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The feasibility of ambitious climate agreements

Norway as an early test case

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Sammendrag:. Det er store forskjeller mellom industrilandene med tanke på hvor vanskelig det vil bli å oppfylle forpliktelsene under Kyotoprotokollen. Land med høye reduksjonskostnader er spesielt interessante fordi de kan sees på som "testtilfeller" for andre land i eventuelle framtidige, mer ambisiøse klimaavtaler. Vi går ut ifra at et lands mål er å utvikle en effektiv klimapolitikk, det vil si å oppnå utslippsmålene på en kostnadseffektiv måte, og som også er politisk mulig å gjennomføre. Norge er et land som må jobbe hardt for å innfri sine forpliktelser. Vår studie antyder at Norges klimapolitikk har lagt vekt på en internasjonal løsning, hvor bare en moderat kostnadseffektivitet er oppnådd innenlands. En åpenbar årsak til dette er at en internasjonal løsning har lavere kostnader. Norge kan få "politiske kostnader" ved en slik løsning i form av kritikk fra miljøorganisasjoner og andre land. I den nærmeste framtid er det liten grunn til å forvente stor entusiasme for klimaproblemet blant folk flest eller i mange av verdens stater. Derfor ønsker de, akkurat som Norge, å gjennomføre reduksjoner av klimagassutslipp så billig som mulig. Dette kan innebære en utstrakt bruk av internasjonal kvotehandel, mens det blir kompromisser med kostnadseffektiviteten innenlands for å gjøre klimapolitikken politisk gjennomførbar.

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Abstract: There are considerable differences between developed countries as to how difficult it will be to meet their commitments under the Kyoto Protocol. 'High-cost abatement countries' are particularly interesting as they can be seen as 'test-cases' for other nations in more ambitious climate policy agreements. We assume that a country's objective is to develop an efficient climate policy, achieving cost effectiveness and environmental effectiveness, and that also is politically feasible. Norway is among the countries that will have a hard time in meeting their obligations. Our study suggests that Norway's climate policy has emphasized an international approach, whereas the domestic performance on cost effectiveness has been more moderate. An obvious reason for this is the lower cost associated with the international approach. A 'political cost' associated with such a policy can be criticism from environmental NGOs and other countries. At least in the near term there is little reason to expect 'climate enthusiasm' from the public or many countries of the world. Therefore, just like Norway, they will want emissions reductions carried out as cheaply as possible, which could imply extensive international quota trading, whereas compromises with regard to cost effectiveness are struck at the domestic scene for political feasibility reasons.

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Contents

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1 Introduction

There are considerable differences between countries as to how difficult it will be to meet their commitments under the Kyoto Protocol. So far, the developing countries have no 'hard' commitments whatsoever. For the Economies in Transition (EIT countries), it will take small or no efforts to meet their commitments due to the recession in their economies during the 1990s. For some OECD countries, it will not take too much effort either. Major emitters like the UK and Germany will not have to take major steps because of 'fortunate circumstances' unrelated to climate policies. Moreover, the world's largest emitter, the US, has rejected the Kyoto Protocol altogether. That is, from a global perspective, and climate change is a truly global problem, few countries will have a hard time in meeting their obligations. These 'high-cost abatement countries', however, are particularly interesting as they can be seen as 'test-cases' for other nations further down the road. Norway belongs to this category of countries.

Since the adoption of the Climate Convention (UNFCCC) in 1992, most countries' climate policies have consisted of two components: a) domestic abatement measures, if any and b) the elaboration of negotiation positions under the international climate negotiations. When the high costs of reducing emissions in Norway was realized, cost effectiveness (reduce emissions at the lowest cost possible) became the motto of Norwegian climate policy. In addition to be a 'high cost abatement country', as the world's third largest oil exporter, Norway will be hit hard by a climate regime that leads to less demand for petroleum products. Applying a narrow interest-based approach suggests that Norway would be opposed to any kind of climate regime, but this has not been the case. In fact, Norway has traditionally been a pusher to establish an international climate regime. Norway also has a reputation of giving high priority to international environmental issues as well as being among 'the best in class' regarding assistance to developing countries. This may indicate that Norway will stretch longer than the average OECD country in adopting domestic climate measures as well as considering the interests of the developing countries.

What is the record of Norwegian climate policy at the domestic and international scene? Are there any lessons to be learned, and how do the Norwegian experiences relate to the possibilities of achieving more stringent commitments in the climate regime further down the road? This last question relates to the question of the relationship between cost effectiveness and environmental effectiveness. As we shall show later, the present climate regime scores very low in terms of environmental effectiveness. Is increased emphasis on cost effectiveness a way to go to increase environmental effectiveness?

Although it makes intuitive sense to reduce emissions at the lowest costs possible, the climate issue is primarily about politics, what is politically feasible to achieve domestically and internationally? Even though it would be most cost effective to start reducing emissions in many developing countries, this may not be possible politically. Internationally it is important that developed countries take the lead on the issue and undertake significant domestic measures as well. Powerful interest groups will, however, try to resist such domestic policies. What is Norway's record on this account? Has cost effectiveness been pushed most strongly at the international scene or has domestic cost-effective measures also been undertaken? What has been the development concerning the relationship between domestic and joint international implementation at the international scene? Figure 1 illustrates the connection between cost effectiveness, environmental effectiveness and political feasibility. The relations between these criteria are further discussed in section 3.

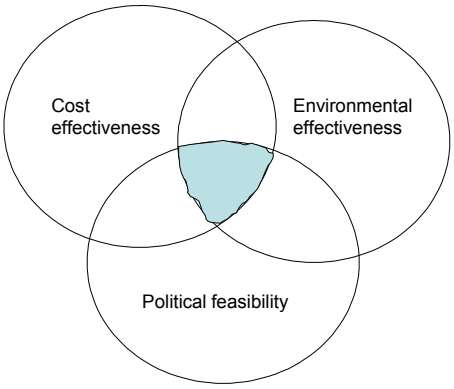

Figure 1. Relations between cost effectiveness, environmental effectiveness and political feasibility.

In the following section we will deal briefly with the development of the international climate regime, focusing especially on the development from focus on domestic emissions reductions towards reductions through joint international efforts. We then turn to the relation between cost effectiveness, environmental effectiveness, and political feasibility and how these concepts relate to climate policy and the climate regime. The two sections 4 and 5 then deal with the development of the Norwegian climate policy and how to 'design' an efficient Norwegian climate policy within real world constraints. Section 6 concludes the study with a discussion of lessons learned and implications for other countries and the climate regime.

2 The development of the international climate regime: domestic vs. international approach?

Until the early 1970s climate change was a rather esoteric scientific concern. Green NGOs as well as activist scientists played an important role in getting the issue on the international political agenda (Agrawala, 1999). The Toronto Conference of the Atmosphere in 1988 proved to be a milestone in the history of international climate policy for at least three reasons.[1] First, the *target and timetables* approach was introduced. Second, the *developed countries* were called on to take the *lead* on the issue. Third, it was (implicitly) assumed that emissions reductions were to be undertaken *domestically*. Up until the Toronto Conference, states had been absent from the scene, but gradually they moved in and a 'green beauty contest' emerged, a race to adopt the most ambitious climate policy goals (Andresen and Agrawala, 2002). 'Rich and green' OECD countries were activists, and the EU soon entered the 'team of pushers'. Why this green enthusiasm? First, from the late 1980s and into the early 1990s the opinion in Western Europe was relatively green, arguing for quick action to deal with the greenhouse effect as well as a host of other international environmental problems. Secondly, although the states entered the scene, at this early stage they were mostly represented by ministers of Environment, creating an impression that they were more eager to react than what proved to be the case when other and more politically influential ministries

[1] This was a non-governmental conference, but participation was very broad. For details, see Agrawala (1999).

entered the scene. There was one exception to this pattern: the US, which stressed scientific uncertainty as well as high costs of mitigating greenhouse gas emissions (Bodansky, 1993).

The United Nations Framework Convention on Climate Change (UNFCCC; The Climate Convention) was adopted at the Rio Summit in 1992. Most observers regarded the Convention as too weak because no targets and timetables were included, mainly as a result of US opposition.[2] The main emphasis was still on the need for domestic reductions, but the international approach was introduced through the provision opening for joint implementation. The main significance of the Convention was that it set the stage for developing institutions for learning, information gathering and co-operation between states on how to deal with the climate problem over the long term.[3] At the first Conference of the Parties (COP1) in Berlin in 1995 it was recognized that the developed countries should take on stronger commitments, thereby setting the stage for the 'real negotiations'. This was taken a step further at COP2 in Geneva (1996) when the necessity for making the commitments *legally* binding was acknowledged.[4] At the third Conference of the Parties in Kyoto in 1997, the Kyoto Protocol was adopted and the Annex 1 countries (OECD and EIT) agreed to reduce their average aggregate emissions by 5.2% by 2008-2012 compared to the base-year 1990. At this crossroad the international dimension was more fully introduced through the adoption of the three so-called Kyoto mechanisms (also called flexibility mechanisms): the Clean Development Mechanism (CDM), joint implementation, and emissions trading. Although some were skeptical to these mechanisms, most observers saw the Kyoto Protocol as a step in the right direction. It has also been described as a true compromise as "the US got their institutions, the EU got their numbers, the developing countries avoided commitments and Japan got some prestige as the host" (Andresen, 1998).

The relative optimism at Kyoto was soon replaced by pessimism in the subsequent process as it became clear that the Parties interpreted the Kyoto Protocol very differently. It was believed that agreement was reached through the Bonn Agreement, but it took another session, COP7 in late 2001 in Marrakech to conclude this phase of the negotiations. Thus, four years after the adoption of the Kyoto Protocol, it seems the Parties finally agree on what it means. The Kyoto mechanisms are thereby seemingly accepted by all major parties, confirming the gradual shift from a domestic to an international approach.

Although the process after Kyoto has generally been characterized by a weakening of the Kyoto commitments, George W. Bush Jr. rejected the Kyoto Protocol shortly after he was elected president in 2000. Somewhat paradoxically, while the US drive for a more international approach through the flexible mechanisms was resisted by the EU during most of the process, after the US de facto left the negotiations, the EU is now embracing the very same mechanisms. The developing countries, however, have been more skeptical towards the flexible mechanisms. As to the future development of the Protocol, the Parties to the Protocol will start negotiations on commitments for the period after 2012 by 2005. The three most important issues are likely to be the strength of the commitments, whether the US will join the agreement, and to what extent (some) developing countries will take on binding emissions limitation commitments.

[2] It may be argued, however, that firm targets and timetables may have been premature in the Climate Convention. For an elaboration, see Andresen and Agrawala (2002).

[3] The scientific process was organized within the IPCC, see Skodvin (2001).

[4] Some of the more distinct 'laggard' countries did not accept the Ministerial Declaration from Geneva.

3 Environmental effectiveness, cost effectiveness and political feasibility

Cost effectiveness is a relatively straightforward concept that in a climate policy context refers to the minimization of the social cost of meeting a specified emissions abatement target. By 'environmental effectiveness' we mean the long term ability to 'solve' the global warming problem, that is to meet the objective of the UNFCCC of "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system".[5] At the international level, the Kyoto Protocol can be interpreted as the climate policy treaty that has been feasible in political terms, probably for the large majority of countries in the world. Political feasibility of international environmental agreements deals with what is considered as a fair sharing of costs and benefits.

An effective international climate policy regime is conducive for environmental effectiveness.[6] But how can the effectiveness of an international environmental regime be evaluated? This question has been extensively researched among analysts of international regimes over the last decade.[7] As indicated above, the 'true' indicator of environmental effectiveness is whether the regime is able to solve the problem that caused its establishment. This indicator is very difficult to apply because of the challenge of controlling for the influence of all non-regime factors. It is therefore hard to establish causality between the regime and the state of the environmental problem. Another indicator deals with the ability of the regime to change the behavior of key target groups in the desired direction. The challenge of establishing causality looms large here as well, but careful analysis makes causality possible to trace (Miles et al., 2001, Skjærseth, 2000). A third indicator is to focus on the output produced by the regime: rules, regulations and commitments. This tells us less about the true effectiveness of the regime, but it can easily be applied and the score here usually gives an indication of subsequent 'true' effectiveness. How does the emerging climate regime relate to these indicators?

The short but somewhat simplified answer is that "whatever indicators are used to measure the effectiveness of the climate regime, it is bound to be low" (Andresen, 2001, p. 129). Greenhouse gas emissions have been rising steadily during the decade after its establishment, and no rapid turn of the tide is expected so environmental effectiveness is certainly low.[8] There are some signs of behavioral changes in key target groups as a result of the regime. The National Reports submitted by the Annex 1 countries show that some actions are undertaken by most of them, but usually not sufficient to reduce emissions significantly. There are also some actions taken within parts of the international petroleum industry, but the picture is mixed (Skjærseth and Skodvin, 2001). Still we can conclude that emissions would have been (even) higher in the absence of the climate regime. What about the output produced by the regime, the Kyoto Protocol as specified in the Marrakech Accord? As noted, the Kyoto Protocol was characterized as a step in the right direction by most analysts. Still, in terms of solving this problem, it has been described as a first 'baby step' (Mahlman, 1997). In this perspective the subsequent development shows that the baby is barely on its feet. As the Bonn

[5] This is a general objective that does not specify what concentration levels in the atmosphere this means, nor how such levels can be achieved.

[6] Stringent compliance rules can be seen as a prerequisite for an effective regime, see e.g. Hovi and Areklett (2002). Compliance issues will not be further discussed in this study.

[7] Some major contributions are Victor et al. (1998), Young (1999), and Miles et al. (2001).

[8] IPCC's new Special Report on Emission Scenarios (IPCC, 2000) shows that global CO_2 emissions alone have increased by 15% from 1990 to 2000.

Accord has been described as a 'Kyoto-light', 'Kyoto Ultra Light' seems to be an apt description of the Marrakech Accord because of the increased allowances for changes in carbon stocks and somewhat softer compliance rules. Consider also that 80% of the countries of the world have no commitments to reduce emissions as a result of the Kyoto Protocol. From a political perspective it is certainly positive that the Kyoto Protocol will probably be in force within a year or two. Still, even if the Kyoto Protocol is perfectly implemented it will only have a marginal effect on global greenhouse gas emissions (Hagem and Holtsmark, 2001).

After these sobering remarks, some more positive elements should be noted. Reaching an agreement between some 180 nations of the world is a remarkable achievement considering the scientific and political complexity of the issue and the somewhat distant and uncertain nature of the threat. Given this extremely 'malign' problem structure, it is not realistic to expect much more in terms of results than have been achieved in this time span (Miles et al., 2001). It is important that the main institutional architecture to deal with this problem is finally in place, although some argue it may be too complex (Bodansky, 2001). Still, much tougher measures have to be adopted by many more actors in the next commitment period if the international society is to be able to deal more effectively with this problem also in environmental terms. How can the environmental effectiveness of the climate regime be enhanced? The easy answer is of course that developed countries must start to take the problem more seriously and implement stronger abatement measures. So far few countries have been willing to do so and more effort is certainly needed in a long-term perspective. A first more realistic, but still difficult, start would be to pursue domestic cost-effective policies and in particular utilize the elements of cost effectiveness that is inherent in the Kyoto Protocol to show that they work. If these 'baby-steps' cannot be effectively utilized, chances of 'real' effectiveness further down the road is slim.

Cost effectiveness means achieving the Kyoto Protocol target at the lowest social cost possible. At the national level, this requires that the marginal mitigation cost is equalized across sectors and over time, where all companies and households are exposed to the same regulation level (e.g. the same tax rate on greenhouse gas emissions). At the international level, cost effectiveness requires that the marginal mitigation cost is equalized across the participating countries. This can be achieved through the Kyoto mechanisms since they create an international market with one quota price per ton of carbon dioxide equivalent.[9] A straightforward way of linking the national and international level is to allow companies and other private or public entities to trade both at the national and international market. Furthermore, cost effectiveness requires that the administrative burden of the implementation system be small to avoid putting excessive transaction costs on companies and households. In a dynamic perspective, a policy is efficient if it gives incentives to develop and use new technologies, and if it stimulates entry of new, efficient companies and the exit of inefficient companies. There can be some trade-off between a short-term climate policy involving purchase of large volumes of cheap emission quotas from e.g. Russia, and a more long-term (dynamic) perspective that would prescribe a larger share of domestic measures to give stronger incentives to develop more efficient and carbon-free energy technologies. Furthermore, the climate policy must be flexible to be able to adjust in the case of exogenous changes taking place in the future (Xepapadeas, 1997). Another important feature is the ability to monitor emissions and bring violators back in line through enforcement (*op. cit*.).

[9] Due to some differences between emissions trading, joint implementation, and the Clean Development Mechanism, the market could be segregated into three markets where prices may differ somewhat.

The cost-effectiveness ideals have to be seen in light of what is politically feasible (see the intersection area in Figure 1). Domestically, climate policy and its implications in terms of total mitigation cost and distribution of these costs must be considered to be reasonably fair to be acceptable for the major target groups, particularly companies and households, in order to secure effective implementation. Various distortions from the ideal can be expected, depending upon the economic and political strength of the target groups. Internationally, the cost-effective ideals have been tempered especially in relation to the perceptions and demands from the developing countries and some 'green groups'. They have tended to see the flexibility mechanisms as a smart way on part of the developed countries to buy themselves out of the problem of high costs of domestic emissions reductions.

This dilemma is also present in Norwegian climate policy: How does the combination of being a 'high cost abatement country' in favor of cost effectiveness square with the ambition of being an environmental pusher and consideration for the interests of the developing countries?

4 Norwegian climate policy 1987–2001/2

4.1 From pusher to pragmatist

In 1983 the Norwegian Prime Minister, Gro Harlem Brundtland, was appointed chairman of the World Commission on Environment and Development. The so-called Brundtland Report, published in 1987, singled out climate change as a major international problem. Norway's high international profile continued over the next years, manifested both at the Hague Ministerial Conference in 1989 and the so-called Bergen Conference in 1990.[10] The Norwegian government officially expressed an ambition to be a frontrunner in the process of establishing an international climate regime.[11] Norway was also the first country to adopt a unilateral target of stabilizing emissions at 1989 levels by the year 2000, and was among the first to introduce a CO_2 tax.[12] In short, Norway was a true pusher in this early pre-negotiation phase (Andresen and Butenschøn, 2001).

During the initial period of 'green enthusiasm,' questions of the potential economic costs involved were more or less absent from the discussion. In this early 'visionary stage,' climate change was seen as a global environmental problem that needed to be addressed, with little emphasis on practical implications. This changed when new and powerful political and economic domestic actors entered the scene, introducing new decision premises. First, it was argued that the best contribution Norway could make to reduce global CO_2 emissions was to export natural gas that could replace some of the far more polluting coal, the most important energy source of most Eastern European countries: "replacing coal with gas would do far more to preserve the environment than individual, domestic action".[13] Secondly, there was an increasing understanding that whatever climate regime was introduced, it would be very costly for Norway. This is supported by a survey of selected OECD countries (Torvanger et al., 1996), in which Norway is identified as a country with low energy-related CO_2 emissions

[10] Norway played an active role from the late 1970s in trying to reduce sulphur emissions from the UK and Central European countries that caused acidification of Norwegian lakes and ecosystems, and thus favoured bilateral or multilateral agreements to meet this end.

[11] See Stortingsmelding (1989).

[12] Norway was, however, not able to meet the emission stabilization target.

[13] The Minister of Oil and Energy of the Conservative Government, see *Arbeiderbladet* (1990).

relative to total emissions, population, and GDP.[14] This is mainly because of Norway's special situation with 70 percent of its stationary energy demand covered by emission-free renewable energy sources (mostly hydropower), and hydropower supplying 99 percent of the electricity consumption. Furthermore, Norway has a large transport sector due to its geography, where emission abatement is costly. This, combined with already high taxes, for instance on emissions from offshore activities, implies that the cheapest measures to reduce emissions are likely to have been carried out already. These circumstances make it more costly for Norway to reduce GHG emissions than most other OECD countries. These factors pointed towards stronger reliance on an international approach. Business and industry, the main ministries, and the main political parties all argued for this view. The Ministry of Environment and the green NGOs, both very influential in the initial phase, were the losers in this struggle as they continued to stress the prominence of domestic measures to curb emissions. In short, economic pragmatism won over 'green idealism' (Andresen and Butenschøn, 2001).

This is also evident when analyzing the CO_2 tax that was introduced in 1991. The CO_2 tax has been the most important policy tool for reducing emissions in Norway, and currently covers 64% of the total CO_2 emissions in Norway (compared to 60% in 1992), or 47% of the total GHG emissions. The tax has been placed on goods such as gasoline, mineral oil, coal, coke and natural gas. However, the tax rate did not correspond to the carbon content of the fossil fuels, and sectors such as air transport, the process industry, and the cement industry were exempted. These exemptions were based on the tradition of supporting a broad residential and employment pattern through supporting cornerstone industries in small societies and the concern for international competitiveness (Bretteville and Søfting, 2000). In February 1992, the environmental tax committee pointed out that a total of 40% of the CO_2 emissions were exempted from taxation. This was not consistent with the principle of cost effectiveness, which prescribes that all sectors be subject to the same rate of taxation. Then in 1996, the Green Tax Commission published its report. Prior to the publication of this report, it became known that there was substantial internal disagreement, largely about whether carbon emissions from industries exempted from taxation should be taxed. A minority of the commission wanted voluntary agreements whereas the majority was in favor of introducing a carbon tax.

With increasing controversy over the making of Norwegian climate policy, it gradually turned into a 'high politics' issue.[15] The Prime Minister herself intervened in the work of the Green Tax Commission, and thereby the minority view prevailed. There were strong political reactions to this intervention (Skjærseth-Nielsen, 1998). The 'high politics' nature of climate policy was highlighted in 1999 when the Centrist government had to step down as a result of strong conflicts over its climate policy.[16]

[14] The countries are Australia, Canada, Denmark, Finland, France, Germany, Japan, Netherlands, Norway, Spain, Sweden, UK and USA. These countries were chosen according to size within the OECD and as representatives of groups and geographical regions within the OECD (Torvanger et al., 1996).

[15] In contrast to more traditional environmental issues, the climate issue is just as much about energy and trade as environment.

[16] The Centrist government wanted a stricter regulation of greenhouse gas emissions from new gas-fired power plants but was defeated in Parliament, resulting in a Labor party government taking office. The issue of new gas fired power plants is still a very 'hot' issue on the Norwegian political agenda.

4.2 International consequences

The more pragmatic climate policy has also had profound consequences on the international scene. As noted, in the initial phase Norway was among the main pushers for strong commitments, but this gradually changed with the approach of the 1992 Rio Summit. It was not considered 'progressive' (although quite creative) when Norway introduced the ideas of flexibility instruments into the negotiations at the end of 1991 under the title 'Joint Implementation' (Michaelowa and Dutschke, 2000).[17] Norway proposed that cost effectiveness could be increased by separating the emissions targets from the method of abatement – in other words, that countries could choose to implement measures domestically or jointly on a bilateral or regional basis. The Ministry of Environment went as far as announcing that Norway would not sign any agreement without a joint implementation option (Tenfjord, 1995).[18] During the subsequent negotiation process, Norway argued for differentiated commitments and supported binding commitments in a protocol, common quantitative emission commitments for groups of countries, a comprehensive approach including all six greenhouse gases as well as sinks, international harmonization of measures, and financial assistance to developing countries.

These policies implied that Norway got new and – compared to the initial period – unexpected allies. While Norway had been on the pusher team with the 'small and green' EU countries as well as the EU, this changed as Kyoto was drawing closer. Norway became a member of the informal JUSSCANNZ group of countries, led by the US and generally considered a 'laggard' group, as they were reluctant to take on domestic commitments and stressed the need for a flexible cost-effective international approach.[19] Although the CO_2 tax has been the backbone of Norwegian climate policy measures, the idea of tradable emissions quotas has also been discussed, and it received political interest after COP3 in Kyoto. A Norwegian quota commission was established, and it released its report in December 1999.[20] A system that would cover about 90% of Norwegian GHG emissions was recommended, and a majority further recommended that all sources should pay market price for the quotas. One part of the minority recommended that the yet untaxed emissions should be granted free permits (Bretteville and Søfting, 2000). The alternative option to meet Norway's Kyoto commitment is to use the flexibility mechanisms under the Kyoto Protocol.[21]

One of the major conflicts after Kyoto has been whether or not to introduce a quantified cap on emissions emission trading, that is, whether or not to restrict emissions trading to meet the requirement that Annex I countries use the flexibility instruments to meet only part of their commitments (also known as the "supplementarity" requirement). Again, Norway sided with the US and the rest of the so-called Umbrella Group against the EU, arguing against any such quantified cap since it would increase the quota price, reducing the cost-effectiveness of the flexibility mechanisms, and thus be in conflict with the agreement adopted in Kyoto. The issue was settled at the second part of COP6 in Bonn in July 2001 when the EU gave up its proposal for a quantified cap on the use of the flexibility mechanism, which is consistent with

[17] This concept has since been modified and is known as 'Joint Implementation,' one of the three flexibility mechanisms in the Kyoto Protocol.

[18] Cited in Andresen and Butenschøn (2001).

[19] JUSSCANNZ is an acronym composed of the initials of participating countries, which are Japan, the United States, Switzerland, Canada, Australia, Norway, and New Zealand. In 1998, Russia and Ukraine joined the group and Switzerland left, and the term was changed to the 'Umbrella Group'.

[20] NOU (2000).

[21] In addition to emissions trading, joint implementation and the CDM, Annex I countries can also form "bubbles", such as the EU-bubble, where the countries have differentiated obligations, but where total emissions reductions are in line with the requirements of the Kyoto Protocol.

the Norwegian policies since this supplementarity requirement is only defined in qualitative terms.[22]

Siding with the 'grey' US against the 'green' EU – with the other Nordic countries except Iceland – has clearly posed a major policy dilemma for Norway. Criticism has been hard from the environmental NGOs. This criticism may have had some effect, as Norway more recently has been able to maneuver itself more in the direction of acting as a broker between the two main contestants. On the important land use, land-use change and forestry (LULUCF) issue, Norway has sided with the EU, against most of the Umbrella Group members.[23] After the US opted out of the Protocol, the decision of whether to follow the EU or the US lost its relevance as it was never a policy option for the small, internationalist Norway to join forces with the US in such a move.

4.3 Costs of meeting the Kyoto commitments

Norway is one of three countries that through the Kyoto Protocol are allowed to increase their emissions, as it is committed to limiting its GHG emissions in the period 2008–2012 to 1% over its 1990 emissions. However, national circumstances and experience shows that Norway is likely to have difficulties in limiting its GHG emissions. The stabilization goal was officially abandoned in 1995 as GHG emissions increased steadily. From 1990 to 2000, the total GHG emissions increased by 6% while the CO_2 emissions increased by 17% (Statistics Norway, 2002). This rise is mainly caused by increased gas production and associated pipeline transportation, an increased share of oil extraction from older oil fields (which requires more energy use), and a steady rise in the transportation sector. Estimates by the Norwegian Pollution Control Authority (SFT) and the Norwegian Ministry of Finance indicate that the total GHG emissions in Norway in 2010 could be 24% higher than 1990 emissions if no measures are taken. Meeting the Kyoto reduction target would then require annual reductions of about 12 Mt CO_2 equivalents. Plans to build two gas-fired power plants could further increase the GHG emissions by at least 2 Mt CO_2 (SFT, 2000).[24]

An important basis for Norway's climate policy is information about domestic marginal GHG abatement costs. A study by the SFT (SFT, 2000) covering all sectors and the most important emissions sources estimates the costs of more than 70 measures to reduce Norwegian GHG emissions in 2010. The marginal abatement cost (MAC) curve in the SFT study, as shown in Figure 2, includes options of reducing emissions by approximately 2 Mt CO_2 equivalents at no cost (no-regrets).[25] The study finds that a reduction of 6 Mt CO_2 equivalents (about half of Norway's reduction target) can be achieved at a cost lower than approximately 22 USD/t CO_2 equivalent.[26],[27] This includes emissions reductions from the

[22] The text now reads "That the use of the mechanisms shall be supplemental to domestic action and domestic action shall thus constitute a significant element of efforts made by each Party included in Annex I to meet its quantified emission limitation and reduction commitments under Article 3, paragraph 1." (See UN, 2001).

[23] Given some limitations a country can count carbon sequestration in forests and agricultural soils as part of meeting its Kyoto Protocol commitments.

[24] There are plans to build additional gas-fired power plants that will increase the GHG emissions even further.

[25] Estimating marginal abatement costs will never be entirely correct, as there are many factors that can cause uncertainty. The SFT study concludes that there might be errors in the data basis, and some measures are not included due to insufficient data, such as measures regarding CH_4 and N_2O from agriculture and carbon sequestration in forests.

[26] Costs are originally stated in NOK, an exchange rate of NOK 9.0 for USD 1 has been used to convert to USD.

process industry, other process emissions, stationary combustion, road traffic and other mobile sources. Another 5 Mt CO_2 equivalents can be abated domestically for less than 45 USD/t CO_2 equivalent.[28]

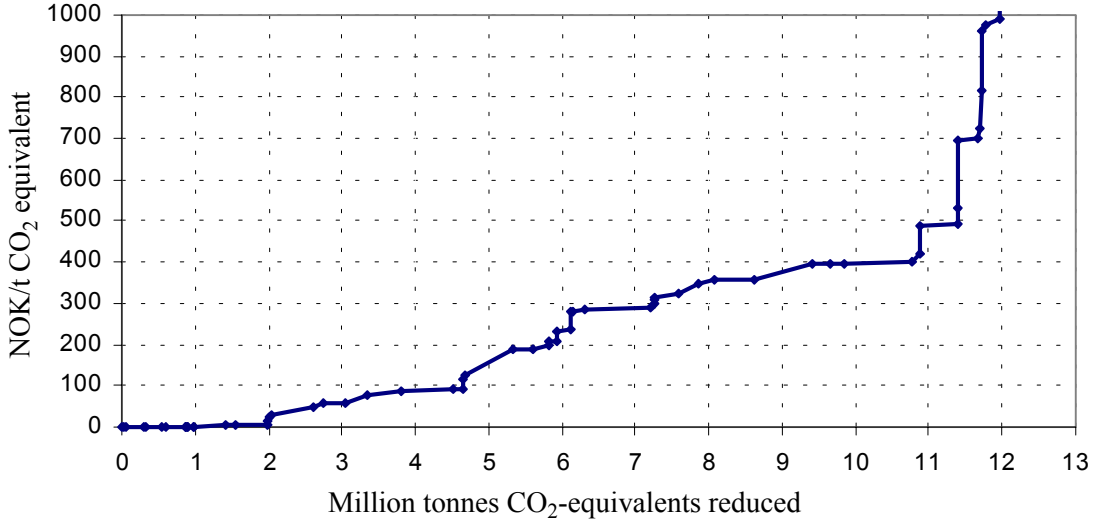

Figure 2. Marginal abatement cost curve for Norway in 2010. (Only measures with costs lower than 111 USD are included.) Source: SFT (2000).

4.4 Reducing costs: pushing for Joint Implementation

Since it will be very costly to reduce GHG emissions using only domestic measures, Norway has not only supported joint implementation in principle. Norway has also been among the most active countries in promoting cross-boundary emissions reductions, and has already gained experience from the pilot phase for JI, 'Activities Implemented Jointly' (AIJ). Table 1 summarizes the Norwegian-supported AIJ projects that have been accepted, approved or endorsed by the designated national authorities.

Table 1. Norwegian-supported AIJ projects. Source: Stortingsmelding (2001).

Host country	Project	Project type
Burkina Faso	Burkina Faso Sustainable Energy Management	Energy Efficiency
China	Thermal Power Plant in Henan Province	Energy Efficiency
Mexico	High Efficiency Lighting (ILUMEX)	Energy Efficiency
India	Integrated Agriculture Demand-Side Management	Energy Efficiency
Costa Rica	Reforestation and Forest Conservation	Forest reforestation
Poland	Coal to Gas Conversion	Fuel Switching
Slovakia	Fuel Switch From Fossil Fuels to Bio-Energy	Renewable energy

[27] Assuming no construction of gas-fired power plants.

[28] For comparison, the Norwegian CO_2 tax as of January 1, 2001, for gasoline was USD 34.6/t CO_2 equivalent.

Norway's involvement in the AIJ started with pilot projects that were initiated in cooperation with the World Bank in 1993, but also includes bilateral projects.[29] The projects have a wide geographical distribution and take place within different sectors, but the main emphasis has been on energy projects. The project in Costa Rica was the first of its kind and involved the Norwegian Ministry of Foreign Affairs and three Norwegian companies engaged in the development of hydropower in the Virilla River. Norway's first JI project was signed in December 2001 with Romania as the host country.[30] Norway will be credited about 35,000 tons CO_2 annually for the first commitment period at a cost of about USD 3.3/t CO2. But Norway has also been active in the World Bank's Prototype Carbon Fund (PCF), which was established in 1999. The PCF funds projects that produce GHG emissions reductions consistent with the Kyoto Protocol and can be registered with the UNFCCC.[31] Additionally, one of the companies planning to build one of the gas-fired power plants has been active in the early phase of the CDM. The company has an option contract to buy carbon credits from an afforestation company, Tree Farms, in Tanzania.

Summing up, what is the experience of Norway in terms of its ability to pursue a cost-effective policy and cope with political domestic and international political challenges? Analyzing the Norwegian climate policies up to the present reveals a clear distinction between the domestic and international approach. Norway has pushed for international flexibility to ensure international cost effectiveness and has already gained valuable experience from the AIJ. This has been done rather consistently although varying governments have had somewhat differing views on the appropriate blend between domestic and international measures. This consistent strategy has had some costs in terms of criticism, primarily from domestic green NGOs. Domestically, cost effectiveness has been given less priority as concerns for such as residential pattern and international competitiveness have been regarded as more important and the positions of major interest groups opposing taxes have prevailed.

5 Designing a climate policy for Norway

So far, the international level has been the most important arena for the climate change problem, as the making of a global regime that would set rules and commitments for the countries of the world has been the main challenge. Since the Climate Convention countries have been encouraged to introduce measures to abate emissions, but there have been no hard commitments apart from the reporting system. When the Kyoto Protocol is in force within a year or two, more focus will be needed on the domestic level to study the will and ability of Annex 1 countries to 'deliver'. The challenge for Norway is to design its future climate policy in light of national circumstances and different international scenarios. In line with the discussion of an effective climate policy in section 3 (see Figure 1), the climate policy should be cost effective, support environmental effectiveness and be feasible in political terms. Can this be done, and if so how?

The strategies for Norwegian climate policies in the short- and long-term were outlined in a recent White Paper (Stortingsmelding, 2001). The CO_2 tax will still be the main policy tool up to 2008, but there is also room for voluntary agreements. A national emission trading system will be established in 2005, covering those industries that are exempted from the CO_2 tax. From 2008 the national system will be linked to international emissions trading under the

[29] The AIJ projects in Costa Rica, China and Slovakia are bilateral projects.

[30] Ministry of Environment (2001).

[31] Companies and governments receive a pro rate share of the emissions reductions. Norway is represented as one out of six governments and by two out of 17 private companies.

Kyoto Protocol. From the same year the tradable permit system will replace the CO_2 tax as the main policy tool, implying that (most of) the remaining industries will be included in the emissions trading system.

The major dimensions for designing the Norwegian policy can be divided into domestic and international issues, and short-term and long-term perspectives, see Table 2 below. By 'short-term' we mean the period until the end of the first commitment period (2012) under the Kyoto Protocol. By 'long-term' we mean to the period from 2013 until 2022, which covers two future 5-year commitment periods under the Protocol. For each of these combinations of time and issue area, there are different alternatives and thus choices to be made. Although domestic constraints are important, as will be demonstrated below, developments at the international level are crucial in deciding the main framework for future Norwegian climate policy. We have chosen to focus on three key aspects: the future participation of the USA, developing countries and the ambition level of future agreements. These are outlined as the two climate policy scenarios 'Kyoto weak' and 'Kyoto strong'.

In the 'Kyoto weak' scenario it is assumed that the ambition level of the present Kyoto Protocol is more or less continued after 2012, that the USA continues to reject the Protocol, and that developing countries refuse to take on binding commitments to limit their GHG emissions. In the 'Kyoto strong' scenario the ambition level is strengthened with the aim to reach a long-term global target, for instance stabilization of GHG concentrations in the atmosphere at some specified level, and that the USA and the most affluent developing countries take on binding commitments to limit their emissions of GHG.

Considerable attention should be given to a climate policy that is designed to be robust, and thus will be able to handle different future developments as smoothly as possible. The following discussion focuses on the 'Kyoto strong' scenario, since this is the most challenging climate policy future for Norway. This scenario is also a prerequisite for a more effective climate regime. The consequences of a 'Kyoto weak', which are significantly smaller than for 'Kyoto strong', are only discussed when most relevant.

Let us consider the issues in sequence starting with the short-term and domestic level, before moving on to the international level and long-term perspectives.

Table 2. Important dimensions for designing an efficient climate policy for Norway.Table 2

Time horizon / **Geographical level**	**Short-term (until 2012)**	**Long-term (beyond 2012)**
Domestic	Wide or narrow national implementation Political feasibility Policy tool choice	Development of new GHG-efficient technologies CO_2 capture and storage technologies
International	Use of the Kyoto mechanisms Dependency on other countries' climate policy US withdrawal from the Kyoto Protocol	New emissions limitation targets American ratification of the Kyoto Protocol? Commitments by developing countries

5.1 Short-term domestic policy

A major concern in the implementation of a cost-effective domestic climate policy is to involve as many economic sectors and activities as possible so that all possible abatement measures are considered. More specifically, the climate policy price signal should be harmonized in all sectors so that the cost of releasing a ton of GHGs to the atmosphere is the same. If all sectors face the same price signal, then they have the same incentive to carry out abatement measures until the marginal cost is the same, thus securing cost-minimization. As part of a cost-effective solution, companies in a tradable permit system can buy or sell permits. There can nevertheless be measurement and control cost considerations that make a system covering all emissions too costly and therefore infeasible.

The coverage of a control system for GHG emissions may be further constrained by political feasibility concerns. Earlier studies have shown that the industry sectors most exposed to climate policy costs (e.g. a green tax) have successfully lobbied the politicians and have thus been rewarded with exemptions from regulation or lower tax rates (see Kasa, 1999). In many cases there has been an alliance with local politicians and labor unions since many industry plants in Norway that are heavy emitters of GHG are situated in rural districts with few employment alternatives. Obviously the political feasibility issue will be much less pressing in a 'Kyoto weak' scenario since the economic consequences would be much smaller.

Market-based policy tools such as taxes and tradable permits can induce a cost-effective solution. With regard to political feasibility, the net cost implications for firms depend more on how the policy tools are implemented, for instance if (some of) the tax revenue is recycled to the firms, or if permits are auctioned to the firms or given for free based on a grandfathering allocation scheme. As noted, the carbon tax of 1991 mainly covered sectors not exposed to foreign competition. Norway is now considering an early domestic emissions trading system covering sectors that are exempted from the carbon tax, possibly starting in 2005, and linking up to emissions trading under the Kyoto Protocol from 2008. This raises the question of the best interface between tax and permits in a mixed system. In the longer term, an obvious alternative given international emissions trading is to expand tradable permits to all sectors of the economy. The choice between an emissions trading system and a mixed system should be governed by practical considerations so that the system with the lowest administrative costs is preferred. For households and small companies, emissions trading may involve disproportionately high administrative costs, and in this case a tax could be preferable. In the case of gasoline, a solution could be to introduce emissions permit obligations for oil companies, where the additional cost is passed on to consumers by increasing the price.

5.2 Short-term considerations at international level

Moving on to the international level, Figure 2 indicates that the cost of abatement for Norway increases significantly after reducing only a few Mt CO_2 equivalents, which demonstrates the cost-saving potential for Norway of utilizing the flexibility mechanisms under the Kyoto Protocol. Therefore the international quota price is important for determining the extent to which measures within Norway will be pursued. A low quota price implies less domestic measures, whereas a high quota price implies more domestic abatement. The cost-saving potential of the flexibility mechanisms can be increased by securing rules and institutions that keep transaction costs as low as possible, and by making the CDM projects attractive (to gain access to a large volume of inexpensive CDM quotas).

The recent American rejection of the Kyoto Protocol is likely to result in a lower quota price than earlier expected. A study by Hagem and Holtsmark (2001) projects that the expected international quota price could be reduced from USD 15 per ton CO_2 equivalent

with US participation to USD 5 per ton CO_2 equivalent without US participation. The large inclusion of LULUCF activities will also most likely push the quota prices downward. This will most likely result in less domestic action in Norway. Given this marginal abatement cost curve, assuming a need to reduce projected emissions by 12 Mt CO_2 equivalents to meet the Kyoto target and assuming a quota price of 5 USD per ton, the cost-effective solution would be to buy quotas for 9 Mt CO_2 equivalents abroad. This means that 75% of the emissions abatement would be met through purchase of quotas abroad. If gas-fired power plants are constructed, this figure would rise accordingly by 2-7 Mt CO_2 equivalents, depending on the number of plants constructed. International emissions trading at such a volume could easily be seen as violating the Kyoto Protocol's provision that the use of the mechanisms be supplemental to domestic action. Consequently Norway is likely to be in a situation where the cost-effective solution is not feasible for political reasons, since Norway risks being criticized by other Parties or environmental NGOs if a large share of its Kyoto target is met through purchase of quotas on the international market.

Since Norway is a small, open economy, the country is particularly vulnerable to climate policy implementation in countries that are major trading partners. Even if the national emission targets are defined by the Kyoto Protocol, each country itself must design its own policy tools and determine how different sectors will be affected by the regulation. If other countries choose to (partly) exempt a certain industry from the regulation, this could imply a competitive disadvantage for the same industry in Norway if this meets the full climate policy regulation. The policy choice of the EU –- being the country's largest trading partner – is of particular importance to Norway. The EU is considering a regional emissions trading system from 2005. This is a narrow system involving only CO_2 from heavy industries, thus representing only around 45% of CO_2 in the region and no other GHG. To keep the national abatement costs down, Norway prefers a wide system, which conflicts with EU's strategy. To increase the trading area and gain experience with early trading, there are benefits for the Norwegian emissions trading system to link up with EU's system. To make this possible, Norway may be forced to introduce a more narrow trading system than it would otherwise prefer. In the 'Kyoto weak' scenario, Norway's vulnerability to other countries' climate policies is reduced since the smaller ambition level significantly reduces the economic consequences.

A major effect of the American withdrawal from the Kyoto Protocol is a substantially reduced environmental effectiveness of the first commitment period. According to Hagem and Holtsmark (2001), global emission reductions compared to business as usual in 2008-12 are reduced from 5.5% to 0.9% as a result of the US position. This demonstrates the importance for the climate policy agreement of engaging the USA in the climate policy effort as soon as possible, notwithstanding the political importance of the USA as the only remaining superpower and the world's largest GHG emitter. Under all circumstances, the USA will probably undertake a national climate strategy that to some extent limits its emissions compared to a 'business as usual' scenario (Agrawala and Andresen, 2001). However, the ambition level of the new climate change policy launched by the Bush administration in February 2002 seems very close to 'business as usual' (see The White House, 2002). This policy plan is based on intensity targets (emissions divided by gross domestic product) and voluntary measures.

5.3 Domestic policy options in the long-term

To reduce long-term abatement costs, Norway could commit to a technology and industry strategy for the future where green and carbon-free energy technologies dominate. During the last few decades, Denmark has developed wind energy technologies (wind mills) into a large export industry and Sweden has developed biomass energy to take a sizeable share of the national energy supply, whereas Norway has done much less to develop these and other

renewable energy sources. For instance, and in spite of more than 20 years of public support programs, Norway's operating wind capacity represents only some 0.03 % of total power production (Christiansen, 2002, p. 239). Kolshus et al. (2000) highlight a number of climate-friendly energy technologies that could have great potential if further developed. The most interesting energy technologies for Norway are combined-cycle turbines, fuel cells, combined heat and power, heat pumps, small-scale hydroelectricity, wind energy, solar energy (photovoltaic and solar-thermal plants), and biomass energy. Should a 'Kyoto weak' scenario materialize, the incentives to develop new technologies would be reduced.

A particularly interesting option for Norway is to develop competitive carbon dioxide capture and storage technologies and deposit CO_2 in (partly) depleted oil and gas reservoirs or other geological formations. In fact, the world's first commercial scale system for CO_2 capture and deposits in a saline aquifer was implemented on the Sleipner West field on the Norwegian Continental Shelf in 1996 (Christiansen, 2001, p. 508). Christiansen (2001) has coined this a major or radical technological innovation, in that it represents a technological discontinuity in upstream activities that offers considerable potential for mitigating greenhouse gas emissions. Currently about 1 million tons of CO_2 is injected annually. Besides its potential impact on abatement strategies, a breakthrough involving wider applications of this abatement technology would also reduce the pressure from an international climate policy agreement on fossil fuel revenues. A prerequisite for such technology development is acceptance for CO_2 capture and storage as a climate policy measure under the Kyoto Protocol.

5.4 Long-term policy options at international level

According to the Kyoto Protocol, negotiations on new emissions limitation targets are to commence by 2005. So far no targets after 2012 have been determined. A first issue is to determine a target for the participating countries, e.g. in terms of maximum concentration levels of GHGs in the atmosphere. A second issue is to agree on an emissions path consistent with the long-term target. A third issue is when the more affluent developing countries should take on binding commitments to limit their GHG emissions. Also, in this regard, the challenge to include the USA in the agreement is of vital importance for the survival of the Kyoto Protocol. A fourth issue is to distribute the emissions limitation and abatement targets among the participating countries. For Norway and other participating countries, the global ambition level and national targets negotiated are major determinants for future emission abatement costs. Being a small country, Norway's ability to influence the outcome of the negotiations as a point of departure is very limited. At any rate, global targets and burden-sharing implications of future global climate policy agreements will be constrained by the consensus requirement, although it can be disregarded under certain circumstances. There is also limited room for sanctions if a country feels unjustly treated and chooses to pull out of the agreement.

Summing up, based on the discussion above, Norway's main option for an efficient climate policy in the short-term is to choose a wide national implementation strategy that builds on market-based policy tools and seeks collaboration and harmonization with other countries with respect to policy choices made as Norway has limited options for choosing more independent policy directions. Policy harmonization with other countries will soften the political feasibility constraints on Norwegian climate policy. This may seem like an easy recipe for a cost-effective policy, but there are bound to be difficult challenges and trade-offs. On the one hand, lobbying is expected if taxes are expanded or emission permits have to be bought. On the other hand, national and international protests are anticipated if the extent of trading is too high. Balancing these concerns is necessary but not easy, and a consequence might be that a cost-effective solution is not achievable. The long term perspective is bound to be (even) more uncertain. Suffice it to mention that there are good opportunities to reduce abatement costs through investments in new climate-friendly technologies. Internationally, it is a paradox that the absence of the US in the future climate regime will be beneficial to

Norway in the sense that quota prices will remain lower, but on the other hand environmental effectiveness will be reduced.

6 Conclusions and lessons learned

What can the experience of Norway as a 'test-case' tell us about the feasibility of ambitious future international climate policy agreements? We think that the Norwegian case could be illustrative for the future developments of climate policies in other nations as well. Many countries have so far been more or less free-riders, but this is bound to change further down the road if the environmental effectiveness of the climate regime is to increase. As long as the costs of damage abatement are relatively high and concentrated while the damage is diffuse, uncertain and long term, there is little reason to expect 'climate enthusiasm' from the public or many countries of the world. Therefore, just like Norway, they will want emissions reductions carried out as cheaply as possible.

Norway has been much better at pursuing cost effectiveness at the international level than domestically. Various Norwegian governments have pushed for the elaboration and acceptance of the Kyoto mechanisms and have also pursued joint implementation projects in the pilot phase. Norway can also be expected to be strongly involved in international emissions trading as a net importer since there is a substantial cost-saving potential. Considering its rather 'progressive' North-South policy, Norway will probably also be actively involved in CDM projects. That is, the international dimension is already strong in Norwegian climate policy, and it can be expected to increase further in the future. The cost-effectiveness record is bleaker on the domestic side, although a CO_2 tax has been operative for more than a decade, longer than has been the case in most OECD countries. But because of interest-group lobbying and other political considerations, there are many important exceptions so that the cost effectiveness is significantly reduced.

Although green enthusiasm has waned somewhat, Norway still has a fairly high environmental profile, a high profile towards developing countries and is also among the wealthiest countries of the world. Why, then, the insistence on the international approach and the more moderate domestic performance? The most obvious and maybe also correct answer is that the international approach costs less money and some of the problem are pushed up from the domestic to the international level. Coined in more positive terms, the international approach can lead to more emissions reductions for less money, a 'rational' approach as this is a global, not a domestic problem. This policy cannot, however, be pursued so far that the weight on domestic measures becomes too small. For example, it will probably not be politically feasible for Norway to purchase 3/4 of its quotas abroad to meet its emissions targets, even though this could be the most cost-effective approach – given the estimated low quota price resulting from the US rejection of Kyoto. However, the political feasibility depends on the sensitivity of Norwegian politicians to the likely criticism from environmental NGOs and other Parties to the Kyoto Protocol in the case of extensive international emissions trading. It may be that the Norwegian case is not representative for other countries. That is, others may be willing to take on more costly domestic emissions reductions than Norway has been willing to. However, so far there are few indications that such willingness exists.

The final adoption of the Kyoto Protocol at COP7 may have been a political success, but its long-term environmental effectiveness in terms of impact on expected global temperature increase is low. Considering the complexity of the issue, this meager result is not surprising. So far the trend towards increased reliance on the international flexibility mechanisms over time has been strong. A cost-effective international approach along the lines of the Kyoto mechanisms represents a first necessary step to demonstrate that the system works. Furthermore, future negotiations could aim at package deals where more ambitious emissions

abatement targets are combined with extensive use of Kyoto mechanisms that are further elaborated. In this way a cost-effective international approach could increase the environmental effectiveness of the climate policy regime.

The flexibility mechanisms are not only important for the Parties to increase cost effectiveness. They could also be an effective tool for involving key target groups like companies and other private or public entities in emissions mitigation efforts. That is, the target groups, usually considered part of the problem, can in this way become part of the solution. The experience with the flexibility mechanisms is also crucial in relation to the US as well as the developing countries. Whether the US re-enters this process to some extent depends upon the workability and experience with the Kyoto mechanisms, as it is highly unlikely that the US will join a treaty where the market does not play an essential role. So far, the developing countries have been either negative or somewhat skeptical to the flexibility mechanisms. It is therefore essential to get the Kyoto mechanisms to work well so that 'green' skeptics and developing countries see that they contribute to real reductions and that they are not only a smart way for developed countries to avoid costly domestic emissions reductions.

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Appendix. The Norwegian climate and oil dilemma

The Norwegian position in climate policy is further complicated by Norway's role as a large oil and gas exporter. The establishment of an international climate policy regime is likely to reduce oil and gas prices due to reduced demand and thereby diminish the oil and gas wealth of Norway. Bartsch and Müller (2000), Kolshus et al. (2000) and other studies have shown that the implementation of the Kyoto Protocol in 2010 and new commitment periods will have significant impacts on the fossil fuel markets. Reduced producer prices will surely affect Norway, which was the sixth largest oil producer in 2000 and third only to Saudi Arabia and Russia when it came to oil export (OED, 2001a). Norway is the second largest exporter of gas to Europe, and it is expected that Norway will have market shares of between 30% and 40% in countries such as Germany, France and Belgium (Austvik, 2001). The petroleum sector is vital for the Norwegian economy, as it in 2000 accounted for 48% of the export value and 25% of the country's aggregate incomes (OED, 2001b).

Kolshus et al. (2000) examine Norway's ability to implement an efficient climate policy in Norway, given that the markets for fossil fuels are influenced by a climate policy regime. Two possible climate policy futures up to 2020 were explored. The first is the Climate Stagnation scenario, where the Kyoto Protocol does not enter into force. The second scenario, a Kyoto Success scenario, is based on the assumption that the Kyoto Protocol enters into force and developing countries are assumed to take on binding commitments through a global burden-sharing scheme in a second commitment period after 2012. The cases of unrestricted international emissions trading and no international emissions trading were examined. The consequences for Norway were focused on the costs of i) abating domestically and purchasing quotas from other countries; and ii) loss of oil and gas export revenues. The analysis shows that the costs for Norway of implementing the Kyoto Protocol will be heavily dominated by the loss of oil and gas export revenues. The cost of reduced oil and gas export revenues is 15 to 18 times greater than the abatement and quota cost in 2010, and 2 to 7 times greater in 2020. Holtsmark and Hagem (1998) estimate the implementation cost of the Kyoto Protocol, including terms of trade changes in the fossil fuel markets in the case of free emissions trading among developed countries, measured as percentage of GDP in 1990. They find that Norway has the highest cost at 1.2% of GDP. The estimate is 0.25% for the USA, 0.4% for Canada, and 0.2% for Denmark. Since major oil or gas importing countries can benefit from lower import prices, Japan turns out with a net gain of 0.1% of GDP.

This is evidence of the conflicting interests between Norway's role as a large fossil fuel exporter and its ambitions to have a green and climate-friendly image internationally. Participating in a climate policy regime will be more costly and make Norway more vulnerable to a climate policy agreement than other developed countries due to the relatively large loss in oil and gas revenue. However, the American withdrawal from the Kyoto Protocol will result in a smaller reduction in oil and gas demand resulting from the implementation of the Kyoto Protocol. Hagem and Holtsmark (2001) calculate that the producer oil price is reduced by 1.8% with US participation and by 0.4% without US participation. Similar results for the three regional gas markets are a reduction of 0.4 to 4.0% with US participation and 0.1 to 1.2% without US participation. As shown by Kolshus et al. (2000), the fossil fuel revenue loss for Norway due to the Kyoto Protocol dominates the abatement costs and expenses to buy quotas by a large margin. If the agreement is later expanded to include the USA and (some) developing countries, the effect on fossil fuel markets will be strengthened. Likewise the Norwegian revenue loss will be larger. Due to non-participation by the USA and developing countries there will be a carbon leakage to these countries since the oil and gas consumers in these countries face a lower price than in participating countries. The effect is a smaller revenue loss than in the case of global participation.

This raises the issue of Norwegian possibilities to influence the oil and gas price to compensate for some of the climate policy related loss. In the short to medium term, the gas price on the European market and the oil price on the international market could be influenced. In this regard, two issues are important when discussing Norway's opportunity to influence the oil and gas revenue loss. The first issue is Norway's relation to the Organization of Petroleum Exporting Countries (OPEC), whose member countries produce about 40% of the world's oil and control more than 77% of the world's proven oil reserves. Norway has traditionally not followed OPEC's production level, and did not reduce its oil production in 1998 when the OPEC decided to reduce its production. OPEC then, at its meeting in Vienna on November 14, 2001, decided to reduce its daily production by 1.5 million barrels in 2002. However, this cut was contingent on cuts by non-OPEC members (The Economist, 2001). A signal of change may now be seen in Norway relation to OPEC as Norway has decided to reduce its production by between 100,000 and 200,000 barrels a day. Could this increase Norway's influence on the international oil price?

The second issue is Norway's ability to exert influence on the price of natural gas. A gas directive from the European Union (EU, 1998) and political processes allow for a more liberalized European gas market. This provides the basis for substantial changes and the creation of a single market for gas. Norway's influence on the gas price may be reduced, as the companies now must sell their own gas, instead of being channeled through the Norwegian sales monopoly (Gassforhandlingsutvalget). Shorter contracts and increased spot trading will gradually replace today's bilateral negotiations. Increased competition and over-capacity will probably force the prices downward in the short term, but future export potential and its costs will be important for the long-term price development. However, Norway will still be a dominant owner across all the large gas fields (Austvik, 2001) and may strengthen its market position, as there is limited political willingness to increase Dutch export, moderate export potential in Algeria, and uncertainties in the Russian production (Sagen, 2001).