CICERO Policy Note 2010:03

NORWEGIAN CLIMATE POLICIES 1990 – 2010: Principles, Policy Instruments and Political Economy Aspects

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October 2010

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Title: Norwegian Climate Policies 1990-2010: Principles, Policy Instruments and Political Economy Aspects.

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CICERO
29 pages

Financed by: NFR-Norklima

Project: Designing Feasible and Efficient Climate Policies

Project manager: Steffen Kallbekken

Quality manager: Knut H. Alfsen

Keywords: Climate policies: Principles, Policy Instruments and Political Economy Aspects.

Abstract: Norwegian climate policies with a focus on the mitigation of Green House Gas (GHG) emissions over the last twenty years, the period of the existence of CICERO, is critically reviewed and analysed in this policy paper.
Best practice principles and policy instruments as recently set forth by the IEA, the OECD and the Stern Review are reviewed along with political economy aspects of the structural social and economic changes caused by ambitious climate policies.

Important Norwegian Official Research Papers and independent foreign Peer Review of Norwegian climate policies are reviewed over the period 1991-2009 and compared with the recent international best practice guidelines. The Norwegian analyses and policy recommendations compares fairly well. Cost-efficiency and effectiveness are main policy principles, but policy instruments should also be assessed on the basis of adaption and compliance, their ability to cope with uncertainty, their effectiveness in stimulating the innovation of climate-friendly technologies, and the facilitation of international cooperation.

Norwegian GHG-emissions increased by some 2 per cent from 1990 to 2009 while GDP per capita grew by more than 52 per cent over the same period, implying significant improvements in emission intensities. Some 70 per cent of Norwegian emissions are now covered by CO_2-taxes and an Emission Trading System (ETS), the two main market based policy instruments, but policies are not cost-efficient across economic sectors du to political economy concerns.

Lessons for future policies are set forth at the end of the paper, and three of these are:
-They should be presented more clearly as measures to buy insurance against the risks of climate change in an uncertain world; -One should identify more precisely the structural consequences of ambitious climate policies, but also the future possibilities for "green growth"; -Assess policy instruments in terms of cost-efficiency and effectiveness, but also their potential to minimize political resistance so as to give clear and credible future signals to the household and business sectors.

Language of report: English

Rapporten kan bestilles fra:
CICERO Senter for klimaforskning
P.B. 1129 Blindern
0318 Oslo

Eller lastes ned fra:
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Executive Summary

Norwegian climate policies with a focus on the mitigation of Green House Gas (GHG) emissions over the last twenty years, the period of the existence of CICERO, are reviewed in this policy paper.

The objectives of this paper are: 1) To set forth best practice mitigation policies as perceived today by leading international organizations like the OECD and IEA and the Stern Review; 2) Review Norwegian policies over the last twenty years to see how these policies measure up to international best practice; 3) In light of the analyses, draw some lessons for future Norwegian climate policies.

In section 2 best practice regarding choice of policy instruments and criteria for policy making as set forth by the OECD (2010) and the IEA (2010) are discussed. One primary criteria is cost-efficiency, that is achieving emission reduction targets at least cost both within and between countries. But policy instruments need also be assessed on the basis of adaption and compliance incentives, their ability to cope with uncertainty, their effectiveness in stimulating the innovation and diffusion of green technologies – a topic briefly reviewed in section 2.3 , and their design in facilitating international cooperation and coordination of climate policy measures. How these principles may be used to construct comprehensive policy packages as perceived by the Stern Review are reviewed in section 3. Political economy aspects, how to overcome resistance to structural change caused by climate policies, are reviewed in section 4.

In section 5 Norwegian policies and a number of Norwegian Official Research papers from 1991 to 2009 are reviewed and compared by best practice policy principles discussed earlier, and structural change is analyzed in section 6.

Section 7 concludes. A CO_2-tax was introduced in Norway in 1991, and the Norwegian economy has performed well with the considerable introduction of economic instruments since then. Today, almost twenty years later, CO_2-taxes and an emission Trading System (ETS) – linked to the EU ETS-system since 2008 – cover more than 70 per cent of Norwegian GHG-emissions. Thus these two marked based policy instruments are the main elements in Norwegian climate policies. Political economy considerations has so far led to the exclusion of the process industry, agriculture and fisheries.

As to lessons for future Norwegian mitigation policies, it is argued that:

- They should be presented more clearly as buying insurance against the future risks of climate change in an uncertain world;
- One should identify more precisely the structural economic consequences – and also the future economic opportunities - of forceful mitigation policies, as was indeed done in the Official Research Papers of the 1990s;
- Assess policy instruments in terms of cost-efficiency, but also their potential to minimize political resistance and to give clearer and more credible future signals to the business sector ;
- Identify and evaluate the least-cost options to ease the impact of policy, especially for those most affected.
- Use more realistic assumptions for international goals and developments. The UNFC-process should, of course, continue. But at the same time one should use the opportunity to explore supplementary and alternative ways of international cooperation - including agreements on finance, technology transfers and deforestation. Given geopolitical developments, a global agreement under the auspices of the G-20 group may be the most realistic one.

Acknowledgements

The author is grateful to Knut Alfsen, Åse Bøe, Eystein Gjelsvik, Steffen Kallbekken, Lorents Lorentsen, Tora Skodvin and Bent Arne Sæther for useful comments to earlier drafts, and to Tone Veiby and Paolo Zupin for excellent secretarial assistance in preparing this paper.

1 Introduction

Over the last twenty years or so, there have been a relatively large number of Official Norwegian Research Papers (NOUs) regarding climate policies in Norway. From the early 1990s and up to 2009, the following papers have been presented:

NOU 1992:3. Towards More Cost-Efficient Policies in the 1990s;

NOU 1995:4. Policy instruments in Environmental policies;

NOU 1996:9. Green taxes – Policies for a better Environment and High Employment;

NOU 2000:1. A Quota System for Green House Gases. Instrument to honor Norways Commitment under the Kyoto protocol;

NOU 2006:18. A Climate Friendly Norway;

NOU 2009:16. Global Environmental Challenges – Norwegian Policies.

Obviously, Norwegian climate policies have also been influenced by policy principles developed internationally by the OECD, the European Commission and by our participation in the international negotiations under the UN Framework Convention on Climate Change adopted in Rio de Janeiro in 1992. In 2007 a fairly critical foreign Peer Review of Norwegian policies and practices were presented, and the main content regarding climate policies was reviewed. Looking forward, Norwegian policies have recently been tied to the EU ETS and Renewable Energy Directives through the EEA-agreement.

In section 2 of this paper I will review main policy principles and instruments as they have recently been presented by the OECD and the IEA, and their application as perceived by The Stern Review is set forth in section 3

Mitigation policies, if ambitious and successful, will mean larger structural changes in our economies over time. Structural changes as resulting from reforms in labor- and product markets have met considerable resistance from the social partners and other interest groups. This has led to a literature on The Political Economy of Reform, and what it may take for policymakers to overcome such resistance partially or wholly. Ambitious climate policies consistent with the Copenhagen Accord of achieving the 2 degree target by 2050, are far from being adopted, and there is so far no international agreement on policies beyond the Kyoto period. This is one indication of real and considerable resistance – explicitly and implicitly - against ambitious and efficient and effective climate policies both within and between countries. This has also been the case for Norway since the early 1990s. In section 4 some political economy aspects of climate policies as they have emerged in recent literature will be reviewed. A key challenge is: If first best or least cost policies cannot be implemented, how to overcome resistance to second best or low cost policies?

In section 5, five of the above mentioned Official Research Papers and the 2007 independent foreign Peer Review of Norwegian climate policies will be examined in the light of sections 2, 3 and 4 regarding both policy principles and instruments and political economy aspects. In section 6 I turn to the topic of climate policies and structural, economic changes – real and perceived – as these may be a main obstacle to develop low-carbon economies.

Finally, in section 7, I will draw some conclusions and possible lessons for future Norwegian policy making.

The focus in this paper is on mitigation policies, that is instruments and policies to contain and reduce Green House Gas (GHG) emissions as this aspect has been the main concern over the last two decades.

Climate policies need a broad, interdisciplinary approach, but the important natural science questions related to climate change, such as whether they are man-made or not, are not a theme of this paper as they are discussed extensively elsewhere. Norwegian authorities, and more recently most countries, assume that political measures are needed to limit and reduce GHG-emissions, and that is the point of departure for this paper. Thus, even if there is considerable uncertainty, the precautionary principle and common sense mean that it it is prudent to buy insurance against the future risk of climate change.

2 Policy Principles and Instruments

2.1 Externalities and Policy-Induced Distortions

The production and consumption processes induce several side-effects or so called externalities in economic terminology. Various elements of the environment can be negatively affected such as water, air, soil, biodiversity, landscape and the climate. An important distinction is between local, national and global externalities. Effects of climate change are largely global so that it does not matter where emissions are reduced - which is of particular importance for policy.

Environmental externalities on material wellbeing are defined as the by-products of production and consumption activities that lead to a reduction in current and/or future production capacity. As the most prominent side-effect of industrialization, climate change is deemed to imply large destruction in physical capital through more intense and frequent storms, droughts and floods, and a rise in the sea level and average global temperatures. Climate change would also impair human capital, as increase in temperature would imply additional deaths from specific diseases (malaria and heat-related respiratory diseases), from deteriorating air quality, see Bollen et. al (2009). It could also cause higher morbidity, work absenteeism and premature withdrawal from the labor force for health reasons.

Environmental externalities on subjective wellbeing can also incur independently from any direct impact on current or future physical and human capital, and thus production capacity.

Aside from externalities, there are also policy-induced distortions leading to misallocation of resources that affects both the environment and GDP. One example is the absence, or very low, pricing of carbon and other GHG- emissions – a negative externality – which leads to excess resources being employed in activities leading to GHG- emissions.

Likewise, environmentally harmful subsidies also imply negative externalities, and their removal would jointly benefit both the environment and the economy – a win/win policy. A fact that deserves much more attention in international efforts to combat climate change is that fossil-fuel consumption subsidies, which are estimated by IEA(2010) to be in the order of magnitude of some USD 557 billion in 2008 in developing and emerging economies, is presently a huge policy-induced distortion. Although politically difficult, a significant reduction in these subsidies would both lower GHG- emissions and create fiscal room for other climate policy measures.

According to the IEA, a phase out of fossil- fuel consumption subsidies would reduce global CO_2 –emissions by 6,9 per cent in 2020.

2.2 Taxonomy of Policy Tools

One of the objectives of a climate policy strategy is to find the policy mix that minimizes the economic and social costs of a transition towards low GHG economies.

One of the primary criteria for policy assessment is the cost-efficiency of specific policy instruments. However, the appropriateness of policy instruments also needs to be assessed on the basis of:

- Adoption and compliance incentives;
- Their ability to cope with uncertainty;
- Their effectiveness in stimulating innovation and diffusion of green technologies;
- Since GHG- emissions and the resulting climate changes are global «bads», and since the effects as already mentioned does not depend on where GHGs are emitted, the extent to which policy instruments can be designed and implemented in a way that facilitates international coordination and a possible internationally agreed framework should also be considered.

For more details, see OECD (2010).

For the purpose of this paper I group policy tools under two broad categories, market-based and non-market instruments.

Market-based instruments aim at addressing market failures, e.g as those described above , through price signals and economic incentives. This category includes CO_2 taxes, charges and fees, tradable permits, and subsidies for reducing emissions, and reducing present large fossil-fuel subsidies as underlined above.

Non-market approaches can be divided into separate categories covering direct regulations, active technology support policies and voluntary approaches including information-based instruments.

It may be useful to distinguish between four types of tax instruments:

- Taxes and charges directly applied to the pollution source. Taxes on direct, measured CO_2 emissions are only found in Norway and Aragon in Spain. Sweden provides one of the rare examples of a direct tax on NOx;
- Taxes and charges applied on input or output of a production process – as a proxy proportionally with emissions - causing negative externalities. These are much more common such as taxes on motor vehicle fuels and motor vehicles, accounting for a large share of revenues from green taxes in OECD countries;
- Negative taxes (or subsidies) for environmentally friendly activities. Despite their budgetary costs, such subsidies are more commonly used than taxes applied to emissions;
- Deposit refund systems (not important for climate policies).

In the case of pollution trading systems, hereafter referred to as emission trading schemes – ETS – a distinction needs to be made between cap-and-trade and credit systems.

Under a cap-and-trade system, an overall limit of the amount of a particular pollutant like CO_2 emissions, is set by central authorities, which then issues pollution or emission rights or permits equivalent of that particular ceiling.

By comparison, instead of a fixed ceiling on the amount of emissions, credit systems usually impose a minimum performance commitment relative to some baseline profile of emissions.

For the present use of market-based instruments i OECD countries, see tables 1 and 2 in OECD (2010), which for convenience is reproduced as Annex I in this paper.

For the purposes of this paper, non-market instruments are grouped as follows:

- Command-and-control (CAC) regulations which include regulations that directly impose decisions on business choices and operations, either through technology standards – requiring operators to use a specific technology – or through performance standards, which set specific environmental or emission targets;
- Active (green) technology-support policies. This covers a range of policies designed to promote the development and deployment of technologies, including public investment in climate friendly R and D, as well as protection of intellectual property rights, the use of public procurement to foster green activities, green certificates and feed-in tariffs,
- Voluntary approaches include rating and labeling programs and voluntary agreements negotiated between the government and particular industrial sectors, such as the recent Norwegian NOX agreement which rapidly replaced the NOX tax adapted by the Parliament in 2007. Successive Norwegian governments failed to implement the necessary measures against NOX-emissions, and political economy considerations and sectoral interests rapidly led to the abolition of a cost-efficient measure. Thus Norway will not fulfill the Gothenburg Protocol, which turned out to be less politically important than bowing to sector interests, which unfortunately is a well-known issue when environmental- and climate measures conflict – perceived or real - with shorter term economic interests.

While the market-based instruments generally meet the cost-efficiency requirement, the non-market instruments generally do not. By failing to put a price or opportunity cost on the negative externality or global «bad» of GHG emissions, they provide no intrinsic mechanism for ensuring that emission targets be attained at least economic costs. These fundamental limitations notwithstanding, there are specific circumstances where non-market instruments may be more cost-efficient than alternative market-based solutions, notably when large information problems as well as monitoring and enforcement costs prevail over market failures.

Regarding Adoption and Compliance incentives, the political obstacles to broad-based adaption of market-based instruments are rather high and compliance incentives low, especially as compared with subsidies.

The political incentives to adopt non-market instruments may in general be higher than it is for taxes (and to lesser extent permits) given that the societal costs of non-market policies – often being higher than those of market based instruments - are not transparent to the wider public, and probably not to most politicians. This is particularly the case for technology support policies since such policy instruments largely amount to distribute subsidies.

Regarding the R and D technology diffusion incentives, the effectiveness can be based on the following criteria:

- Dynamic efficiency, that is whether the policy instrument creates incentives for continuously cheaper abatement options;
- Stability, that is whether it creates a clear, credible and fairly predictable signal about the long-term policy objectives;
- Flexibility, that is to what extent the instrument gives leeway as regards the technology used to reach the emission target,
- Incidence, that is to what extent it is directly targeted at the reduction of emissions.

See Johnstone and Harsice (2009).

By setting an opportunity cost on the emission of a particular pollutant or use of a natural resource, both taxes and trading schemes provide emitters with incentives to continously search for cheaper abatement solutions, in order to keep the marginal cost of abatement below the emission price set by the tax or the permit market.

As GHG emissions are global «bads», incentives for adoption in an international context are important.

- The main advantage of a tax is that harmonization of institutional settings is not required for implementation as it can be largely done through existing national tax collection systems. By comparison, a broadly based ETS-system would not be easy to implement without new legal framework and institutions;
- The main advantage of ETS-systems is that it provides a natural mechanism for financial transfers allowing for a clear separation between where emission cuts take place (where it is the cheapest to do so) and who bears the cost. Furthermore, permit allocation rules can even be designed to be more favorable to developing countries, thereby raising their incentives to join.

2.3 The Role of Technology

There seems to be an emerging consensus that acceleration in the development and implementation of climate-friendly technologies also is a necessary – but certainly not sufficient - element in future climate policies.

In a recent publication from The international Energy Agency: ”Energy Technology Perspectives: Scenarios and Strategies to 2050” (IEA 2010), it is argued that current energy trends run directly counter to long term climate objectives and are not sustainable. If present developments continue, the so called Baseline Scenario, energy-related CO_2-emissions are projected to roughly double from 2007 to 2050.

In the so called BLUE Map Scenario, energy-related CO_2-emissions are – on the other hand – projected to be reduced by 50 per cent in the same period.

Many of the most promising low-carbon technologies currently have higher costs than the fossil-fuel incumbents. It is only through technology learning from research , development, demonstration and deployment (RDD and D) that these costs can be reduced and the technologies become economic. Much clearer (political) signals of future policies and carbon pricing would be an important incentive to accelerate such developments. According to the IEA:” Most new technologies will require, at some stage, both “push” of RD and D (including public subsidies) and the “pull” of market deployment (economic, market-based incentives through taxes and trading)”, ibid., page 6.

A portfolio of low-carbon technologies, with costs up to USD 175 per ton of CO_2, when fully commercialized, will be necessary to halve energy-related CO_2-emissions by 2050. No one technology or small group of technologies can deliver the magnitude of the changes required.

The IEA BLUE map scenario projects investment requirements estimates for the whole period at some USD 316 trillion. Over the the past three years, annual investments in low-carbon energy technologies averaged approximately USD 165 billion. Implementing the scenario aiming at reducing energy-related CO_2-emissions by 50 per cent by 2050 (The BLUE Map), will according to the IEA require investments to reach approximately USD 750 billion per year by 2030 and rise to over USD 1,6 trillion per year from 2030 to 2050. It is not clear how much of these considerable sums should be financed by public subsidies.

2.4 Summing Up

Unless the public-good or market failures are dominated by monitoring and information costs, putting a price on carbon through mechanisms such as taxes and tradeable permit schemes represent the most efficient single policy to reduce GHG emissions. Non-pricing instruments should be mostly considered either as a complement to pricing mechanisms or for situations where the latter cannot work.

The use of non-market instruments is appropriate when market failures result in a weak response of agents to price signals.

Despite their drawbacks (that is lack of flexibility and low incentives to innovate), technology standards may nevertheless be the best option in specific circumstances, notably when the administrative costs of performance standards are too high and/or when abatement costs are relatively homogeneous across agents.

- Active technology support policies are wholly insufficient on their own to address environmental externalties or GHG emissions. They may nevertheless be appropriate in technology areas characterized by strong market size and learning-by-doing effects which lead to high entry costs. As shown by the IEA, developing low-carbon technologies consistent with objectives of the Copenhagen Accord requires large financial resources, see Section 2.3.
- Voluntary approaches are seldom effective in addressing climate change, but can be useful in revealing information about abatement costs and will most likely work best when the authorities are in a position to put strong pressures on emitters.

Like The Stern Review, see section 3 below, the OECD argues that: ”No single instrument scores well on each of the criteria used for the review, suggesting that many environmental challenges will be best addressed through a combination of instruments. This will be the case for most challenges involving several market imperfections and/or multiple and varied sources of pollution, such as:

- Where the development and diffusion of clean technologies are hampered by specific innovation failures, overall cost-efficiency can be improved by combining pricing instruments with R and D and technology adoption policies;
- Where the degree of damage caused to the environment depends on the specific location or timing of emissions, pricing instruments may need to be complemented with command-and-control regulation such as local standards on emissions or local bans on certain products;
- Information-based instruments can be useful and effective in strengthening the responsiveness of agents to price signals;
- A combination of taxes, tradeable permits and/or performance standards may be optimal in the case of multiple and varied sources of pollution. Again the best example is greenhouse gases where emissions originate from very different types of agents and economic sectors. However, instruments should be set as to minimize the differences in the implicit or explicit pollution prices across sectors.” OECD (2010), page 25.

The IEA and the OECD seem, perhaps with nuances, to agree that both the pull of market based instruments and proper carbon pricing and the push of subsidies to developing and implementing new and climate friendly technologies are necessary conditions for ambitious climate policies. Subsidies to stimulate new technologies will not be very effective if one does not at the same time get “the prices right”, so that it becomes profitable for the private sector

to implement such technologies. It is private business and households that need to be the main agents in moving towards low carbon economies.

3 Application of Principles: The Stern Review

According to The Stern Review. The Economics of Climate Change (2007): «Climate change is the greatest market failure the world has ever seen, and it interacts with other market imperfections. Three elements of policy are required for an effective global response:

- The first is the pricing of carbon, implemented through tax, trading or regulation.
- The second is policy to support innovation and the deployment of low-carbon technologies;
- And the third is action to remove barriers to energy efficiency, and to inform, educate and persuade individuals about what they can do to respond to climate change», see. Page xviii.

The Review stresses that climate change demands an international response – as it is in technical economic terms a global «bad» - based on shared understanding of long-term goals and an agreement on a framework of action.

It is argued that key elements of such a future international framework for action should include:

- Emission trading: Expanding and linking the number of growing number of emission trading schemes around the world. And if trading is not comprehensive – a condition likely to exist for some time – who pays: how are policy measures in developing countries to be financed;
- Technology cooperation: Informal co-ordination as well as formal agreements can boost the effectiveness of improvements in innovation around the world;
- Action to reduce deforestation;
- Adaptation policies.

The Stern Review is a major treatise on both the natural science and economic aspects of climate change of some 692 pages, and it should be required reading for everyone involved in the theme, natural scientists, engineers and social scientists. It is beyond the scope of this paper to review this major contribution in any detail.

Nicholas Stern published a second book of some 246 pages last year: A Blueprint for a Safer Planet. How to Manage Climate Change and Create a New Era of Progress and Prosperity (2009) focusing on policies ahead of COP 15 in Copenhagen.

Like in the studies by the OECD it is pointed out that emissions clearly are externalities, but their impact is unlike that of, say, congestion or local pollution in four fundamental aspects:

- The externality is long-term,
- It is global;
- It involves major uncertainties;
- And it is potentially of a huge scale.

Thus the heart of the economic analyses of this global market failure must be:

- The ethics of values both within and between generations;
- International collaboration;
- An appreciation of risk;
- And changes way beyond minor adjustment, or "marginal increments" in the jargon beloved by economists.

The central economic criteria in forming policy should be:

- Effectiveness in reducing emissions on the scale required;
- Efficiency, to keep costs down;
- Equity, in recognizing differences in incomes, technologies and historical responsibility.

Stern points out in this book that if economic output were to grow by little over 2 per cent per annum as an average globally until 2050, not an unlikely scenario, global GDP would expand by a factor of 2.5 – in other words, it would be two and a half times as big. Halving GHG-emissions by 2050 would therefore, in the event, mean reducing emissions per unit of output by a factor of 5 – an 80 per cent cut. This is consistent with the OECD analysis: "The Economics of Climate Change Mitigation. Policies and Options for Global Action Beyond 2012" (2009).

According to Stern, low carbon growth can be a reality if we so wish. We have to do four things:

- The first is to make much more efficient use of energy, which is used wastefully across the board – in buildings, industry, transport, power generation, agriculture and so on;
- The second is to halt deforestation;
- The third is to put existing (or close to existing) technologies to work quickly. In electricity these include wind, solar, hydro, wave and tidal;
- The fourth is to invest strongly in new technologies which are on the medium term horizon.

4 The Political Economy of Climate Change Mitigation

As further discussed in the following sections, the pricing of carbon and other policy measures to foster low emission economies over the longer term are likely to significantly accelerate industrial re-structuring with economic social changes.

Restructuring of labor- and product markets has led to resistance from the social partners and other interest groups or involved persons. In the case of climate change, one would expect larger resistance, for example because the costs come up front and the benefits appear largely in the longer run – which is not easy to handle for politicians who would like to be reelected every 3 or 4 years. One large political party in Norway did not join the political consensus of the need for climate policies adopted by all the other political parties in the Norwegian Parliament in January 2008.

In any case, even if one succeeds in convincing most politicians and the public at large of the need for strong climate policies, and succeeds in establishing policies that minimize structural changes when shifting from high to low-emission economies, climate policies are bound to raise concerns about their effects on:

- International competitiveness;
- Income distribution.

4.1 Concerns of International Competitiveness

Climate change is a global challenge as it does not matter where the GHG emissions take place. In the absence of international policy coordination, governments may be reluctant to take bold action – at least domestically. This is particularly the case when efforts to reduce emissions in one country, for example in a small, open economy like Norway, may be undermined or even completely sterilized due to leakage effects.

Furthermore, recent model-based analysis has shown that although most countries would achieve benefits from taking domestic action against climate change, some would gain much less than others, see Bosetti et al. (2009). This concern is particularly strong among energy-intensive industries like chemicals, metal products, iron and steel, paper and non-metallic mineral industries like the cement industry.

The most common policy measure to counter real or perceived loss of competitiveness has so far been to exempt trade-exposed, energy-intensive industries from the application of a carbon tax or a cap-and-trade scheme. However, this is not a long term solution to a short term political economy problem. Analysis has shown that exempting energy-intensive industries from such policy instruments could raise the global costs of achieving a given emission-reduction target by as much as 50 per cent, see OECD (2009).

Another measure to meet political economy concerns so far has been the free allocation of permits, as in the EU-ETS and Norwegian-ETS systems. The main drawback over time of such exemptions is that the competitiveness concern can only be addressed at the expense of incentives to reduce the production of carbon-intensive goods, and in addition governments forgo significant revenues.

4.2 Income Distribution Concerns

Income distribution concerns also generate resistance against climate change policies. Indeed, the burden of CO_2-taxes may fall disproportional on some low-income groups and skills categories. However, if the regressitivty of environmental taxes seems clear in partial, static analysis, it is much less obvious in general dynamic macro-model analysis, where the net distributional effects would depend on how the revenues are recycled but also on the wage response. Insofar as low-income households usually live in areas more exposed to the effects of climate change, they can expect to benefit proportionally more. Nevertheless, these concerns – real or perceived - creates political economy consequences hampering forceful climate policies.

As mentioned, policies to address climate change in the absence of a global agreement and the consequent lack of coordinated action across countries, opens national policy making to negative lobbying on a range of grounds.

4.3 Possible Political Economy Measures

The initial challenge seems therefore to convince voters that domestic action against climate change is worth taking, notwithstanding the cost, and given the uncertainties regarding other countries commitments.

According to Llewellyn (2010), the policy tasks to foster climate policy reform are:

Building a constituency for reform by:

- Educate the public in understandable terms about the case for mitigation;
- Make clear the potential consequences of inaction;
- Be open about uncertainties concerning the impact (damages) of climate change;
- Define an objective that can be accepted as both achievable and sustainable;
- Frame the arguments in terms of risk and insurance;
- Build strong and visible leadership within governments around mitigation policies.

Policy actions to secure a politically feasible and least-cost outcome are:

- Identify the main losers from mitigation action, including distinguishing between individuals (that is distributional impact of CO_2-taxes) and industries (competition, stranded costs);
- Quantify the mismatch between those who bear more of the cost and those who benefit most so as to calibrate the policy response (identify the intra- and inter-generational mismatch);
- Assess policy instruments in terms of their potential to minimize political resistance . There may for example be cases where a permit system is deemed preferable, even if a tax would be more cost-efficient.
- Identify and evaluate the least-cost options to ease the impact of policy, especially for those most effected;
- Take into account the wider economic implications of possible measures, e.g. job/or output reallocation effects.

For more details, see Llewellyn (2010).

5 Norwegian Official Research Papers and an Independent Foreign Peer Review 1991-2009

5.1 NOU 1992:3.Towards more Cost-Efficient Environmental Policies in the 1990s

The Environmental Tax Commission (Miljøavgiftsutvalget) was established by The Norwegian government 14. December 1989 and consisted of civil servants from The Ministries of Environment, Finance, Industry and Transport, Head of Research Lorents Lorentsen of Statistics Norway and professor Michael Hoel of The University of Oslo. Most of the members of both the Commission and the Secretariat were economists.

In the 1980s Statistics Norway carried out research in the area of environmental- and energy economics, inter alia through the SIMEN project, and the OECD did considerable analytical work on the economics of climate change from the beginning of the 1990s. Both in Finland

and Sweden similar commissions were established before the one in Norway, and Finland was the first country in the world to have a CO_2 tax.

The Norwegian Commission presented its proposals in two reports:

- Status report from The Commission . Economic Instruments in the State Budget for 1991. A confidential report to the Government 30. April 1990;
- NOU 1992:3. Towards More Cost-Efficient Environmental Policies in the 1990s. January 1992.

Both will be commented on in turn.

The timing of the first report of April 1990, delivered only some four months after the Commission was established, should be seen in the light of the Government wanting analyses and concrete proposals as a basis for their State Budget proposal for 1991. In the following focus is given to emissions to air and climate related questions as there were proposals for green taxes in a fairly large number of areas.

The point of departure was the following Norwegian national environmental objectives at that time:

- Emissions of CO_2 should be no higher in the year 2000 than in 1989;
- Emissions of SO_2 should be reduced by 50 per cent by 1993 compared to the base year 1980;
- Emissions of NOX should be reduced by 30 per cent by 1998 with 1986 as a base year.

In section I.3 : Longer Term Considerations and Criteria for Choice of Policy Instruments, the basic challenges of (negative) externalities and lack of markets are discussed, although less elaborate than in recent OECD publications such as: ”The Economics of Climate Change Mitigation. Policies and Options for Global Action Beyond 2012”, Paris 2009. But all the basic environmental economics of climate change is present in the Report from April 1990.

The Polluter Pays Principle is discussed, and the following three criteria for use of policy instruments are elaborated upon:

- Cost-Efficiency;
- Effectiveness ;
- Incentives for technological development and innovation.

All these three are on the Taxonomy of Policy Tools discussed in section 2. 2 above.

Ability to cope with uncertainty was, however, not much discussed by the Commission.

Political economy aspects were. In section I.4 of the April 1990 report, pages 23-28, Structural Changes and Target Conflicts were elaborated upon, notably the question of international competitiveness, which was important for the concrete proposals for 1991:

- Proposal 1: A CO_2 tax on all fossil fuels, with the exception of wooden material, should be introduced. A real increase in the gasoline tax of NOK 1 per liter from 1990 to 1991 and a similar real increase for other fossil fuels;
- Proposal 2: CO_2 tax on domestic air transport;
- Proposal 3: Awaiting more international coordination, and for competitiveness reasons, the following temporary exemptions were proposed for 1991: Shipping,

petroleum activities in the North Sea, and reduces tax rates for inland shipping and fisheries and the use of coke and coal in industrial processes.

All in all there were 14 proposals in this Report, and they are summed up in Table 3, page 33, of the report.

More elaborate analyses and discussions regarding economic consequences are discussed such as effects on prices, on emissions to air, consumption for various groups of households etc analyzed with the aid of the macroeconomic model MODAG.

The final report, NOU 1992:3, is 256 pages long, including three appendices. It should be seen in the light that a fair amount of the concrete proposals in the April 1990 report had already been accepted and introduced by the Norwegian Government, and that it sums up two years of work in the Commission. It is basically a broad and analytical strategy document for how to integrate better environmental- and climate policies into economic- and sectoral policies for the 1990s, and in addition there are concrete proposals and evaluations of the following policy instruments:

- Emission rights that are traded;
- Environmental taxes;
- Deposit- refund systems;
- Subsidies;
- Direct regulations.

International aspects are discussed much more than in the April 1990 report, as it was presented in the run up to the Rio de Janeiro Conference later in 1992. The cost-efficiency requirement is nuanced in the sense that the Commission differentiates between national cost-efficiency (Box 1.1 page 20) and international cost-efficiency (Box 1.2 page 28). In appendix 1:»Principles and Guidelines for Cost-Efficient International Environmental Agreements», this is discussed in some detail. The main point being that pricing of the environment in general and GHG-emissions in particular – through taxes and ETS-systems – should be equal at the margin, not only across sectors and fuels/emissions in each country, but also as far as possible across countries as marginal costs of GHG mitigation vary a lot between countries. Since it does not matter where global GHG-emissions are reduced, international cost-efficiency as an important criterion for policy making and international negotiations, was a main point in NOU 1992:3. The policy implication, namely that one reduces emissions the most in countries where it is the cheapest, created many of the same emotions then as now. The representative of The Ministry of Environment was instructed by his minister not to join the rest of the Commission in recommending this principle, as The Minister of Environment wanted to stick to a national goal – which afterwards was abandoned as unrealistic. In any event, international aspects of climate change policies were discussed before the UNFCC negotiation process started.

Technology aspects were relatively little discussed, although the important role pricing can play by stimulating environmentally friendly technological advances, so called dynamic efficiency, was discussed at some length.

An analysis is presented in section 1.7, pages 30-37 in NOU 1992:3, of:"Effects of the Phasing in of a System of Better Pricing of Emissions to Air under several Alternatives" using macroeconomic models.

Two alternatives, The Combination Alternative (CA) and The Agreement Alternative (AA), were highlighted and compared with a reference scenario of business-as-usual (BAU) for the period 1990-2000. In AA it is assumed that Norway joins an international cost-efficient agreement, and in the CA alternative it is assumed that Norway in addition takes on a bilateral

commitment of stabilizing national CO_2-emissions at the 1990 level in the year 2000. (In the Kyoto protocol from 1997, Norway was allowed to increase GHG-emissions in 2012 by one per cent compared to the level in year 1990.).

The analysis shows that in CA compared to AA:

- GDP for mainland Norway is 15 billion NOK lower in 1990-prices, or more than 2 per cent lower;
- Industrial production is lower;
- Employment is more than 1 per cent or 20000 persons lower.

However, with these economic costs, CA has only a very marginal effect on global GHG-emissions compared to AA. Net domestic use of energy is considerably lower in CA compared to AA as much of the Norwegian energy-intensive industries are reduced or knocked out in achieving a national emission goal inefficiently.

Thus, climate policies and structural changes for a small, open economy were highlighted through the analysis, and the uncertainty of these changes were discussed in some detail. So the competitiveness issues, a main element of the political economy considerations as elaborated upon above, and possible «carbon leakage» were significant elements in NOU 1992.3.

5.2 NOU 1996:9. Green Taxes : Policies for a better Environment and High Employment

The Green Tax Commission was established as a result of a budget compromise in the Parliament in the Fall of 1994 between the Labor party and the Socialist Peoples party. It was established by royal decree in December 1994 and delivered its report to The Ministry of Finance in June 1996. The final report was a large, 394 pages long with 4 appendices (Appendix 1 discusses:"Optimal and Green Taxation"), research report covering fairly comprehensively the Norwegian tax system and also harmful subsidies vis a vis the environment in The State Fiscal Budget. The following questions were asked:

- What is the scope for green taxes both in the short and longer run?
- What will in the event be the results regarding an improved environment and the efficiency of the tax system?
- Can high employment be maintained through tax switching from labor- to green taxes, and are there double dividends?
- What are the harmful subsidies on the expenditure side of The State Budget?

The Green Tax Commission was a different animal from The Environmental Tax Commission in the sense that the social partners were members in addition to a prominent member from Norwegian industry (Eivind Reiten). The four ministries Environment, Finance, Industry and Transport were represented as well as Statistics Norway (Solveig Glomsrød), Cicero (Helga Hernes), three economic professors (Christiansen, Hoel and Mæhler), and representatives from the NGOs. Chair was former civil servant and ambassador Bernt H. Lund.

In addition to the broad questions listed above, the following challenges were looked at:

- How will green taxes influence Norways role as a large exporter of energy (petroleum) and the revenues from these activities?

- How will it influence the desire of Norwegian authorities to be a role model for international cooperation both for higher employment and an ambitious climate agreement?

NOU 1996:9 contains a broad range of analyses and recommendations regarding:

- The efficiency of tax systems, including the question of a double dividend;
- Taxation of rents;
- Green taxes and charges, including the revenue potential in the medium- and longer term;
- Employment policies;
- The economic effects of a substantial Green Tax Reform.

Regarding Norwegian climate policies, three approaches, or a combination thereof, are analyzed:

- The importance of Norwegian policies for reductions of global emissions of CO_2;
- The importance of Norwegian policies for reduction of national emissions of CO_2;
- The importance of Norwegian policies for making visible a policy that would be effective if it gained widespread support internationally.

Regarding the environmentally harmful effects of subsidies, these were classified and analyzed as follows:

- Direct subsidies to environmentally harmful activities in the state budget;
- Exemptions from taxation (excluding environmental taxes);
- Exemptions from environmental taxes;
- Other forms of under-pricing of goods and services from an environmental point of view;
- Support in the form of protection against international competition.

The majority of the members of The Green Tax commission proposed that CO_2-taxes, which had remained largely unchanged in Norway since 1992, should be differentiated according to the carbon content of the various fuels (cost-efficiency across fuels). As a consequence of a carbon graded system is that the present (in 1996) exemptions for certain products and uses would disappear, and that in the short run the tax would be set at NOK 50/ton CO_2 for uses and products that were not taxed (in 1996). A possible further escalation of the CO_2-tax should be seen in relation to Norway as a role model in international climate policies and negotiations.

The main recommendations of a green tax reform included CO_2-taxes, SO2-taxes, gasoline taxes, taxes on buses, on the use of gas, automobile taxes, and reductions of a large number of environmentally harmful subsidies. These are summed up in NOU 1996.9, chapter 3.10, pages 75-88. It should be noted that the majority recommendations, notably those which concern cost-efficiency of green tax systems, were supported also by non-economists, the representative of CICERO (Helga Hernæs) and the NGOs. A number of analyses and macroeconomic simulations were carried out by The Green Tax Commission. In one alternative called the escalation alternative (EA), it was assumed that CO_2-taxes over a period of 7 years were increased in all sectors of the Norwegian economy to NOK 360 per ton which were the same level as the CO_2-tax on petrol in 1996. A recycling of tax revenues was assumed allowing the employers social security contribution to be reduced by 2 percentage

points over the same period. In the period up to 2010, the EA compared with the business-as-usual, BAU alternative gave the following simulation results:

- A slightly lower GDP for Mainland Norway;
- Higher employment as the tax switch stimulated labor intensive industries;
- Consumer prices and wages increase somewhat less;
- Norwegian CO_2-emissions were 12 per cent lower in 2010 compared to BAU,
- By 2010 gross value added in the metal industry was estimated to be 22 per cent lower than in BAU.

Thus over all, there seemed to be a double dividend in the sense that a substantial tax switch would contribute to maintain over all GDP and employment while reducing national CO_2-emissions substantially. However, capital- and energy intensive process industries – situated to a large extent in the districts – were reduced by more than 20 per cent.

These analyses did not succeed in gaining a consensus in the Commission. The representatives from the social partners and industry, objected largely because of the industrial consequences elaborated upon above, arguing that this would also lead to carbon leakage and thus little effect on global GHG-emissions.

The many proposals of the majority of The Green Tax Commission were largely not followed up by the Labor party in power at the time. In the Fall of 1996 prime minister Harlem Brundtland stepped down and was replaced by Thorbjørn Jagland. Jens Stoltenberg, who supported the minority of the Commission as Minister of Industry- and Trade, became Minister of Finance.

A White Paper from the Bondevik government which took power in 1997 suggested a follow up, but these proposals were largely not accepted by the Parliament which wanted the government to look at an alternative market based policy instrument. Emission Trading.

5.3 NOU 2000:1 A Quota System for Green House Gases. Instrument to honor the Norwegian Commitment under the Kyoto Protocol

As a result of the Report to the Parliament no. 54 Green Taxes (1997-98), the Parliament decided to ask the government to look into another market based instrument, namely tradeable quotas – ETS-systems. As mentioned above, there was reluctance to follow up on the proposals of The Green Tax Commission while at the same time Norway signed the Kyoto protocol in late 1997 taking on legal commitments to limit emissions of GHGs.

One of several political economy aspects in this connection was that the social partners, who largely opposed green taxes, looked for an alternative. Their strategy was that they thought it was easier to obtain free quotas in an ETS-system than exemptions from, or reduced, green taxes.

NOU 2000:1 was the third large Norwegian Official Research Paper during the 1990s. A saying goes that:»When the government does not know what to do, establish a new research group». The report is 221 pages long. Unlike the Green Tax Commission, the social partners were not directly represented, but Statoil (Gerd Halmø) was represented along with CICERO (Cathrine Hagem) and Worldwatch Institute (Øystein Dale). Chair was Eva Birkeland of Statistics Norway, and the Ministries of Environment-, Finance-, Oil- and Energy-, Trade- and Industry and Transport were represented – and professor Michael Hoel was once more an expert member. However, there was a large Reference Group with the social partners and others which followed the work closely.

The following possible reasons for offering free quotas were discussed in NOU 2000.1:

- Competitiveness of Norwegian firms;
- Structural changes in the economy;
- Carbon leakage;
- Regional considerations;
- Possible imperfections in capital markets.

A majority of the members, the chair and the representatives of The Ministries of Finance- and Transport and the experts from CICERO and The University of Oslo recommends that:

«All participants pay full market price for emission quotas», ibid, page 17.

The representatives from Statoil and Worldwatch Institute did not agree arguing that it was necessary to: conserve a national industrial infrastructure.

The three representatives from The Ministries of Environment-, Oil- and Energy and Trade- and Industry had, after two years of work, no recommendation to offer other than saying that: «There is a political question to decide who should receive free quotas and how much», ibid page 19.

So deciding on this «political question», not only was there opposition from the social partners and Statoil, there were internal splits between the ministries and in the Government. Unlike in The Green Tax Commission, The Ministry of Environment did not come out clearly in favor of ambitious and cost-efficient climate policies.

Macroeconomic analyses were conducted of four alternatives:

- The minimum alternative without free quotas;
- The minimum alternative with free quotas;
- The sales alternative which is an ETS-system encompassing all emission of GHGs at market prices;
- The free quota alternative were the economic sectors exempted from CO_2-taxes (in 1999) were given free quotas for 70 per cent of their GHGs in 1990.

For more details, see chapter 13, pages 134 – 157.

As in NOU 1992:3 and NOU 1996:9, the consequences of cost-efficient climate policies, or the lack of such policies, were extensively analyzed – including the efficiency of actually reducing Norwegian and global GHG-emissions, government (State) income, and industrial and regional consequences. Indeed one may say that after CO_2-taxes were introduced in the early 1990s where Norway was an early mover, the social partners and other political economy considerations – including the different views between ministries involved in climate policies -partially succeeded in preventing the general spread of the use of economic instruments in Norwegian climate policies before the next decade to which I now turn.

5.4 NOU 2006:18.A Climate Friendly Norway

In the mandate for this NOU given by royal decree 11. March 2006, the focus is largely on two aspects:

- National (Norwegian) emissions reductions. A “national climate vision” should indicate how Norwegian emissions could be reduced by 50-80 per cent by 2050;
- Technological developments. “Main focus should be put on the possibilities to develop and implement new technology”, NOU 2006:18, page 15.

It seemed that the initiator, The Ministry of the Environment, wanted a report with natural scientists and technology experts as The Ministry of Finance was not invited to join in the work. Furthermore, the mandate contained little mentioning of how national emission reductions and technological developments relate to what other countries do and to global developments.

The main conclusions of the Commission are that a reduction of Norwegian (national) emissions by two/thirds by 2050 is necessary, doable and not very expensive. It recommends a formal national goal for GHG-emissions reductions to be reviewed by 2020. Table 1.1., page 12, contains 15 recommendations, the two main being:

- A long term information plan,
- Long term and stable public subsidies to their technology package which then in turn are specified by 13 recommendations regarding transport, energy-efficiency, agriculture, the process industry, petroleum activities and electricity production.

A good part of the costs of these measures should be born by the Government over The State Budget, and other costs can be "born by the polluter and be part of a natural renewal", ibid page 13. The main thrust of NOU 2006:18 was thus to propose relatively few but concrete policy measures which were affordable – if not necessarily cost-efficient.

This National Climate Vision was somewhat at odds with The Stern Review (published later in 2006) and the OECD which argues that:" Active technology support policies are insufficient on their own to address environmental externalities. They may nevertheless be appropriate in technology areas characterized by strong market size and learning-by-doing effects which lead to high entry costs", see section 2 above. On the other hand, even if cost-inefficient but affordable, distributing public subsidies scores higher on the adoption and compliance criteria discussed in section 2: "The political incentives to adopt non-market instruments may in general be higher than it is for taxes (and to lesser extent permits) given that costs of non-market policies are not transparent to the wider public. This is particularly the case for technology support policies since they largely amount to distribute subsidies", OECD (2010). Public subsidies to renewable energy and green technology developments have been increased significantly in Norway in recent years, probably influenced by NOU 2006:18. For the period 2006-2010 the Government has set aside NOK 3.3 billion for renewable energy and energy efficiency measures through Enova. See also the IEA view discussed in section 2.3.

There are some economic analyses of consequences of the proposals in chapter 8 exhibiting much smaller costs and structural changes than in the previously mentioned Norwegian studies.

Shortly after this NOU, The Stern Review published later in 2006 stole the headlines and largely dominated national and international debates on climate policies. Thus the limits of discussing national climate policies largely in a national vacuum, a limit given in the mandate by The Ministry of Environment, was much discussed in the aftermath of NOU 2006:18. And the debate of to what extent Norwegian policies should largely be dependent on what others do and an international agreement, or to what extent we should also have national goals and climate policies more independent of international developments, continued.

5.5 An Independent Peer Review of Norwegian Sustainable Development Policies

The Peer Review was initiated by The Ministry of Finance, responsible for the coordination of sustainable development policies in Norway, as part of the revision of The National

Strategy of Sustainable Development. Here the focus is on the chapters of the report on climate issues.

It was carried out by economic and non-economic experts from the Swedish administration and one economist from The Ministry of Finance of Uganda, and the work was coordinated by Lars Lundberg of The Swedish Ministry of Finance.

The Peer Review, presented in March 2007, criticized Norwegian climate policies at the time for being unclear on the importance of cost-efficiency as a requirement for policy. On page 15, section 2.5, The Group writes. "An important principle for the development of policies for sustainable development should be cost-efficiency, which is emphasized in article 3 of the UNs Climate Convention. Cost-efficiency is not given status as a guiding principle in The Norwegian Action Plan for Sustainable Development". The practical importance of the lack of cost-efficiency was illustrated by the CO_2-tax with is exemptions and differentiated rates.

The Group recommended that: "Norway should consider to auction off the largest possible share of total quotas when Norway in 2008 joins the EU ETS-system", and it supported public support to develop Carbon Capture and Storage (CCS) technologies. The main message from this independent Peer Review Group was the lack of clear and consistent climate policies in Norway – delivered in the middle of the internal government process of preparing a White Paper on climate policies in June 2007 to the Parliament. Clearity, and cost-efficiency as a guiding principle for climate policies – as recommended by the Peer Review Group – was not followed up in the June 2007 White Paper on Norwegian climate policies.

5.6 NOU 2009:16. Global Environmental Challenges – Norwegian Policies

The parliamentary consensus regarding climate policies supported by all political parties except one adopted in January 2008 was rather general in a number of ways. The Ministry of Finance in the run up to COP 15 in 2009 felt the need to clarify some of these questions through the aid of another Official Research Paper.

The group established by royal decree 30. May 2008 was in many ways similar to The Environmental Tax Commission of the early 1990s. It was chaired by the director of Statistics Norway (Øystein Olsen) and consisted largely of Norwegian and one Swedish economic experts. It was supported by a secretariat from The Ministries of Environment- and Finance and Statistics Norway.

A main issue was a "systematic consideration of sustainable development in the public decision making process regarding:

- How longer term issues may be handled in the day to day decision making process;
- Methods to evaluate future, uncertain and partially unknown environmental damages;
- What are the hindrances to the introduction of new and more sustainable and environmentally friendly technologies,
- How to improve existing rules and guidelines for public decision-making processes to support sustainable development", page 7.

The Group focused on the climate challenge, biological diversity and hazardous substances. Here the focus is on climate change.

Principles and choice of policy instruments are discussed in section 3.7.2. The Group notes that most of the policy instruments to combat climate change lie outside the responsibility of The Ministry of Environment. It is further noted that : "Independent of choice of goals, there

has under the various governments (since NOU 1992:3) been developed some key principles for the choice of policy instruments of which the two most important are:

- Effectiveness (Styringseffektivitet);
- Cost-Efficiency (Kostnadseffektivitet).

Back to square one. This is almost identical with the view in NOU 1992:3. Effectiveness is reducing emissions on the scale required, i.e. to realize a specific goal for reducing GHG-emissions. Cost-efficiency is to keep the costs down, i.e. to achieve these goals at least social and economic costs. Or that: "The environmental improvements in society are in as little conflict as possible with other political or societal objectives", White Paper no. 58 (1996-97). However, these two criteria are not the only ones in the choice of policy instruments. "Decision makers also have other considerations, especially distributional consequences", NOU 2009:16, pages 20-21.

Chapter 4 is a broad update on the climate challenge, including The Stern Review, the global challenges leading up to COP 15, and global economic costs of mitigation policies (Table 4.1). The group notes that present (in 2009) Norwegian climate policies give uneven incentives for emission reductions depending on which sector or type of energy carrier the emissions come from. Figure 4.4, page 35, illustrates that the marginal costs of CO_2 reductions in kroner per ton CO_2 vary between sectors and type of energy carrier, and thus that: "Present use of policy instruments vis a vis CO_2-emissions do not satisfy the criterium of cost-efficiency", ibid page 35.

International considerations are given a prominent place in NOU 2009:16. It is illustrated in figure 4.5 of the report that emissions of CO_2 per capita in mill. tons in 2006 varied between 20 in the US, 10 in Norway and around 5 in China and as a global average. Thus costs vary widely between countries and regions. Thus international cost-efficiency means that GHG-emissions are reduced the most where it is the cheapest:" To minimize the social and economic costs for the world as a whole to achieve a certain goal for climate policies, all firms and households in all countries should – directly or indirectly – face the same price of emissions", NOU 2009:16, box 9.5.

Of the main recommendations of the report in section 9.6, recommendation 5 stating that. "A domestic (national) goal for emissions developments means a solution which is not cost-efficient ...", page 103. It is just stating a fact, but a weakness of the report is that it is not estimating the extra economic and social costs of having a national goal as was done in the NOUs of the 1990s.

NOU 2009:16 is positive to public R and D support for climate friendly technologies, but less so than NOU 2006:18. In the latter this was seen as one of two main policy instruments, while in the former it is seen as an important and necessary supplement to market instruments – as in The Stern Review and by the OECD.

6 Climate Change Policies and Structural Change

Industrial restructuring and structural economic and social changes are intrinsic elements in economic development processes. In recent decades these restructuring processes within and between countries have become more pronounced through enhanced globalization and the emergence of rapidly growing economies like Brazil, China and India implying a changing division of labor with the slower growing OECD countries. Norway has experienced large changes in its economy since petroleum emerged as a major factor of economic development forty years ago – partially replacing more traditional industries. Many of the goods produced domestically at that time are now imported from China. However, CO_2-taxes and an ETS-

system have not prevented Norway from performing well economically since the crisis of the early 1990s – indicating that reasonably ambitious and market based climate policies have been consistent with good economic performance and high employment.

In section 5 analyses of intensified structural change caused by climate policy instruments in Norway were reviewed. In all cases structural changes were intensified by CO_2-taxes or implementing ETS-schemes under varying assumptions. In one case where a large recycling of taxes away from labor and towards CO_2-emissions was assumed, the analysis showed that over-all employment held up compared to BAU. But as labor-intensive industries were stimulated by such measures, energy- and emission-intensive industries exhibited significant reductions in production and employment – as would be expected in a small, open economy. From a political-economy point of view, the regional location of these industries is important as well. Unfortunately, there is a lack of such Norwegian analyses during the last decade. See, howewer, The National Budget 2011, section 3.6.

The climate policies needed to achieve the 2 degree target in the Copenhagen Accord from December 2009 would, in the event, lead to intensified reallocation of resources within and across broad economic sectors. The OECD has recently with the aid of their ENV-Linkages model analyzed the potential economic restructuring on a global and regional basis of climate policies consistent with reaching the objectives of the Copenhagen Accord.

To identify the pace and extent of industrial restructuring that a transition to a greener or low-emission economy could imply, two GHG emission reduction scenarios were considered and compared to a business-as-usual (BAU) scenario.

The results reported in OECD (2010) show that for the majority of Annex I countries, achieving ambitious emission cuts would lead to a substantial increase in the extent of sectoral re-allocation relative to BAU. For example sectoral shifts would be twice as large as those experienced in the absence of ambitious climate policies in the European Union/EFTA (The European Economic Area/EEA) and Canada, and nearly three times as large in the United States. In the case of non-Annex I countries, participation to a global effort to stabilize emissions at 550 ppm would lead to a substantial increase in the extent of structural reallocation in Brazil and China, but not in India.

In general, the largest declines in sectoral economic shares are found in the fossil-based electricity and transport sectors, which is not surprising considering that these represent two of the main sources of CO_2 emissions. The agricultural sector, a major emitter of methane, also loses importance in countries where they represent a significant share of the economy – which is not the case in Norway. By comparison, the decline in the share of energy-intensive industries – the third major source of emissions – is relatively modest except in the Australia/New-Zealand region. In all cases, the sectors which gain most are construction and services. Relatively small gains are observed for renewable energy sources.

Since this issue is an important determinant for the practical progress of climate policies and negotiations, there is need for further national, regional, and global analyses of not only over-all global losses of GDP - which show relatively small losses of GDP in most such studies – but the structural implications of a potential binding target for future GHG-emissions, and how one could facilitate a transition to low-emission economies with least social and economic costs. As part of future climate policy processes in Norway, Statistics Norway and The Ministry of Finance should analyze these issues with the proper models. One should also look for the future opportunities for “green growth” which may be considerable.

7 Conclusions

7.1 Summing Up

Emerging international consensus, at least as recently proposed by The Stern Review (2007) and the OECD (2009 and 2010), on the use of policy instruments to mitigate GHG-emissions is that:

- Cost-efficiency and effectiveness remain basic criteria for best practice policies;
- Political compliance incentives, the ability to cope with uncertainty, the effectiveness in stimulating innovation and diffusion of green technologies, and the extent to which policy instruments may be designed and implemented in a way that facilitates international cooperation and a possible future global climate agreement are also important considerations.

As there is no formal international framework established beyond the Kyoto period, political economy considerations have made governments in OECD countries – including the Norwegian one – reluctant to adopt forceful and cost-efficient national mitigation policies. At the same time future major emitters of GHGs such as China and India have adopted national energy-efficiency plans, but not committed to formal targets for limiting emissions.

Recent global analyses by the Stern Review and by the OECD and the IEA, make it clear that a continuation of present policies – with a large number of exceptions and imperfections – will never succeed in combating future climate change in an ambitious way. The IEA argues that a continuation of present energy trends and technology developments may lead to increased energy-related CO_2-emissions of some 50 per cent by 2050. On the other hand, if the necessary climate policies consistent with the Copenhagen Accord were put in place, this would accelerate structural economic changes. Thus implementing such changes at least or low social and economic costs remain a crucial issue. In any event, a political choice has to be made: If one wants to buy sufficient insurance against future climate change, the necessary structural changes of transforming high emission economies to low ones must be accepted . To think that one can subsidize ones way out of this, or rely only on technological miracles, is probably an illusion. Last but not least, policy-induced distortions such as the 557 billion USD subsidies in 2008 of the use of fossil fuels in developing and emerging economies must – however politically difficult – be reduced.

Norway was an early mover both regarding economic analyses and the use of market based instruments i climate policies, introducing a CO_2-tax in 1991. Presently a little over 70 per cent of Norwegian emissions under the Kyoto protocol are facing quotas or CO_2-taxes. Thus, these two market based instruments, admittedly with exceptions and free quotas, are the main climate policy instruments in Norway. International considerations, notable membership in the European Economic Area and that the Norwegian ETS-system became integrated in the EU ETS-system in 2008, has been as important recently for national climate policies as decades of analyses and debates. EU has recently revised their Quota Directive for the period 2013-2020. For Norway this would mean, in the event, that process industry – presently excluded along with agriculture – will be included so that quotas and green taxes will cover 85 per cent of Norwegian GHG-emissions during the coming decade.

Outside the area of mitigation, large public subsidies have recently been offered by the Norwegian government to development of technology in Norway and deforestation projects abroad. NOK 4 billion is to be used on CDM projects abroad in order to bilaterally exceed our Kyoto commitment by 10 per cent by 2012. In this sense Norway may be said to be a role model.

The Official Research Papers reviewed in this paper and other studies and processes have contributed to these policy developments and to increasing understanding between ministries, the social partners, NGOs and various professional groups. The Norwegian (Nordic) model of political decision making may not be perfect, but no better alternative to solve conflicts seems to be available, and the major Norwegian labor union (LO) – and indeed the Nordic labor unions, see (2009) – are positive to the 2 degree objective, and to cooperating on climate policies. An outstanding issue is to what extent Norway "should go it alone", with separate national emissions goals, what the benefits of such policies would be in reducing global GHG-emissions, and how much extra social and economic costs one in the event would be willing to incur. In the hearing process regarding NOU 2009:16, industry and the labor unions are against having separate national goals while the environmental organizations and the NGOs are in favor, see The Revised National Budget 2010.

An updated overview of present Norwegian climate policies and developments regarding emissions of Norwegian GHGs since 1990 are given in Report no.1 to the Parliament (2010-2011) : The National Budget 2011, chapter 3.6:

- Norwegian emissions measured in mill. tons CO_2-equivalents increased from 49.7 in 1990 to 50.8 in 2009;
- Emission intensity, that is emissions per unit of Gross Domestic Product (GDP), has been reduced over this period by some 37 per cent in a period in which Norwegian GDP per capita increased by more than 52 per cent;
- Climate policies initiated in Norway since 1990 are estimated to have reduced Norwegian emissions by some 11-14 tons CO"-equivalents by 2010 compared to an estimated development without such measures;
- -Assuming a continuation of present policies, but with no new policy measures, Norwegian emissions are estimated to increase to some 57-58 mill. tons of CO_2 equivalents by 2020.

7.2 Some Lessons for Future Policies

7.2.1 International Cooperation

A key premise for policy and future international cooperation, not always well understood or acknowledged, is that GHG-emissions constitute a negative externality to our economic systems that differ from externalities in connection with for example congestion or local pollution in four fundamental aspects.

- The externality is long-term;
- It is global;
- It involves major uncertainties;
- And it is potentially of a huge scale.

Global negotiations involving many countries are always difficult. The international trade negotiations, the Doha-round, started 10 years ago and has stalled. A global binding agreement on reducing GHG-emissions is more difficult to achieve because:

- It does not matter where emissions are reduced, and costs of reductions vary widely geographically. This raises questions of carbon leakage and free riding;
- Benefits vary widely between countries and regions, and they are largely long term,

- Natural scientists have estimated that limiting average global temperatures to 2 degrees C above preindustrial levels requires very large reductions in global GHG-emissions which in turn – according to calculations by the OECD and the IEA - requires large structural changes in our economies and massive investments in new technology implying large increases in public subsidies;
- Developed countries are called upon – rightly – to finance climate measures in developing countries in a situation where a number of developed countries after the financial crisis in 2008 have difficulties in managing their domestic public finances.

These are extremely challenging conditions, and while one should continue to strive towards what may be considered as a first best international solution in the form of a comprehensive and binding global agreement, political economy lessons and considerations tell us that we should at the same time look for constructive second best policies that would move us in the right direction. These should build on a number of positive developments over recent years:

Emission intensities, that is GHG-emissions per unit of GDP, are significantly reduced in many developed countries. In Norway emissions increased some 2 per cent from 1990 to 2009 while GDP per capita increased by more than 50 per cent in the same period.Thus a favorable economic development was combined with CO_2-taxes, emission trading and other policy measures;

-Emerging global economic powers like China and India have ambitious goals for energy efficiency in their economic plans, and one should look more for synergies between the drive to save energy and renewable energy and climate policies.

Thus international cooperation in the short- and medium term should, through bilateral and multilateral cooperation and agreements aim at:

-Strengthening experiences made with the introduction of ETS-systems, looking for ways of gradually including more sectors, reduce free quotas and strengthening present markets. Continue to look for ways of using such systems for the financing of climate measures in developing countries,

-Look for ways of increasing investments in the application of new technologies, and for cooperation on the transfer of such technologies to developing countries;

-Build on the success of present deforestation projects which show developing and emerging economies that some developed countries are willing to finance measures in their countries leading to rapid reductions of GHG-emissions.

The world economic order has changed a lot through rapid globalization since the climate convention was adopted in Rio in 1992, and we learned in 2008 and 2009 that the emerging global economic powers could in the G-20 Group agree with the established ones on measures against the global financial crisis. Agreement on a global solution to the climate challenge, which is more long-term and difficult, may - in the event - have to be adopted in such a setting.

7.2.2 Norwegian Policies

Interactions and discussions between the various science- and interest groups and the social partners, through Official Research Papers, although sometimes long-winded and frustrating , have been useful and should be continued as necessary as part of the workings of “The Norwegian Model”. This model also involves broad political accords on key policy issues which are compromises, as the one on Norwegian climate policies in the Parliament in January 2008. However, to be useful for future policy making, one should also acknowledge more explicitly that ambitious climate policies mean, in the event, accelerating structural change where some will be losers as future generations benefit.

Future Norwegian climate policies should thus identify more explicitly what these benefits and costs are, and what can be done to help the losers – preferably as part of an international agreement. If one wants separate and more ambitious national policies, the economic and social costs should be made explicit along with what the possible benefits may be in the form of reduced global emissions of GHGs.

Future policies should not hide the uncertainties and should be couched more clearly in terms of risk and buying insurance against such future risks and damages, a fundamental intergenerational issue.

Cost-efficiency and effectiveness – as in other policy areas – should be guiding principles for future climate policies, but due consideration should also be given to stability, the adoption and compliance incentives, the ability to cope with uncertainty, their effectiveness in stimulating innovation and diffusion of low-carbon technologies, and the facilitation of international cooperation – as with the Norwegian and EU ETS-systems – and possibly a binding global agreement down the road.

Credible and stable longer term signals about future frameworks and policies are key elements. The twenty year history of Norwegian climate policies reviewed in this paper is one of ambitious (national) goals that successively and quietly have been abandoned. I will argue that future climate policies will be more credible and effective over time if one could agree on realistic targets which in turn were backed up by a consistent set of policy instruments which were both least or low cost and politically feasible – and to a greater extent then gained the credibility of the private sector where most of the emission reductions will have to be implemented in the future.

Appendix

Table 1. Taxes or charges in key environmental domains in OECD countries

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Table 1. Taxes or charges in key environmental domains in OECD countries

	Climate change			Eco-systems		Natural resources	Materials management	
	GHGs	Fuels/ coal/ electricity[1]	Motor vehicles[2]	Air	Soil/ Water	Water / Fishing	Domestic and Hazardous Waste[3]/Recycling	Deposit-refund
AUS		F	P / R	Ozone	Water effluent		DW/ Oil recycling	Beverage containers
AUT		F / E	P / R					
BEL		F / C/ E	R		Water effluent		DW/ Packaging	
CAN	CO_2	F	R		Pesticide s/ Water effluent	W	DW	Beverage containers / Batteries
CZE		F		NOx/CO	Farm land use	W	DW	Beverage containers
DNK	CO_2	F	R	Ozone	Nitrogen / PVC / pesticides	W	HW/DW	Beverage containers / Batteries
FIN		F	P / R		Water effluent/	W / F	HW/DW	Beverage containers
FRA		F	R	Petrol refineries	Water effluent	W	DW	
DEU		F	R		Water effluent	W	HW	
GRC		F	R		Water effluent	W	DW	
HUN		F / E	R	Various gases	Water effluent	W	HW/DW	Beverage containers
ICE		F	R				HW	Beverage containers
IRL		F / C / E	P / R				DW/ Plastic bag	
ITA	Methan e	F / E	R	NOx/ SO_2	Water effluent	W	Oil recycling/DW	Chemical containers
JAP		F / C	P / R	SOx	Water effluent	W	DW	
KOR		F	P / R	Various gases	Forest land use/ Water effluent	W	DW	Beverage and chemical containers / Batteries

ECO/CPE/WP1(2010)6/ANN1

Table 1. Taxes or charges in key environmental domains in OECD countries (cont'd)

	Climate change			Eco-systems		Natural resources	Waste management	
	GHGs	Fuels/ coal/ electricity[1]	Motor vehicles[2]	Air	Land/ Water	Water / Fishing	Domestic and Hazardous Waste[3]/Recycling	Deposit-refund
LUX		F / E	R					
MEX		F	P / R		Water effluent	W		Beverage containers/ Batteries
NLD		F / C / E	P / R		Water effluent	W/F	DW	Beverage containers
NZL		F	R					
NOR	CO_2 on mineral products				Chemicals / Pesticides/ Water effluent		HW/DW	Beverage and chemical containers
POL		F			Forest land use/ Water effluent	W/F	HW/ Packaging	Beverage and chemical containers / Batteries
PRT		F	R			F	Packaging	
SVK		F		Ozone	Water effluent		DW	
ESP		F	R	SOx / NOx	Water effluent	W	HW	Packaging
SWE	CO_2	E	R	NOx	Water effluent/ Pesticides		DW	Beverage containers
CHE	CO_2 on heating	F	P / R	Sulfur / VOC			DW	
TUR		F	P / R		Water effluent	F		Beverage containers
GBR		F / C	R			W	DW	
USA		F	R	Ozone	Water effluent	W	HW / DW	Beverage and chemical containers / Batteries

1. F: Fuel. C: Coal . E: Electricity.
2. P: Purchase. R: Registration.
3. DW: Domestic waste. HW: Hazardous waste.

Source: OECD/EEA database on instruments used for environmental policy and natural resources management.

Table 2. Permit systems in key environmental domains in OECD countries

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Table 2. Permit systems in key environmental domains in OECD countries

	Climate change	Bio-diversity and quality of Eco-systems			Natural resources	
	GHGs	Bio-diversity	Air	Soil and water	Water	Fish stock
AUS		Land preservation		Saline quotas	Water trading	Quotas
AUT	EU-ETS					
BEL	EU-ETS					
CAN	Alberta	Hunting / Alberta	NO_X / VOC	Nutrients / Ontario	Allocation / Alberta	Quotas
CZE	EU-ETS					
DNK	EU-ETS					
FIN	EU-ETS					
FRA	EU-ETS	Land preservation				
DEU	EU-ETS					
GRC	EU-ETS					
HUN	EU-ETS					
ICE						Quotas
IRL	EU-ETS					
ITA	EU-ETS					
JAP						
KOR						
LUX	EU-ETS					
MEX	CDM[1]	Hunting				
NLD	EU-ETS			Nutrients		Quotas
NZL		Land preservation				Quotas
NOR	EU-ETS					
POL	EU-ETS					
PRT	EU-ETS					
SVK	EU-ETS		SO_2			
ESP	EU-ETS					
SWE	EU-ETS					
CHE	CO_2 ETS		NO_X / VOC Basel			
TUR						
GBR	EU-ETS					
USA	N-E and mid-Atlantic States	Land preservation	NO_X / SO_2 Regional	Nutrients / Regional	Watershed / Regional	Quotas

1. Clean Development Mechanism.

Source: OECD/EEA database on instruments used for environmental policy and natural resources management.

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