jasanoff, 2004). According to Jasanoff co-production takes place along certain well-documented pathways, four of which are particularly prominent: making identities, making institutions, making discourses and making representations. Each of these instruments of co-production may serve varied functions in maintaining order. They may be either morally or metaphysically sustaining, politically sustaining or symbolically sustaining. However, as we shall see there are also de-stabilising forces that are found along these pathways.

The main focus of the article is, as mentioned above, whether and to what degree climate change policy has been stabilised in a Norwegian context. However, we study efforts and actors that contribute to stabilizing the climate change knowledge and policy as well as possible acts of de-stabilization that also are likely to be important in other countries. Consequently, by studying opposing forces that appear to mould climate change policy in Norway we hope this may increase our understanding of different situations and phenomena that may be generalized to other settings. The main concern here is how the different instruments of co-production operate when it comes to anthropogenic climate change. How do they stabilize what we know about climate change and how we know it? In order to answer this question we have concentrated on three different groups of actors and their role in relation to these instruments. These groups are (1) politicians and public management authorities (2) climate scientists, and (3) the media. These three groups of actors are of course not the only relevant groups as to whether climate science and policy will be stabilised in a Norwegian (or for that sake international) contexts. None the less, they are without doubt extremely significant when it comes to the governance and public awareness in this area. This, applies not only for a Norwegian context, but for most developed countries, thus there are definitely a large learning potential here.

The analysis includes 25 interviews with directors, researchers and advisors from some of the most prominent research institutions dealing with climate change in Norway: the Norwegian Meteorological Institute, Centre for International Climate and Environmental Research, the Department of Geosciences at the University of Oslo, Statistics Norway, ECON Analysis, Point Carbon (a global provider of independent analysis and forecasting for the emerging carbon emission markets), as well as the Norwegian Pollution Control Authority. The interviews were conducted between April and November 2005. In addition, seven politicians (mostly members of parliament) and three leading bureaucrats in the central public management were interviewed during March – May 2006.

The policy documents used in this paper were found by searching for the expressions climate policy [klimapolitikk] and climate change [klimaendring] between 1999 and 2004 in the ESOP (Electronic Searchable Public Documents) database. This is a bibliographic database containing a complete overview of publications from the Norwegian Parliament and Government from 1971/72 until today. It provides information about what has happened to a Governmental Report, a White Paper etc., making it possible to follow the political process and to find related public documents since documents belonging to the same case are linked together. The Norwegian Climate Policy, also called the “Climate Report,” (White Paper 54, 2000-2001) and the Supplementary white paper to White Paper 54 (2000-2001) were the most important documents in this period and thus the ones that are given most attention in the analysis.

The sources for analysing the press coverage of climate science consist of 394 newspaper articles on climate change in the period from January 2002 until October 2005, printed in 8 different Norwegian newspapers: *Aftenposten*, *Adresseavisen*, *Bergens Tidende*, *Dagsavisen*, *Dagbladet*, *Dagens Næringsliv*, *Klassekampen* and *Nordlys*. The articles were found through the Atekst database which contains the editorial archives of Norway’s largest and most important media enterprises. The analysis of the newspapers was supplemented by interviews with two journalists that were experienced in writing about climate change. The reason that we had such a small sample of journalists in the data material was that there were few journalists with special competence on science journalism covering climate change in Norway at the time that the interviews were conducted. There is no strong tradition of science journalism in Norwegian newspapers (Hornmoen 1999) and most journalists consider themselves as ‘generalists.’ However, to view science journalism as a separate entity may be

misleading as noted by Allan (2002), as most science-journalists first and foremost are *journalists* with an ambition of seeing their stories on print.

Co-producing knowledge and policy in relation to climate change

Jasanoff (2004) claims that identities, institutions, discourses and representations created by science and technology can be *politically* sustaining by helping societies to accommodate new knowledge like climate change. This may be achieved without undermining the legitimacy of existing social arrangements; in fact, these arrangements may often be reaffirmed. The activities may also be *symbolically* sustaining by offering substitute markers for the persistent validity of certain familiar dispensations when uncertainties threaten to overwhelm or disrupt them (Jasanoff, 2004). The question is to what extent the co-production of knowledge and policy about climate achieved stability as reflected in Norwegian measures to manage the climate problem. Do we observe a manifest impact of climate science on Norwegian policy-making?

Climate scientists – missing their audience?

Making institutions is a crucial function in the co-productionist account of world-making. With respect to global warming and climate science, a myriad of research institutions, both political and the scientific organizations operating internationally as well as nationally, have been established to develop and stabilize climate science facts. The Intergovernmental Panel on Climate Change (IPCC) established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), has been the most important institution on the international level and, to a large extent, has had the defining power regarding climate change. The role of the IPCC has been to assess the scientific, technical and socio-economic information relevant to understand the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation in a comprehensively, objectively, and openly way. The IPCC provides regular assessments of the state of knowledge on climate change based mainly on peer reviewed and published scientific and technical literature. Its Second Assessment Report provided key input to the negotiations which led to the adoption of the Kyoto Protocol to the UNFCCC in 1997. The Third Assessment Report (TAR) of the IPCC documented that the climate of the earth was changing. The report showed changes in temperature, ice thickness, precipitation and sea-level-change, which together drew a picture of a world that was in the process of warming up. Based on 35 different scenarios of the development of the atmosphere's content of green house gasses and particles, the climate models estimated an additional global warming of 1.4 – 5.8 °C from 1990 to 2100 (IPCC TAR, 2001).

Norwegian climate science knowledge has been produced through a wide array of different institutions, which all has contributed to the stabilisation of climate change knowledge through their research and dissemination activities. They all insist on the overall scientific agreement that the earth is experiencing global warming due to CO₂ emissions partly caused by human activity. Further, these climate research institutions are part of a quite stable system that has traditionally envisioned a clear division of labour between science and policy, where their role is seen as providing best possible facts and ground material which may serve as a basis for policy. Most research communities had some contact with policy-making authorities. Some were even administratively placed under a Ministry and some seemed to look upon themselves as civil servants providing information about climate change to the authorities, the industry and the general public. Most of these institutions had a formal

role as providers of information services and some also provided commercial service through commissioned research. Thus, there was evidence of many existing ties between the producers of scientific knowledge and policy-making bodies. Thus, these research environments constituted institutions where climate change knowledge was produced, but they also served as stable repositories of knowledge and power.

Making representations of climate change knowledge were one of the main activities of Norwegian climate scientists. These representations manifested themselves mainly through publications aimed at different audiences, from international journal articles targeted at professionals to articles published in mass media targeted at lay persons.¹

Clearly, climate change knowledge was represented in policy related documents like public reports and governmental white papers. These may be regarded as societies' "inscription devices" (Latour, 1987). The "Climate Report" (White Paper 54, 2000-2001) maintained that Norway has had an active national climate policy since the end of the 1980s, as Norway was one of the first nations to introduce a tax on CO₂ in 1991. The report stated that in order to fulfil the collective obligations in the Kyoto protocol, there would be a need of a broad set of measures in addition to the CO₂ tax. Thus the report suggested the following policy instruments on the national level: to continue the CO₂ tax, to enter into agreements about emission reduction with businesses and industry that are not included in the current CO₂ tax, to use the Pollution Act to demand that industry employ best available technologies and effectively use energy, to stimulate technological development, and from 2008, to institute a national quota system. A broad national quota system was seen as the main instrument. There were also other measures mentioned in the "Climate Report" that we will not discuss here, as they probably would play a modest role, for example voluntary climate plans in the municipalities and the preparation of a national action plans for the development of infrastructure of water-borne heating. On the international level, the "Climate Report" supported the building of capacity and knowledge and the green development mechanism. Consequently, taxes, regulations, and agreements were unquestionably seen as the central instruments in Norwegian climate policy.

The "Climate Report" proposed a broad national quota system enforced from 2008 to 2012, according to the Kyoto protocol. This quota system was intended to ensure that Norway would fulfil their binding emission limitation during the period. The Kyoto protocol and the Kyoto mechanisms were portrayed as one of the rescuing instruments of the future, even though the agreement was known to be too humble to have any real impact on the concentration of green house gasses in the atmosphere. However, the treaty was seen as the first necessary legal step towards other more binding and ambitious agreements in the future.

The White Paper stated that the government was preparing for a long-term and strengthened prioritizing of climate research in Norway. Yet, no specific propositions for a budgetary strengthening of research were to be addressed in the yearly budgetary procedure. Thus, the White Paper made no concrete plans about how much or in what way the research would be strengthened. In spite of advocating technological development to solve the climate problem, the "Climate Report" named no specific technologies for further research, apart from working on reducing CO₂ which was explicitly mentioned as a priority area.

One might have expected that Norwegian climate policy would be shaped by the relatively stable knowledge provided by the IPCC in a way that would have meant more severe measures for curbing climate gas emissions. However, the co-production of climate

¹ Climate science knowledge has also been known to be represented through models and scenarios reproduced as graphs and diagrams, the hockey stick being the most famous and perhaps strongest tool in order to stabilise climate change knowledge.

change knowledge and policy was mediated through other sets of knowledge, in particular economics and political concerns, which stressed problems other than climate change. In fact Norway distanced itself further and further away from the Kyoto emissions target in the period as the actual climate gas emissions increased by 8.5 per cent from 1990 to 2005, while the Kyoto protocol allow Norway to increase its emissions by 1 per cent compared to the 1990 level. A report from the European Energy Agency (2007) stated that Norwegian climate gas emissions from the transport sector increased by 27 per cent from 1990 to 2004 while emissions from the gas and oil industry increased drastically in the same period.

There was little doubt that climate science had made an impact on Norwegian policy on a symbolic level, but in practise the effect of climate change knowledge has been relatively moderately co-produced with policy. Few policymakers also seemed to have developed an identity as climate politicians. Consequently, it seems reasonable to look for deficiencies in the relationship between climate scientists and policy-makers. Had the climate scientists avoided a dialogue with politics or had they mismanaged the dialogue?

Interviews with politicians and bureaucrats, as well as the analysis of public governmental reports and White Papers demonstrated that climate science as represented in the IPCC reports served as a knowledge basis for most Norwegian politicians and bureaucrats having to deal with climate policy considerations. Thus, the making of institutions like the IPCC helped politicians to accommodate the scientific evidence of climate change in a way that reaffirmed the legitimacy of already existing social agreements (such as the Kyoto protocol). The TAR acted as a strong stabilizing force concerning climate change knowledge in a Norwegian context. First, the report served as a unified “state of the art” of climate science knowledge and was widely referred to by both politicians and research communities as ‘rock solid’ evidence. Second, Norwegian climate scientists were participating in the production of the IPCC reports, thus acting as stabilising forces more directly.

Despite these numerous efforts and activities to stabilise climate change knowledge, there were still difficulties of reaching some of the audiences. One of the most prominent climate researchers in Norway pointed to the fact that one of the largest opposition parties in Norway (the Norwegian Progress Party) had stated in their political program that they did not believe in anthropogenic climate changes. Thus, a political shift could potentially have a huge de-stabilizing effect on the communication and implementation of climate change knowledge.²

The appropriation of the climate science was obviously seen as a challenge and as one of the climate scientists pointed out, there had not been enough emphasis on using the scientific knowledge that were available.³ There seemed to be a common understanding among climate scientists that on one hand the Norwegian authorities (the Progress Party aside) had taken on the scientific reports and incorporated the knowledge provided by the research communities, on the other hand, they “stuck it under the table.”⁴ This was also to some degree reflected in the interviews with politicians. As voiced by one of the MPs interviewed: she did not have any doubts about the evidence produced by the climate scientists, however, she admitted to using their representation to a small extent and only to illustrate “the big picture”. She expressed that a different and perhaps more specific kind of knowledge was needed in sector-specific policy making and decision making.

Thus, the dialogue between climate scientists and policy-makers did not appear very successful, despite the achievements with respect to institutionalising climate science and providing identity, discourse and representations to climate scientists. What we observe is that the climate science is appropriated on a symbolic, discursive and cognitive level on part

² Interview with climate scientist 3.

³ Interview with climate scientist 1.

⁴ Interview with climate scientist 2.

of the politicians. Nevertheless, the co-production that did take place to a very little extent included changing behaviour and produced climate measures that would contribute to sustainable development. Thus, what we observed is that Norwegian climate policy did not follow the recommendations of the climate scientist to a large extent, even though every political party (except the Progress party) seemed to believe in its conclusions. Why is this so? As already suggested above there are some possible weaknesses regarding the way climate scientists relate to climate policy. The dialogue between science and policy do not function particularly well, maybe as a consequence of the lack of understanding concerning the political handicraft. Is it reasonable to believe that this is the only reason for the weak translation from science into policy? In the next section we will look at the role of the media.

The media – staging climate science disagreements?

According to Jasanoff (2004), solving problems of order frequently takes the form of making discourses. This often happens by giving accounts of experts, persuading sceptical audiences, linking knowledge to practise or action and providing reassurance to various publics. The media has been particularly important regarding the making of the discourse on climate change as the media has clearly been setting the agenda of how climate research reaches the public (Wilson, 1995, 2000; Bell, 1994). According to Nelkin (1995), newspapers are the most important source of information with respect to the dissemination of new scientific knowledge, like climate change knowledge.

The 394 articles on climate change published in leading Norwegian newspapers from January 2002 to October 1, 2005 suggested that the discourse surrounding climate change to a large extent was dominated by the journalists' urge to dramatise the scientific knowledge about climate change. The media coverage in Norway emphasized both certainty and uncertainty at the same time and conveyed an image of two types of drama. First, they framed climate change as a 'Nature-drama', featuring spectacular natural phenomena. This framing was made through the use of strong metaphors and pictures that portrayed human-made climate changes in sensational ways, through reports of extreme weather and catastrophic incidents in nature, like inundations, hurricanes and long dry spells. It drew upon the picture of a threatened Earth devastated by catastrophes similar to classic Judgment Day prophecies. This kind of sensational writing has long been recognised as typical for science writing and news about science (Nelkin 1995). None the less, the media coverage of science is above all subject to the same journalistic standards as other topics (Einsiedel and Coughan, 1993) which implies that novelty, controversy, geographic proximity and relevance for the readers are considered crucial factors for newsworthiness and also influence the way media present issues related to climate change (Carvalho, 2007). The use of Nature drama probably was intended as a strategy to represent scientific knowledge about human-made global warming in a popularised manner, to reduce the complexity of the issues. The strategy has been observed also in Germany (Weingart et al., 2000) and Sweden (Olausson, in press).

The second frame that was typically used in Norwegian newspapers was that of a 'Science drama', emerging from framing climate change in terms of heated scientific controversy. This strategy was referred to as giving a 'balanced view' by the journalist themselves. However, climate scientists feared that by highlighting scientific disagreement, journalists produced a drama that blurred the rather comprehensive scientific agreement about the main issues related to global warming. For example, Norwegian journalists were quite eager to present statements that went against the Intergovernmental Panel on Climate Change (IPCC) and the opinions of the established research community by giving voice to marginalised climate change sceptics. This strategy was also traced in studies of newspapers in other countries which revealed examples of articles that framed climate change in terms of

debate, controversy or uncertainty and where the journalistic ‘balance’ was suspected to lead to bias (e.g. Antilla 2005; Moser and Dilling, 2004; Boykoff and Boykoff, 2004). In the study of the Norwegian newspaper coverage of climate change, journalists that were interviewed about their strategies regarding climate change reporting made it clear that ‘balancing’ as well as framing articles on climate change in terms of drama and controversy was a deliberate strategy. This kind of strategies were used in order to produce drama and excitement, while giving journalists an image as objective and distanced. Such focus on controversy and polarisation was also thought to gain the interest of readers.

Arguably, these two dramas represented a contradictory view of anthropogenic climate change. On the one hand, newspapers framed human made climate change in terms of a Nature drama which may be seen as a popularized representation of climate science, thus lending support to the climate scientists urge to diffuse their knowledge. On the other hand, the Science drama invited a cooling scepticism – there was disagreement, so maybe the dangers were not that imminent after all? Thus, the Science drama may have contributed to destabilising the Nature Drama. There was also an almost complete lack of articles that discussed possible solutions to the climate problem and the discourse was to a very limited degree connected to discussions around energy usage and new renewable energy technologies. Exceptions to this rule were discussions about the Kyoto-agreement and trading of CO₂ quotas.

Very few politicians did also engage in the discussions of climate changes in the newspapers and it was also difficult to trace a forceful interplay between the scientific knowledge and climate policy in the news coverage of the papers, as the linkage between scientific knowledge and policy measures were not made clear. Consequently, we observed a mediated co-production where the media’s tradition of framing news (and science) as very conflict-laden was making the political translations of scientific knowledge less important. Instead, readers of Norwegian newspapers were invited to watch a series of reruns of public proofs of manmade climate change. The media saw it as their responsibility to try out objections and to create debate as the journalists were convinced that it was important to shed light on all views on the issue and even the most marginal ones. The scientific debate and arguments portrayed in the media did not reflect the actual scientific debates that went on within the scientific community. It was not the scientific uncertainties surrounding cloud formations or effects of vegetation changes on the climate that was creating the headlines, but rather a focus on marginalized climate skeptics. In this way, one may say that the media produced a somewhat exaggerated picture of scientific controversy.

Based on the strong efforts to stabilise anthropogenic climate change as a fact by the research institutions, we would have expected that the media debate on climate change would not be seen as mere communication of science, but also as an attempt to create a political order. However, there was little evidence of political translations where the point would be to transform knowledge into action found in the newspaper coverage. There was a lack of focus on alternatives of action, measures and policy. In one way, the scientific language voiced by the IPCC and other climate change experts persuasively spoke of climate change in a way that aligned well with the Norwegian policy and research institutions. On the other hand, one of the media discourses induced destabilisation of climate change knowledge as it consistently sought to give voice to climate sceptics and focused on uncertainty, conflict and polarisation among climate scientists.

Concluding remarks

In this article we have focused on one particular area that has consequences for sustainable development: the appropriation and stabilisation of climate change knowledge. It has tried to answer the question of how socio-technical objects like climate change achieve cognitive as well as political standing within a particular national context by analysing three important groups of actors in society: the politicians and public management authorities, the research community and the media, and the way these different actors contribute to stabilise and destabilise climate knowledge. The analysis showed us that the climate scientists have been trying to stabilise the scientific knowledge by stressing the overwhelming amount of evidence and unison character of the scientific knowledge. Taken as a whole, the climate research institutions and the official policy bear witness of significant efforts of co-construction, as politicians and researchers have endeavoured to achieve stabilisation through the making of representations and institutions. However, the efforts and instruments created to stabilise climate change science into policy have met powerful destabilising forces. The strategies of destabilisation are first and foremost performed by the media, as one part of the media discourse seems to untangle some of the co-constructionist efforts in its quest for 'balance' and conflict. Such destabilising efforts have yet to be widely studied in the name of the co-productionist idiom. In the period that this study was carried out, the media proved successful in destabilising climate change knowledge. This seems at least to some extent to have undermined the stabilization of climate change knowledge and probably making policy options in relation to sustainable development more difficult to achieve. It is reasonable to suggest that this might have led to the weak political translations that we also found to characterise this particular policy area. As the media highlighted the uncertainty about scientific facts surrounding climate science, this might have led to the fact that providing solutions and measures that dealt with the problem was not seen as very pressing. In particular not if the media discourse on Scientific controversy resulted in creating a climate 'sceptical' public. However, these questions may not to be answered in this article, but are certainly important to develop in further research.

The analysis of this Norwegian case in relation to climate change policy demonstrates the importance of studying how different actors and sectors of society may influence each other as possible acts of co-construction (Jasanoff, 2004). Drawing upon the framework of co-production it becomes evident that the climate science so far has not succeeded in stabilising climate policy because a) there is no such thing as an 'climate politician' identity operating, b) mass media contributes to maintaining several (and sometimes contradictory) climate discourses, c) there is a lack of institutions where climate science meets climate policy, partly as a consequence of the fact that the authorities mainly engage political scientists and economists, d) the representations of climate knowledge are difficult to translate into policy and/or the relationship between the climate political representations (as the Kyoto agreement, carbon capture and storage initiatives) and the representations of the climate research (global warming, sea level rise) is unclear.

Litterature

- Allan, S. 2002. *Media, Risk and Science*. Buckingham: Open University Press.
- Antilla, L. 2005. Climate of Scepticism: US Newspaper Coverage of the Science of Climate Change, *Global Environmental Change Part A* **15**: 338-352.

- Baumgartner, R. J. 2009. Organizational culture and leadership: Preconditions for the development of sustainable corporation. *Sustainable development* **17**: 102-113.
- Bell, A. 1994. Media (Mis)communication on the Science of Climate Change, *Public Understanding of Science* **3**: 259-75.
- Boykoff, M.T. and Boykoff, J.M. 2004 "Balance as Bias Global Warming and the US Prestige Press," *Global Environmental Change* **14**: 125-136.
- Carvalho, A. 2007. "Ideological and media discourses on scientific knowledge re-reading news on climate change", *Public Understanding of Science* **16**: 223-43.
- Collins, H. M. 2001. Tacit knowledge, trust, and the Q of sapphire, *Social Studies of Science* **31** (2001) (1), pp. 71-85.
- Dobson, A. 2007. Environmental Citizenship: Towards Sustainable Development. *Sustainable Development* **15**.,276-285.
- Funtowicz, S. O. and J. R. Ravetz, 1993. Science for the post-normal age, *Futures* **25** (1993) (7), pp. 739-755.
- Gibbons et al., 1994. *The New Production of Knowledge*, Sage Publications, London.
- Giddings B, Hoopwood B, O'Brian G. 2002. Environment, economy and society: fitting them together into sustainable development, *Sustainable Development* **10**: 187-196.
- Grundmann, 2006 R. Grundmann, Ozone and climate: scientific consensus and leadership, *Science, Technology and Human Values* **31**: 73-11.
- Habermas, J. 1970. *Technology and science as "ideology,"* Beacon, Boston.
- Herrick, C. and Jamieson, D.1995. The social construction of acid rain. Some implications for science/policy assessment. *Global Environmental Change* **5**: 105-112.
- Hopwood, B, Mellor M, O.Brian G. 2005. Sustainable development: mapping different approaches. *Sustainable Development* **13**: 38-52.
- Hornmoen, H. 1999. *Vitenskapens vakthunder*. Oslo: Tano-Ascheough.
- IPCC TAR, 2001, *Climate Change 2001*, Syntesis Report, Watson, R.T. and the Core Writing Team (Eds.). Cambridge, UK
- Jasanoff, S. 1990. *The Fifth Branch: Science Advisers as Policymakers*, Harvard University Press, Cambridge, MA (1990).
- Jasanoff, S. (ed) 2004), *States of Knowledge. The Co-production of Science and Social Order*. Routledge, London.
- Jasanoff, S. and Martello, M.L. 2004. Conclusion. In: Jasanoff, S and M. L. Martello, editors, *Earthly Politics. Local and Global in Environmental Governance*. MIT Press, Cambridge, MA.
- Jasanoff, S. and B. Wynne, 1998. Science and decision making. In: S. Rayner and E. Malone, (eds), *Human Choice and Climate Change*, Battelle Press, Columbus, OH, pp. 1-87.
- Lasswell, H. D. and A. Kaplan, 1950. *Power and Society: A Framework for Political Inquiry*, Yale University Press, New Haven, CT.
- Latour, B. and S. Woolgar, 1979. *Laboratory Life: The Social Construction of Scientific Facts*, Sage Publications, Beverly Hills, CA.
- Merton, R. K. 1973 [1942] *The Normative Structure of Science*. In: R. K. Merton, *The Sociology of Science; Theoretical and Empirical Investigations*, University of Chicago Press, Chicago, pp. 267-278.
- Miller, C. 2001. Hybrid management: boundary organizations, science policy, and environmental governance in the climate regime, *Science, Technology and Human Values* **26**: 478-500.
- Moon, J. 2007. The contribution of corporate social responsibility to sustainable development. *Sustainable development* **15**, 296-306.
- Moser, S. C. and Dilling, L. 2004. Making the Climate Hot Communicating the Urgency and Challenge of Global Climate Change, *Environment* **46**:32-46.

- Nelkin, D. 1995. *Selling Science: How the Press Covers Science and Technology*, Freeman, New York.
- Olausson, U. (in press) "Global warming – global responsibility? Media frames of collective action and scientific certainty", *Public Understanding of Science*.
- Price, D. 1965 *The Scientific Estate*, Harvard University Press, Cambridge, MA.
- Sarewitz, D. 2004 How science makes environmental controversies worse, *Environment Science and Policy* 7:385-403.
- Shackley, S. and Deanwood, R. 2002. Stakeholder perceptions of climate change impacts at the regional scale; implications for the effectiveness of regional and local responses, *Journal of Environmental Planning and Management* 45: 381-402.
- Shapin, A. 1994. *A History of Truth*, University of Chicago Press, Chicago.
- Weingart, P., Engels, A. and Pansegrau, P. 2000. Risks of Communication Discourses on Climate Change in Science, Politics and Mass Media, *Public Understanding of Science* 9: 261-283.
- Williams, K and Dair, C. 2007: A framework for sustainable behaviours that can be Enabled through the Design of Neighborhood-Scale Development, *Sustainable Development* 15: 160-173.
- Wilson, K. M. 1995. Mass Media as Sources of Global Warming Knowledge, *Mass Communication Review* 22: 75-89.
- Wilson, K. M. 2000. Communicating Climate Science through the Media. Predictions, Politics and Perceptions of Risk, in Allan, S., Adam, B. and Carter, C. (eds.) *Environmental Risks and the Media*. London, Routledge.