

Interaction of the EU ETS and national climate policy instruments – Impact on biomass use

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Abstract

Multiple policy instruments are applied simultaneously in the climate and energy policy field both at the EU and Member State levels. The targets and objectives of these instruments often overlap, creating interactions between the instruments. These interactions can be complementary and synergistic but they may also be conflicting.

This article looks into the interactions of climate policy instruments and their impact on biomass use. The objectives of this paper are to analyse the potential interaction of the EU ETS with the main national climate policy instruments and to identify the influence of these interacting instruments on biomass use in seven EU countries participating in the Bioenergy Network of Excellence (Austria, Finland, Germany, the Netherlands, Poland, Sweden and the United Kingdom). The analysis examines the policy interactions in these countries in search for both common features and differing factors in the effects. The paper is based on literature analysis and interviews with biomass related experts.

The results show, among others, that the climate policy instruments together have a combined effect on biomass use, whereas the effect of the EU ETS alone is difficult to assess separately. There are similarities in the policy effects on biomass among the countries analysed, such as increasing competition of the biomass resources, change in fuel mix and contribution to the upward pressure on wood prices. On the other hand, differences in these effects are partly linked to the countries' policy mix and, for example in Finland and Sweden, to the importance of peat in the fuel mix.

Analysis and comparison of the effects in the selected countries can yield insight on how to improve the design of the climate policy mix. This study confirms that the interplay of various climate policy instruments should be better coordinated. The development of more synergistic policy instrument mixes would be beneficial also for the bioenergy field.

Keywords: emissions trading, policy interaction, bioenergy, climate policy

1. Introduction

Under the European Commission funded Bioenergy Network of Excellence (NoE), the project “Bioenergy and EU ETS” explored various issues related to the linkages between bioenergy and the EU Emissions Trading System (ETS) during 2006-2009. One of the major foci of the project addressed climate policy interaction and its effects on biomass use.

Energy and climate policy are inherently interlinked. The European Commission’s “Climate action and renewable energy package” [1], being one example of addressing the integrated character of these two policy fields, sets various targets for the year 2020: 20% share of renewable energy in total energy use, 20% reduction of greenhouse gas emissions (compared to 1990), 20% increase in energy efficiency and a share of 10% of biofuels in total transport fuels. As one of the concrete measures, the Directive on renewable energy [2] (hereafter RES-Directive) contributed to the achievement of the emission reduction target by setting national renewable energy targets for each Member State to reach the overall share of 20% renewable energy in 2020. In addition, the update of the EU ETS Directive [3] provided important amendments for the system entering into force in 2013 and running until 2020.

Biomass is forecast to contribute around two-thirds of the estimated primary energy consumption of renewable energy share in 2020 [4]. However, the development of the bioenergy sector has not been satisfactory, as confirmed by the EC renewable energy progress report [4]. One contributing factor is the lack of coordination of various biomass related policies [5]. There is thus reason to believe that the policy instruments influencing bioenergy use are not well coordinated either.

At present, multiple policy instruments have been designed and implemented simultaneously in the climate, energy and environment policy field, both at the EU and Member State levels. The EU ETS is an essential instrument of the European climate policy, covering 40% of total CO₂ emissions in the EU. In addition, EU Member States employ numerous policy instruments at national level to attain their climate and energy policy goals. Thus, the policy environment is becoming increasingly crowded (“policy congestion” is confirmed e.g. by [6], [7] and [8]). The targets and objectives of policy instruments often overlap and create interactions between these instruments. This interaction can be complementary (i.e. synergistic or mutually reinforcing), but various instruments can also reduce the effectiveness of another and undermine the meeting of objectives of an instrument – particularly when the targets are contradictory (e.g. [6] and [8]). As an example, the EU ETS and a support instrument for renewable electricity coexist at the national level and interact in a complex way as both have the overlapping goal to reduce CO₂ emissions. As del Rio González [9] points out, “policy coordination may be necessary to ensure that, if possible, conflicts are mitigated and synergies exploited”. Moreover, as another motivation for this study, compatibility of different regimes is crucial for policy design [8].

The focus of this paper is to understand how the various climate policy interactions affect the use of biomass for energy. In particular, the aim is to assess how the combination of national and international climate policy instruments, in particular the EU ETS, impact on biomass use and, moreover, to what extent the implementation of these policies could be coordinated with other measures supporting biomass use.

This paper is structured as follows: section 2 gives an overview of process the theoretical background of policy interaction, whereas the section 3 describes the methodology of the paper. Section 4 presents the results obtained through the literature and interview analysis and discusses the implications of the analysis results. Finally, conclusions are presented in section 5.

2. Theoretical background of policy interaction

In the bioenergy field, the need for a coordinated approach to biomass policy has been emphasised by the EC documents on renewable energy [5] and EU Biomass Action Plan [10], but they do not specifically touch upon policy interaction. Furthermore, even though a coherent and coordinated policy mix has been called for by both policy makers and analysts, there have been relatively few (academic) studies on energy and climate policy interaction (see for some explanations [8]). Since the INTERACT study of Sorrell et al. [6], this issue has received more attention, but has been claimed to be under-researched, for example by del Río González [9] and Oikonomou and Jepma [8]¹.

At the EU level, the interactions of implementing various targets have been assessed for the EU's 'climate and energy package' [1]. Furthermore, the Green-X project on optimal promotion strategies for renewable electricity has analysed trade-offs between different support instruments². Interactions of the EU ETS and green and/or white certificate schemes have been examined e.g. by Harrison et al. [12] and Sorrell et al. [13], whereas the interaction between energy taxation and EU ETS has been assessed for the Green Paper on market-based instruments [14].

The most important EU climate policy instruments are named under the Second European Climate Change Programme (ECCP) [15]. However, while the ECCP lists a wide array of policies, it does not explicitly acknowledge the interaction of these policies. The INTERACT project, 'Interaction in EU Climate Policy' [6], developed a systematic approach to analyse policy interaction and used this approach to explore the potential interactions between the proposed EU ETS and other instruments within both EU and Member State climate policy spheres. The project demonstrated through empirical research that policies can work effectively in combination and that such combinations can often be more effective than individual instruments in isolation. However, the project results also highlight that there is a need to identify the circumstances in which the policies do or do not create positive interactions³, and to redesign policies accordingly [6].

Moreover, the INTERACT project stressed that it is especially important to clarify the policy objectives of those instruments, which coexist with the EU ETS. The reason given for this is that the EU ETS guarantees the achievement of a particular, Europe-wide emission target. Those instruments, which directly or indirectly interact with the EU ETS, will not contribute further to

¹ In particular, the lack of economic literature in the issue of policy interaction has been highlighted by Sorrell and Sijm [7]. In addition, Coria [11] emphasises the little work done on the economic impacts of applying multiple environmental policy instruments.

² For more information: <http://www.green-x.at/>

³ Through a systematic examination of the scope, objectives, operation, implementation and timing of each instrument (see more for Sorrell et al. 2003).

overall emission reductions of the EU ETS sectors as they do not affect the overall cap of available emission allowances but only the trading of these allowances among countries and installations [6]. Sijm [16] concludes that once the EU ETS is operational (and the cap of emission allowances is fixed), the effectiveness of other policies to reduce the CO₂ emissions of the participating sectors becomes zero. However, there are three major justifications given for the coexistence of the EU ETS and overlapping instruments: i) improving the design of the EU ETS, ii) correcting for market failures, in particular in the field of energy efficiency and R&D, and iii) meeting other policy objectives besides CO₂ efficiency.

In this light, support for renewables can be justified by objectives such as improving the security of supply, raising rural income opportunities and reducing other environmental effects [16]. It can be argued that EU ETS, as a general instrument aiming to reduce GHG emissions, cannot replace target-oriented support for renewables. Diekmann et al. [17] indicate that the trading scheme can be expected to have little impacts on the expansion of renewable energy markets as the financial incentives are too low and the investment risk is too high. In addition, learning effects usually justify the use of renewable energy support schemes⁴ [18] (see more for learning curves [19]).

In general, one of the main motives behind policies for bioenergy and other renewable energy sources is the reduction of CO₂ emissions. However, policies promoting bioenergy are primarily intended to reach a certain amount of bioenergy use rather than an efficient reduction of carbon emissions [20]. It should be noted that policy actions promoting biofuels for transport tend to offer fairly low climate benefits compared to substituting biomass for fossil fuels in heat and electricity production, which generally is less costly and provides larger CO₂ emissions reduction per unit of biomass (e.g. [21], [22]). It also needs to be clearly recognised that interventions often have markedly different underlying motives (e.g. security of liquid transportation fuel supply vs. greenhouse gas reduction).

The primary climate policy instrument in the EU, the EU Emissions Trading Scheme, was introduced in 2005. As often is the case, a new type of regulation does not fully replace existing policy instruments, but instead operates in parallel with them ([7], [23]). One classification of interactions between the ETS and other policy instruments is provided by Sorrell and Sijm [7]: direct interaction, indirect interaction and trading interaction (for other typology classifications of policy interaction, see [8] and [9]). Moreover, policy interaction can be categorised as a) national or international, b) same or different policy context, and c) parallel functioning or coordination [24]. The energy research group of the University of Groningen in the Netherlands has been developing a decision support tool, ECPI, which is focused on energy and climate policy instruments, and aims to provide a tool for policymakers and policy relevant stakeholders to optimise the policy mix [24].

The theoretical framework of policy interaction offers justification to the research on the effects of different energy and climate policy interactions in concrete, national situations. As an example, the UK's Climate Change Simplification Project [25] reviewed the three major climate change instruments with a purpose to eliminate avoidable overlap of the instruments, simplify

⁴ Support for renewables can foster the learning by doing effects and thus lead to reduced energy costs in the future [18].

existing regulations and consequently ensure that the administrative burden on business and regulatory burden economy as a whole are kept to a minimum. Climate change policy has to take into account multiple, various market failures at all levels of the economy. Thus, some overlap between instruments is unavoidable. Nevertheless, as UK Defra [25] highlights, it is fundamental to recognise the overlaps and manage them to remove any unnecessary burden.

3. Methodology

3.1. General approach

This chapter describes the methodology to study the EU ETS and climate policy interactions and their impact on biomass use in the seven NoE countries involved in the project, i.e. Austria, Germany, Finland, the Netherlands, Poland, Sweden and the United Kingdom (UK). It adopts a qualitative approach. Although the analysis is focused on observed effects of the policy instruments (ex-post evaluation), also theoretical interactions and estimated effects (ex-ante) are examined to some extent.

In general, the methodology consisted of two parts, i.e. literature analysis and expert interviews on bioenergy and climate policy interactions (conducted in the period October 2008 – January 2009).

3.2. Methods for data collection

The data collection consisted of scrutinizing official national documents and related studies as well as interviews with experts. To track the use of biomass before and after the introduction of the EU ETS, mainly international statistics were used (Eurostat). Furthermore, the examination of theoretical interactions was based on country studies, whereas the data and interviews contributed mainly to the analysis of ex-post /observed effects of the policy instruments.

The interviews were semi-structured, and were carried out mainly by telephone and by email (one face-to-face). Interviewees were partly chosen based on the contacts of the project partners, and partly based on authors and contacts found via literary search. The interviewed experts represented various organisations: research and consultant company (Sweden), forest industry (Finland, Sweden and the UK), a governmental energy department (Finland), governmental energy agency (Sweden, the Netherlands) and research centres (Finland, the Netherlands). Altogether 15 experts were interviewed (see the Appendix 1; some of them are cited in section 4).

Due to differences in data availability, there are differences in terms of depth of analysis between the countries examined, in particular:

- The status in Finland, the Netherlands, Sweden and the UK were examined through literary analysis and expert interviews.
- Austria, Germany and Poland were assessed by means of literary analysis; Austria and Poland were assessed only in terms of climate and bioenergy policy in the country and main climate/bioenergy instruments.

3.3 Methods for data analysis

To explore the interaction of the policy instruments, an analysis was carried out in each country based on themes, which were determined based on the findings of initial literature research. They were as follows:

- climate and bioenergy policy framework: climate and biomass/biomass strategies, current biomass use for energy, policy targets, and policy coordination;
- key climate and bioenergy policy instruments, and their linkage to carbon savings;
- theoretical interaction of the EU ETS and national instruments: possible conflicts and synergies);
- effects of the instruments on the use of biomass: before and after the introduction of the EU ETS, including competition between different uses of biomass, change in fuel mix, increased biomass prices etc.;
- observed (/realised) effects of the instruments (after the introduction of the EU ETS); and
- measures taken to balance the effect of the EU ETS.

3.4 Limitations

As the approach of the examination is of rather practical than of theoretical nature, the emphasis is on the effects of the instruments that interviewees consider have arisen. Moreover, the evaluation in terms of linking statistical bioenergy development and the support instruments is limited to the timeframe shortly before and after the introduction of the EU ETS (2004-2007). This study also includes the discussion on peat due to its importance in energy production both in Finland and Sweden.

Theoretical examinations of interactions between emissions trading and other policy instruments are presented when the information was available, but this paper refrains to explore these interactions further. In addition, this paper does not take into account the interactions and the effects of the other international climate policy instruments, such as Joint Implementation (JI) and the Clean Development Mechanism (CDM).

Concerning the interviews, it must be noted that experts may have their own strong views, which may not always reflect the common 'national'/ organisations' opinion or view on the issue. However, the opinions have been presented in the results referring to the expert's background/organisation.

4. Results and discussion

This chapter summarises the most important results of the country analyses corresponding to the themes listed in section 3.3.

4.1 Climate and bioenergy policy framework, and their linkages

Six out of seven examined countries have recently adopted a new energy and/or climate strategy (Table 1), i.e. Austria, Germany and the Netherlands in 2007, Finland and the UK in 2008, and

Sweden in 2009. Thus, the clear majority of the examined countries follows the EU level decision to integrate energy and climate policy in one policy document.

Despite the multiple measures implemented nationally, the coordination of the use of the support instruments appears to be minimal. Any of the examined NoE countries do not have a ‘full-grown’, coherent national biomass action plan (nBAPs, encouraged by the EU BAP) which could coordinate the policies connected to biomass use. However, it should be noted that this kind of integrated biomass plan has not yet been developed either elsewhere in Europe [26]. Nonetheless, national biomass action plans have been prepared by three NoE countries: Germany, the Netherlands and the UK. Austria has a draft of the plan while in Finland, Poland and Sweden there is no official BAP.

It should be noted however that the lack of a formal plan does not need to indicate the absence of other bioenergy activities or planning in the country (see for more information on the status of nBAPs [27] and [28]). Importantly, policy coordination is expected to improve in the field of renewable energy when the countries will establish national renewable energy action plans (NREAPs) by June 2010, required by the RES-Directive. Established and planned national biomass strategies and plans form an essential part of NREAPs [29].

Among the countries linking climate change and bioenergy policies, Finland for instance regards the use of wood-based fuels, waste fuels and biogas as essential in meeting its strategic policy targets. In turn, the Dutch “Biobased (/Green) Raw Materials Platform” [30], as part of the Energy Transition Task Force, supports meeting the long-term energy and climate change goals. Furthermore, the UK links climate change and bioenergy policies in its national BAP (UK Biomass Strategy [31]). It specifically mentions climate change to be the primary motivation for its national BAP; the role that bioenergy can play in reducing national carbon emissions has also been investigated by the House of Commons [32]. Both documents clearly acknowledge that heat and electricity production from biomass is more efficient in terms of reducing carbon emissions and that biofuels for transport do not present the most effective or efficient way of making a significant difference to the UK’s carbon emissions in the long term. The report of the House of Commons [32] also notes that a multiplicity of biomass support schemes causes confusion. In 2006, there were some eight support schemes for biomass alone. According to the report, UK Government policy has not left room for newer, more efficient technologies to develop and become commercially viable because it does not link incentives to carbon savings.

In addition to the UK, Germany and Sweden have discussed the role of bioenergy in their climate change policies. In its report on biomass and climate change mitigation, German Advisory Council on the Environment (SRU) states that biomass promotion can contribute in varying degrees to the fulfilment of agricultural, energy and environmental policy targets [33]. However, the inherent costs and the conflicts between these targets need to be taken into account. Like the previously mentioned report [32], this report acknowledges that prioritising the use of biomass in the transport sector does not adequately exploit the potential of biomass in climate change mitigation. Swedish report remark, however, that liquid biofuels are argued to be the most effective bioenergy alternative from the point of view of security of supply [34].

Table 1. Climate and bioenergy policy framework and instruments in the selected NoE countries – status in February 2009*.

	Key climate instruments	Key bioenergy instruments	Climate& energy policy
Austria	feed-in tariffs (FIT), inv.subsidies, tax incentives, R&D funding, env. standards	See key climate instruments	2008-2012 (2007)
Germany	FIT, Climate Legislation Package, National Climate Protection Initiative	FIT, inv.grants, quota & partial tax exemption, obligation to use RES-heat, biogas feed-in ordinance	until 2020 (2008)
Finland	energy taxes, inv. subsidies, feed-in tariffs; R&D funding, energy efficiency measures	Inv. subsidies, tax returns, FIT for peat-based electricity, R&D funding	up to 2020/2050 (2008)
Netherlands	FIT, R&D, inv. subsidies/tax incentives, energy taxes, standards & regulations, voluntary agreements	FIT, tax reduction, research subsidy on sust.energy and energy savings	2007-2011 (2007)
Poland	tradable green certificates and quota obligation, Red Certificate System (GoO for high efficiency co-gen.), tax subsidies & soft loans, energy crop subsidies	See key climate instruments	No integrated package, but 3 legislative changes in 2007
Sweden	electricity certificates +quota system, energy taxes, inv. grants, energy efficiency improvement programme, Climate Investment Programme	electricity certificates+quota, energy tax for biofuels (transport), CO2 tax (heat), inv. subsidies	until 2020 /vision 2050 (2009)
UK	climate tax, quota obligation and certificate system, Climate Change Agreements, Renewable Transport Fuel Obligation	quota obligation and certificate system, tax incentives, inv. subsidies, energy crop subsidies	2020/2050 (2006/2008)

*) The last column shows the publication/adoption year of the most recent energy/climate policy strategy (in brackets), including the time frame of this strategy. In addition to the (national) climate instruments listed in the second column, all countries participate in the EU ETS.

4.2 Bioenergy support instruments and their linkage to climate policies /carbon savings

As can be seen from Table 1, the countries included in the analysis employ various policy instruments to reach their climate and energy strategy objectives. Furthermore, it shows that there are rather clearly defined support instruments for electricity from biomass (feed-in tariffs in Austria, Germany and the Netherlands, tradable green certificates with a quota system in Poland, Sweden and the UK, and tax support/investment grants in Finland.

Concerning the measures of the national climate and energy strategies and the support for biomass, there are clear overlaps and linkages between them in all seven countries. The primary economic support instruments for renewables (and bioenergy) are often deployed, among others, to mitigate climate change. Nevertheless, in general, carbon savings are not explicitly connected to the design/performance of the support instruments. However, an indication of considering it is seen in the measures of the German [35] and UK [31] biomass action plans as well as in the case of the evaluation of the support instruments in Austria and the Netherlands.

4.3 Theoretical interaction of the EU ETS and national support instruments

In addition to the INTERACT study, theoretical interaction studies found in the case of Sweden, Germany and the UK show the importance of identifying the overlaps and interactions of various policy instruments in place. It can be concluded that there are both synergies and conflicts between the EU ETS and national policy instruments. In the case of the Netherlands, the combination of the EU ETS and feed-in tariff/energy tax stimulates the fuel switch from fossil fuels to renewables. In Sweden, electricity tax, green electricity certificates and the EU ETS all seek to decrease electricity consumption whereas the CO₂ tax and EU ETS complement one another in the sectors outside the ETS. Moreover, the ETS and the electricity certificate scheme have appeared to function satisfactorily together; however the experience is still limited [36].

In terms of conflicts, the reduction of cost-effectiveness from the viewpoint of CO₂ reduction in the case of combined use of EU ETS and feed-in tariff/green certificates/ CO₂ taxes is recognised by Germany, the Netherlands, Sweden and the UK. As the earlier mentioned (see chapter 2) UK's Climate Change Simplification Project [25] emphasises, the time scale of policies is important; the cost-effectiveness of climate policy has the potential to be improved by renewable energy support instruments in the long-term. Thus, these possible long-term benefits must be clearly recognised and balanced against the loss of efficiency to the economy in the short-term [25]. Furthermore, Diekmann et al. [17] suggest that to avoid the conflict between the RES-E policy instrument and the EU ETS, the emission cap should be adjusted to reflect the positive climate impact of renewable energy. Therefore, the contribution of the support instrument to reduce CO₂ should be integrated into the national allocation plans or the determination of the emission cap at the EU level [17].

4.4 Estimated effects in the past and for the future

The effects of the EU ETS on biomass use have been assessed in particular for Finland. The competitiveness of wood fuels was expected to be increased while peat use was assumed to be replaced by wood and even coal. Another expected effect of the EU ETS was the increased competition from the woody biomass raw material when the CO₂ price increases [37], [38]. From a regional point of view, at least three Finnish regions have assessed the effects of the ETS before its introduction (south-western [39], central [40] and eastern Finland [41]).

Furthermore, an increased demand for wood fuels and a rise in wood prices were found to be linked in Finland (before the EU ETS) and Sweden (in 2006). The report of the Nordic Energy Perspectives project estimated in 2006 that the willingness to pay for wood rises in the future, resulting in higher power price of more than 200SEK/MWh or 22€/MWh [42]. However, the increasing use of biomass for energy competes with the forest-based raw material of forest industry. This is estimated to lead to a general increase in timber prices.

According to Swedish Environment Protection Agency [36], both the electricity certificate scheme and the EU ETS were expected to promote the use of bioenergy. The CO₂ tax is not expected to have any short-term impact on the use of biofuels in CHP production; however, it is thought that the CO₂ tax will increase the use of biofuels to some extent in the long term.

While this project assessed the estimated and realised effects of the support instruments mainly in the near past, it is vital to look into the impacts of the various factors affecting the development of biomass use for energy in the future. The ambitious RES targets, required by the new RES Directive and high carbon allowances can increase the competition for wood and endanger wood processing for products, emphasised in particular by the Finnish forest industry energy advisor. For instance in the case of the UK, the country must compete in the growing international market of bioenergy while the EU Member States ‘chase supply’ in order to meet their respective national renewable energy targets. Yet, this can put strains on supply and divert feedstock away from the most appropriate use for the biomass, that is of local heat and power [43]. Prebble [43] also acknowledges the threat of displacement of woody material seen by the wood panels industry when the incentivised market for woodchips as a fuel grows. Moreover, competition for the available bioenergy feedstocks is seen as likely to increase in the UK, which could increase the price of biomass for fuel [31].

Concerning the competitiveness of the European pulp and paper industry, it is foreseen to suffer from higher energy and fibre raw material prices in the future if the revision of the EU ETS does not exempt the industry from the auctioning of CO₂ emission allowances [44]. In Finland, the EU ETS is anticipated to be harmful to the competitiveness of the industry. In addition, this analysis, based on expert views, assumes that the most important political measures affecting the bioenergy market development in the near future will be fiscal and subsidy policies, common legislative obligations and the EU ETS [45].

4.5 Realised effects

Changes in fuel mix

Since the introduction of the EU ETS, the expected impacts have largely been realised. Figure 1 shows that the use of biomass and wastes grew between 2004 and 2007 in most of the examined NoE countries. The biggest increase took place in Germany (+95%), whereas Finland’s biomass consumption remained almost at the same level (-0.4%)⁵. The consumption of wood and wood wastes, included in the biomass and wastes, also mainly increased in all countries (Germany again leading with 30% increase between 2004-2007). At the same time, fossil fuels consumption mostly diminished, apart from Poland [48].

Electricity generation from biomass powered stations follows the same tendency; it increased in all countries except in Finland (Fig. 2). Poland guided the growth in electricity production both in terms of total biomass and wood and wood wastes (+201 and +207%, respectively). Fossil fuel generated electricity in general terms stayed at the same level, while in Sweden it decreased the most (-32%) [48].

All in all, we consider that these developments suggest the change in fuel mix due to the national support instruments and the EU ETS. However, it should be noted that the emphasis is here on the changes in the fuel mix, and we recognise that this comparison does not acknowledge the current status of biomass use in the NoE countries. Moreover, changes in the fossil fuel use may

⁵ According to Finnish energy statistics [46], biogas, recycled and waste based fuels were consumed 25% more in 2007 compared to 2004. In addition, despite the wood fuels seemingly remaining unchanged, the use of forest residues for energy is reported to be strongly increased in 2005 and 2006 (in 2006 around 3 Mm³ while in 2004 it was 2.3 Mm³ [47]).

have other reasons in addition to the policy mix to support renewables; however, these factors have not been examined in this study.

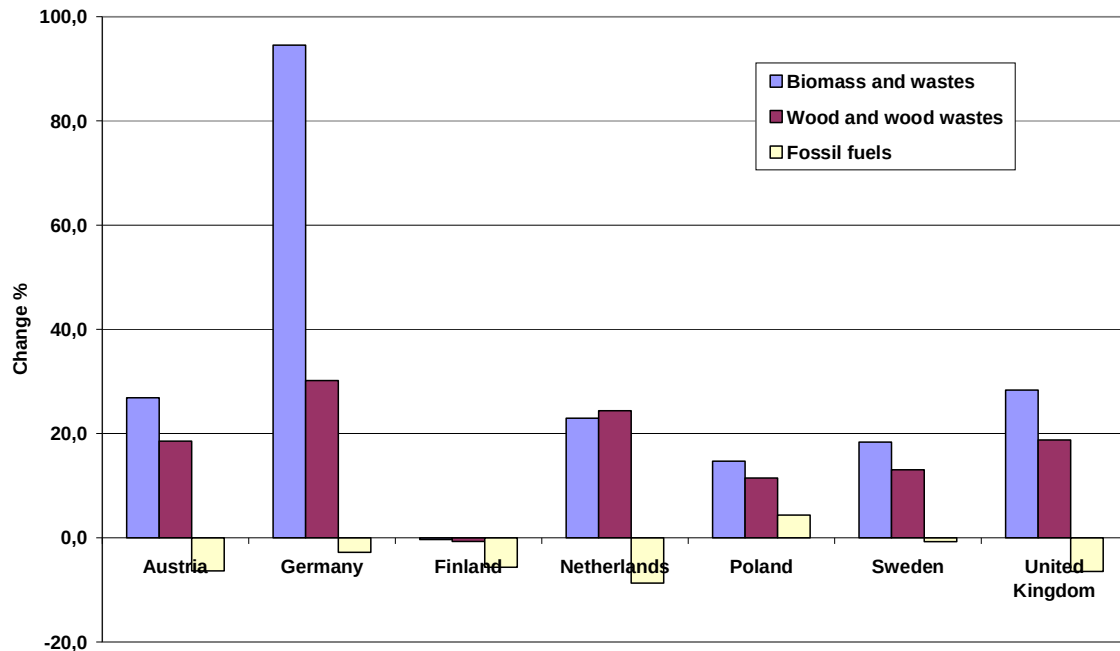


Figure 1. Change in gross inland consumption from biomass and wastes, wood and wood wastes and fossil fuels between 2004 and 2007. Fossil fuels include solid fuels (excl. peat), crude oil and petroleum products and natural gas [48].

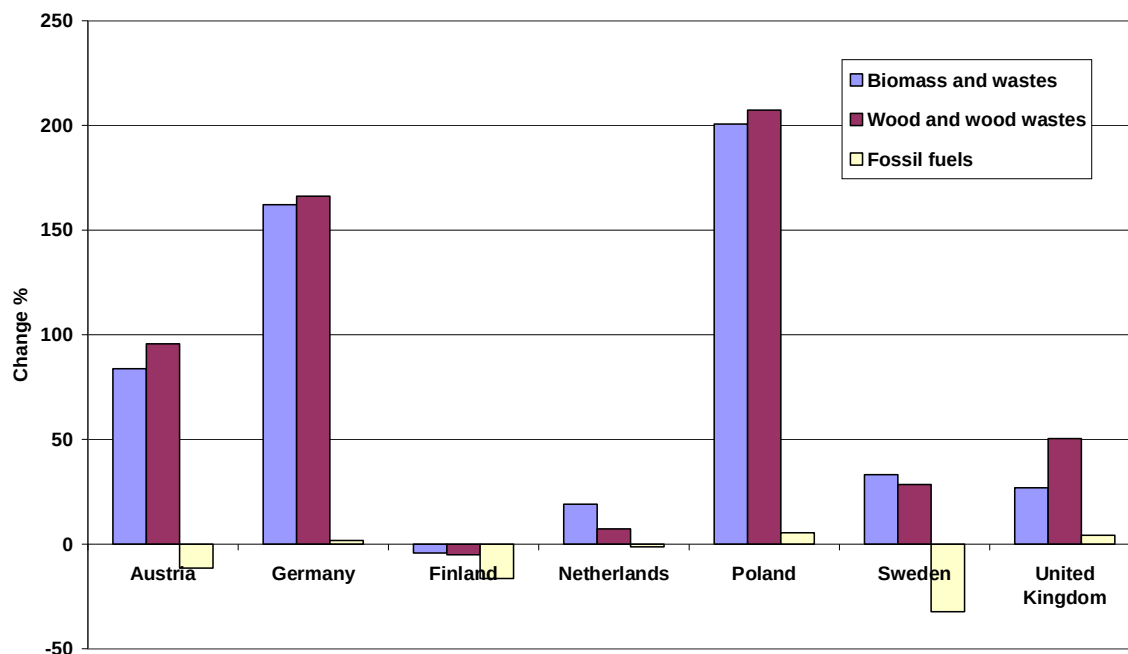


Figure 2. Change in gross electricity production from biomass and wastes, wood and wood wastes and fossil fuels between 2004 and 2007 (coal, oil and natural gas fires power plants; excl. lignite and peat) [48].

Regarding the effects in Finland and Sweden, perhaps the clearest impact of the EU ETS has been on the use of peat. In Finland, where peat use is far more important than in Sweden (see Fig. 3), peat use has increased despite the introduction of the EU ETS – according to the Eurostat [48], the increase in peat use was 15% between 2004 and 2007. Peat use became more expensive because of the ETS, but energy tax for peat was suspended in 2005 to strengthen its competitiveness in the scheme [49]. In addition, the Finnish feed-in tariff for peat has enabled its use since May 2007, and may have contributed to the positive trend. However in Sweden, biofuels and peat are both eligible for electricity certificates, receiving the same level of support. The introduction of the EU ETS reduced the competitiveness of peat compared to biofuels in combined heat and power (CHP) production. The electricity certificate scheme has not been strong enough to offset the disadvantage, i.e. balance the impact of the EU ETS for peat (this was confirmed by the Swedish research and consultant company and forest industry representatives; see more from [49]) – the peat use decreased 30% between 2004 and 2007 [48].

Furthermore, measures to balance the effect of the EU ETS have been taken at least in Finland and Sweden in the form of a reduction of the energy tax level; as mentioned before, in Finland for peat, and in Sweden as a reduction of the CO₂ tax on fuels in industry for district heating and CHP plants in the EU ETS scheme (planned in the Budget Bill for 2008 (Bill no. 2007/08:1) [50]). In addition, the introduction of a new support instrument, i.e. feed-in tariff for peat in Finland, can be considered as a “balancing measure”.

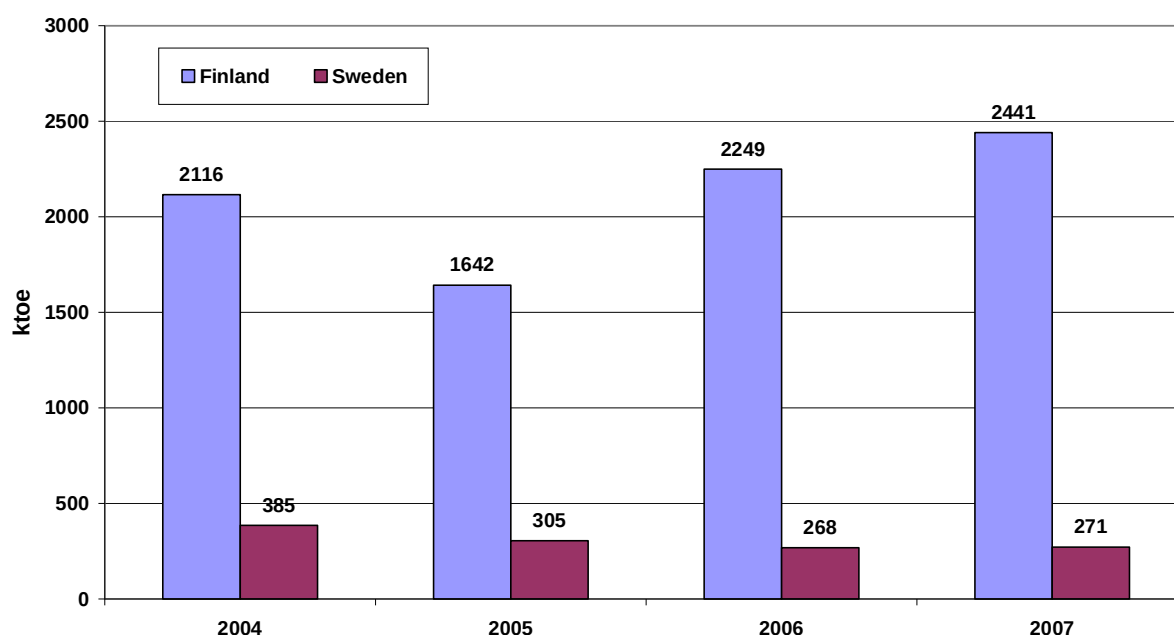


Figure 3. Gross inland consumption of peat between 2004 and 2007 in Finland and Sweden [48].

The Finnish forest industry representative (Finnish Forest Industries Federation (1)) considers emissions trading as a powerful steering mechanism as it affects the industry’s fuel choices by providing an incentive to use renewable energy. Furthermore, interviews carried out by the Swedish Environment Protection Agency [36] confirm the importance of the ETS. From the

view point of the two power companies, emissions trading and the electricity certificate scheme are key instruments for their business. According to these interviews, the previous carbon dioxide and fuel tax regime affected decisions on investment in new biofuel-fired boilers, and increased peat burning. These investments reduced coal use. Burning peat would have terminated when the ETS was introduced without peat being eligible for electricity certificates. In addition, another impact of the ETS for the two power companies in question is that plans are being made for biogas production and combustion in the long term.

As a more specific example on the change of fuel mix, there has been discussion in the Netherlands on the support of replacing fossil fuels with biomass in coal-fired power plants in the end of 2008/beginning of 2009. To increase the likelihood of achieving the ambitious renewable energy targets, biomass based power is expected to play an important role in meeting the targets, and the cheapest option is to increase the co-firing of biomass with coal. In 2009, a discussion paper was formulated to examine advantages and disadvantages of co-firing. According to some estimations, additional funding for co-firing might still be needed at a CO₂ price of 20€/tCO₂, whereas at 50€/tCO₂ additional funding may not be required, i.e. the feed-in tariff would be enough (representative of the Dutch governmental energy agency (14)). According to Dutch experts interviewed (10-14)), the support of co-firing should be linked to the CO₂ price as well as to the power price and the price of coal.

Competition for biomass resources

Based on the expert opinions in Finland and Sweden, competition between different uses of biomass resources is notified but generally is not yet considered as serious. However, a representative of the Finnish forest industry (Finnish Forest Industries Federation (1)) considers there to be true competition between board industries and energy sector. Also, according to the Swedish forest industry expert (Swedish Forest Industries Federation (6)), in some regions the balance is tight and locally pulp wood has been sold to the energy sector. Moreover, as Sköldbörs and Rydén [42] state, this competition can increase in the future due to the use of biomass for production of fuels for the transportation sector and export of biomass to other European countries. In Finland and Sweden the import of biomass is of considerable size; in 2006 around 15–20% of biomass was imported as raw material for industry and of fuels for heat and electricity production [42]. In terms of raw material competition, other factors increasing it in the future between Finland and Sweden can be the export taxes for wood from Russia (representative of the Swedish research and consultant company (8)).

Noteworthy is that at high emission allowance prices, power plants are able to pay a higher price for wood; in this case the forest industry needs to pay more for the wood than before. A Finnish governmental energy expert (Ministry of Employment and the Economy (2)) points out that when the price of wood is rising, it is obvious that the supply of wood is also increasing. Thus, the availability problem considered by the forest industry is primarily a wood price related problem. Increased competition for forest resources might start to pose a threat to wood availability when CO₂ allowances are above 30€/tCO₂ due to the usage of mainly domestic wood. The power plants are however not yet in the wood material niche of the forest industry at current emission allowance prices⁶ (Ministry of Employment and the Economy (2)).

⁶ 13 €/t CO₂ in the end of October 2009

Competition is not yet much discussed in the UK. However, the forest industry representative in the UK has noted the concerns over the growing competition in the international bioenergy market (Confederation of Forest Industries (UK) Ltd (15)). He sees that principally domestic policy is affecting the increasing use of biomass and boosting the competition, rather than the EU ETS. Some indications of competition for biomass resources have already been seen locally, for example in South-West Scotland where there is wood powered electricity plant. The threat of displacement (mentioned in [43]) concerns not only panel industry but also the saw and timber industries (representative of the Confederation of Forest Industries (UK) Ltd (15)).

Balancing the use of wood for energy and materials

There has been a lively debate, especially in Finland, on good quality wood being diverted to energy production instead of its use for paper or materials; this is boosted by the ability of the energy sector to pay a higher price for wood, as mentioned before. According to the Finnish Forest Association [51], it is against the principles of sustainable development to use the wood directly for energy instead of making first paper out of it, and using it for energy at the end of the recycling process of the paper. Furthermore, the use of round wood in the forest industry creates considerably more welfare and employment compared to the energy production from wood. Already now over half of the wood used in forest industry is transformed to energy at the plant level so that the direct use of wood would increase the energy production by only half of the potential [51]. According to the Finnish forest industry representative (Finnish Forest Industries Federation (1)), pulpwood is being used for energy production for example in Austria, Czech Republic and in the UK. Behind this phenomenon are considered to be both the EU ETS and national support mechanisms.

It can also be argued that the EU ETS in its current form does not add value to wood outside the energy use. Hassi [52] is of the opinion that emission trading only recognises a tree's value in energy use, and ignores other values. He advocates that emission trading quotas/caps should be connected to all wood use, including constructing with wood, which would also decrease building with energy intensive materials such as steel and concrete. As the UK's forest industry representative (Confederation of Forest Industries (UK) Ltd (15)) states, businesses and jobs can be lost if energy use of wood overrides the material use. The role of forest sector and forest products in climate mitigation has also been recognised by the UNECE Timber Committee and FAO European Forestry Commission⁷. Furthermore, the ability of harvested wood products to store carbon is expected to be recognised in the United Nations Climate Conference in Copenhagen in the end of 2009 [53].

Effects in prices

The analysis of competition regarding the use of biomass has shown that prices and willingness to pay in different sectors are of greater importance than national physical quantities of available biomass [42]. Even if this examination did not look into the biomass price development in a detailed way, it can be concluded that there is recognised a tendency in the increase in biomass prices (noted both by the representative of Finnish Forest Industries Federation (1) and representative of a Swedish research and consultant company (7)). For example in Sweden, the highest prices of biomass in the middle of 2008 were for refined wood fuels amounting to 24

⁷ For more information, see <http://timber.unece.org/index.php?id=214>.

€/MWh (262 SEK; in 2004 206 SEK/19€⁸). The price of industrial by-products has risen 41% since 2004 until the second half of 2008 [54]. Also, according to the Swedish forest industry representative (Swedish Forest Industries Federation (6)), prices of pulp wood and forest residuals (branches and tops) are getting closer to each other. It must be noted that there are various reasons for the price development, which would need to be examined further. In general, all costs, investments and raw material prices had a rapid growing tendency before year 2009, that naturally further affected profitability to produce electricity from biomass, as subsidy levels were rather constant.

Linking effects to policy instruments

It is a challenging task to link specific effects to specific instruments; finding the causal linkage between the policy instrument and its impacts is not an easy task. Moreover, it is not straightforward to attribute the effects discussed above – such as fuel choice change, increased competition for raw material and the higher prices of timber – to the ETS or other support instruments separately. Rather, these effects are the overall outcome of the mix of instruments together (confirmed by the expert of Technical Research Centre of Finland (5) and the representative of Swedish Forest Industries Federation (6)). It is acknowledged that the effects of the EU ETS may be more visible in the second trading period, as there is still rather little experience of the EU ETS and the first phase of the scheme had several shortcomings. More significant policy effects have been observed in Finland and Sweden, but this can simply be explained by more detailed research in these two countries. In addition, the policy effects may be more visible at the regional level compared to the national level. There are indications of this in Finland, Sweden and the UK.

It should be noted that rather than a single instrument being responsible for favorable development, bioenergy development is typically reliant upon the synergistic effects of several success factors [55]. The performance of policy instruments cannot be separated from the social, industrial and political environment in which these mechanisms are applied to. For example in Finland, the linkages between power industry and forest industries may be more powerful than the effect of the national support mechanisms [55]. One indication of the linkages between these two sectors is that in the light of the current adverse economic situation, decrease in pulp and paper production can in turn reduce the amount of bioelectricity produced. This can be the case in the countries such as Finland and Sweden where forest industry is tightly linked with the energy production sector.

Moreover, differences between Finland and Sweden include different energy production structure and support measures to promote the use of biomass (for example in Sweden more hydropower and higher energy taxes). In addition, different ownership structure of forests may be one explanatory factor for the different situation in terms of competition for biomass resources; in Finland the state owns around 15% of the forests, while in Sweden the state owned forests constitute around fourth and the forest resources are larger overall (representative of the Finnish forest industry (1)).

⁸ Exchange rate 1€ = 10.77 SEK, without taxes

5. Conclusions

In this paper, we have focused on the interaction of the EU ETS and national climate policy instruments and their effects on biomass use from a practical point of view. We conclude firstly that the NoE countries included in this analysis employ various policy instruments to reach their climate and energy strategy objectives. However, the coordination of the support instruments to find the most efficient policy mixes appears to be minimal, and the carbon savings are often not linked to the performance of the instruments. It would be useful to link CO₂ reduction and its costs to the performance of the policy instruments. There are also other bioenergy policy objectives in addition to climate change mitigation that should be connected with the instruments. Nevertheless, policy instrument performance can be extremely difficult to quantify (such as increasing biodiversity, sustainability or quality of life in rural areas). Moreover, generation of only one performance indicator would strengthen this aspect more than others and may create distortion, despite the fact that in general it would be beneficial to be able to link all the objectives to instruments regardless their scope.

The analysis also confirms that it is important to identify the overlaps and interactions of policy instruments as both synergies and conflicts can occur. The short-term disadvantages, such as reduced cost effectiveness need to be weighed with the long-term benefits. In terms of the effects of the instruments on biomass use, the changes in fuel mix suggest the combined effect of the national policy instruments and the EU ETS; the effect of the EU ETS alone is difficult to isolate. Competition for biomass resources is generally not yet considered as serious, however it is anticipated to tighten in the future due to higher prices of EU ETS allowances and the more ambitious RES targets set at the EU and national level. When evaluating the effects of support instruments, it is important to understand the different national settings in the countries, not only in terms of support mechanisms, but also regarding for instance forest industry position, energy production structure and for which purposes biomass is used. More research on regional and local level effects would be needed, as biomass is used for products, which can be subjected both to international and local competition.

In the context of a coordinated and coherent policy framework, often the promotion of renewable energy, and thus bioenergy, is part of a comprehensive energy and environment strategy. Because of possible intersections and indirect interactions between the various policy instruments in the strategy, the design and the application of the respective policies should take account of these interactions and the measures should be adjusted accordingly [17]. One recommendation is to make targets of the policy instruments consistent in order to reduce perverse incentives and better align domestic instruments with national and international policy objectives, as in the UK's Climate Change Simplification Programme [25]. Furthermore, a monitoring and evaluation framework of policies is needed; energy performance would be more easily tracked against the objectives. Aim is to improve policy coherence, which in turn contributes to balanced decision-making.

National action plans and strategies have the opportunity to coordinate all biomass related policies and measures, and include the consideration of the interplay of support measures. In addition, as Diekmann et al. [17] points out, such a coherent and integrated strategy for biomass can forbid the sectoral competition for support among various bioenergy applications (electricity, heat and transport). Moreover, it can assist in finding the most efficient uses of biomass

resources. According to Bringezu et al. [56], sustainable biomass strategy should consider the interrelations of material, energy and land use, and it should be included in a cross-sector strategy for sustainable use and management of resources. Often limited biomass resources can be used more efficiently when there is a coordinated approach on biomass use. This can be enabled by the application of the ‘cascade principle’ (e.g. use wood first as a material and generate energy only in the end of a life cycle). Thus, we suggest that a cascade principle should be applied to allow more efficient use of biomass resources. In addition, support measures for the material use of biomass should be explored.

It can be questioned whether an optimal mix of instruments would be possible to design on the whole. All the measures from different support schemes together form a complex network of interactions, with a certain outcome, that might or might not have been thought prior to implementation of the support schemes. In any case, the development of more synergistic instrument mixes would be beneficial for biomass-related policy fields.

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Appendix 1

Conducted interviews

Number	Date	Interviewee	Organisation and position (if known)	Method
Finland				
1	October 2008 (clarifications provided October 2009)	Ahti Fagerblom	Finnish Forest Industries Federation, Director of Energy and Climate Policy	email & telephone
2	October 2008 (clarifications provided October 2009)	Name withheld	Ministry of Employment and the Economy	telephone
3	October 2008	Eija Alakangas	VTT Technical Research Centre of Finland	telephone

4	October 2008	Name withheld	VTT Technical Research Centre of Finland	telephone
5	October 2008	Tiina Koljonen	VTT Technical Research Centre of Finland	telephone
Sweden				
6	October 2008 & November 2008	Lars-Erik Axelsson	Swedish Forest Industries Federation	telephone & email
7	October 2008	Bo Rydén	Profu (a research and consultant company)	telephone
8	October 2008	Håkan Sköldberg	Profu (a research and consultant company)	telephone
9	October 2008	Matti Parikka	Energimyndigheten (Swedish Energy Agency)	telephone
Netherlands				
10	November 2008	Bert Daniels	Energy Research Centre of the Netherlands (ECN)	telephone
11	November 2008	Marc Londo	Energy Research Centre of the Netherlands (ECN)	face-to-face
12	November 2008	Marijke Menkveld	Energy Research Centre of the Netherlands (ECN)	telephone
13	November 2008	Ton van Dril	Energy Research Centre of the Netherlands (ECN)	telephone
14	January 2009	Kees Kwant	SenterNovem (governmental energy agency)	telephone
United Kingdom				
15	January 2009	Stuart Goodall	Confederation of Forest Industries (UK) Ltd (ConFor), Chief Executive	telephone

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