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ETS & Ecodesign – Anything in Common?

Assessment of the interactions between the EU Emission Trading Scheme and the Ecodesign Directive

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Thesis for the fulfilment of the
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'Vision without action is a dream; action without vision is a nightmare.'

Japanese proverb

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Abstract

In the EU, climate policy-making takes place in a complex environment, where multiple climate and energy policy instruments co-exist and interact together. Interactions between different climate and energy instruments can affect - positively or negatively - the achievement of the climate targets. However, the performance of instruments is often evaluated without taking into account those interactions and, therefore, the interactions are often overlooked. The review of the academic literature suggests that the strong focus has been devoted to the interactions between the EU Emission Trading Scheme (ETS), the EU's flagship climate policy, and different renewable energy support scheme. The lesser focus in the literature has been dedicated to understanding the interactions between the ETS and various energy efficiency measures. According to the European Commission, one of the most effective instruments to promote energy efficiency is the Ecodesign Directive that sets Minimum Energy Performance Standards (MEPS) for energy-related products. Thus, this research aims to understand how the Ecodesign Directive interacts with the EU ETS and how the synergies between the instruments can be enhanced and overlaps can be mitigated. The research examines the interaction between the two instruments at the policy instrument level, employing a qualitative evaluation approach. The context in which both instruments operate as well as stakeholders' perspectives towards interactions are examined, as they can determine whether interactions are positive or negative. The research highlights that both instruments lead to a reduction of GHG emissions in the energy sector, and if the reduction of the emissions achieved by the Ecodesign Directive (and other energy efficiency measures) is not anticipated in the cap of the ETS, it will have a negative impact on the price of the allowances. The policy implications to reduce the potential negative impact on the price of allowances are further presented in the research, including the need to adjust the cap level, the potential use of Market Stability Reserve and the need for transparency.

Keywords: policy interaction, EU ETS, Ecodesign, MEPS, climate and energy instruments

Executive Summary

Problem definition

Climate policy-making takes place in a complex environment, where multiple climate and energy policy instruments co-exist and interact together. In the EU, multiple climate and energy policies exist, including among others the EU ETS, renewable energy support schemes and energy efficiency measures. All of these policy instruments interact together, and those interactions can affect - positively or negatively - the achievement of climate targets. The interaction between different instruments can be complementary and mutually reinforcing, but the interactions can also undermine the objectives and credibility of the instruments.

In academia, climate policy interactions are often overlooked compared to the vast amount of literature looking into evaluations of individual policy instruments. The review of the academic literature suggests that the strong focus has been devoted to the interactions between the EU ETS and different renewable energy support scheme. However, the lesser focus has been dedicated to understanding the interactions between the ETS and various energy efficiency measures. Despite the lesser focus in the literature, the EE measures play a key role in decarbonizing the energy sector and shifting towards a low-carbon economy. According to the European Commission (2016b), one of the most effective instruments to promote energy efficiency in the EU is the Ecodesign Directive that sets Minimum Energy Performance Standards (MEPS) for energy-related products. It is estimated that the Directive will lead to significant CO_2 emissions reduction while providing billions in net savings for consumers. Taking into account that the MEPS reduce energy consumption in the power sector that is covered by the EU ETS, there is a need to understand better the interactions between those instruments and mitigate potential conflicts and enhance synergies between the instruments. To the knowledge of the author, there have been no studies examining the interactions between the ETS and the Ecodesign Directive. Therefore, this thesis addressed this research gap by examining the two instruments and providing a better understanding on how the instruments interact.

Research Questions

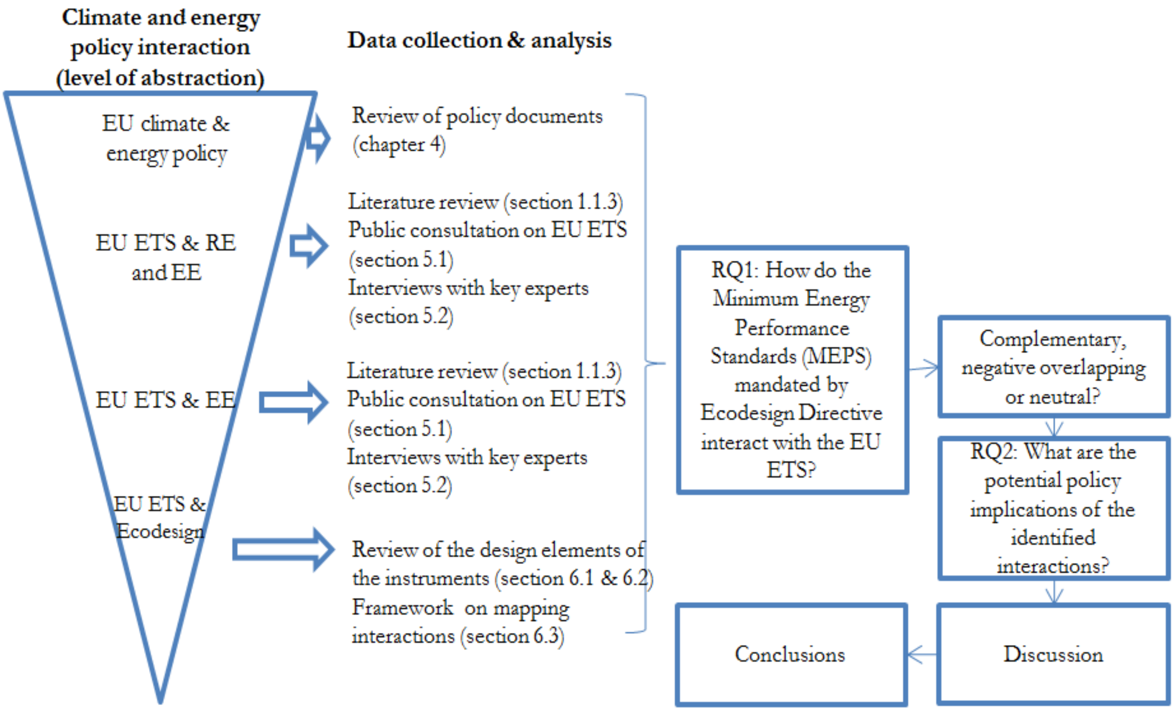
This research examined the following research questions:

1. *How do the Minimum Energy Performance Standards (MEPS) mandated by Ecodesign Directive interact with the EU ETS?*
2. *What are the potential policy implications of the identified interactions?*
    a. *How can the potential negative overlaps between the two instruments be mitigated?*
    b. *How can the potential synergies between the two instruments be enhanced?*

Research Design

As the aim of the thesis was to provide a better understanding of how the Ecodesign Directive interacts with the EU ETS, the qualitative evaluation approach was used. The qualitative approach allowed for the understanding of the context in which the two instruments function, capturing the effects of social and political factors on policy success. The context in which the instruments operate can determine whether the interactions are positive or negative.

The figure below illustrated the research design guiding this thesis. The figure presents the level of abstraction used when discussing climate and energy policy interactions. It also elaborates on what type of data was used to obtain which information. For example, the review of policy documents was used to understand the EU climate and energy policy context.



Main findings

The two instruments interact through the energy sector covered by the ETS. The Ecodesign Directive reduces GHG emissions in the energy sector and as such decreases the demand for allowances. The decreased demand for allowances leads to a decrease in price, as the supply of allowances is inelastic. The interaction between the two instruments can be considered complementary, as both instruments contribute to the reduction of GHG emissions. However, if the achievements of the Ecodesign Directive and other policies (renewable energy & energy efficiency) are not taken into account in the cap setting, it will lead to a negative impact on the carbon price. Furthermore, different stakeholders can influence how the interactions are perceived. On the one hand, the energy sector and energy-intensive industries perceive that the interactions between the ETS and renewable energy & energy efficiency policies undermine the functioning of the EU ETS. On the other hand, the stakeholders from NGOs, public institutions and academia, see the interactions as complementary.

In order to avoid the negative impacts on the price of allowances, the ETS' cap should take into account the reductions achieved by other policies, including the Ecodesign Directive. Nonetheless, the findings from the interviews illustrate that it may be politically challenging to introduce a more stringent cap, as the industry will oppose any changes made. Another potential way to mitigate the negative impact of the EU ETS is through the Market Stability Reserve (MSR). The mechanism could help to remove the allowances from the circulation and as such adjust the supply and demand of allowances. This option is supported by the energy sector, though, the experts are less optimistic about the MSR's ability to adjust to external shocks and account for impacts of other policies in due time. The MSR will be operating according to the predefined rules, ensuring that the Member States or the EC cannot influence the implementation.

Conclusions

All stakeholders and experts confirm the need to ensure coherence between the climate and energy policies. However, how to achieve this coherence remains unclear. The literature and experts argue for the stringency of the cap under the EU ETS, whereas the industry believes that the MSR will mitigate the structural imbalances of the supply and demand of allowances. One thing is clear, in order to transition to a low-carbon economy by 2050, the EU needs a coherent climate and energy framework that incentivise more ambitious targets.

Finally, this thesis contributes to the debate on climate policy interaction by highlighting these often overlooked interactions that have implications for achieving the climate targets.

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Abbreviations

CAC	Command and Control
CAN	Climate Action Network
CO_2	Carbon dioxide
EC	European Commission
EE	Energy Efficiency
EEA	European Environmental Agency
EEO	Energy Efficiency Obligations
EPBD	Energy Performance of Buildings Directive
ETS	Emission Trading Scheme
EU	European Union
EUA	European Emission Allowances
GHG	Greenhouse Gas
IEA	International Energy Agency
IETA	International Emission Trading Association
IPCC	Intergovernmental Panel on Climate Change
IPP	Integrated Product Policy
IRENA	International Renewable Energy Agency
LCA	Life-cycle Assessment
MEPS	Minimum Energy Performance Standards
MSR	Market Stability Reserve
NAP	National Allocation Plan
NDCs	Nationally Determined Contributions
NGO	Non-governmental Organisation
OECD	Organisation for Economic Co-operation and Development
RE	Renewable Energy
UK	United Kingdom
UNFCCC	United Nations Convention on Climate Change
US	United States

1 Introduction

This chapter starts by presenting the background and significance of this thesis. The existence of multiple climate targets, as well as different policy instruments to achieve those targets, is further elaborated. The importance of understanding the interactions between different climate and energy policies is addressed. The literature review on the current work on climate and energy policy interactions is presented. Based on the literature review, the research gap is identified, and the research objectives, as well as questions, are defined. Finally, the chapter elaborates on the scope, limitations and audience for this thesis.

1.1 Background

1.1.1 Climate change and EU mitigation efforts

Climate change is one of the most significant problems facing the world. The international scientific community acknowledges that climate change is caused by increasing concentration of atmospheric greenhouse gases (GHGs) due to anthropogenic activities (IPCC, 2007). It is also recognized that an increase in global temperature of more than 2°C could have irreversible environmental consequences on the planet (IPCC, 2007).

In 2015, 197 countries agreed on a global action plan known as the Paris Agreement to tackle climate change by limiting GHG emissions, maintaining global temperature well below 2°C and pursuing to limit it to 1.5°C (UNFCCC, Paris Agreement, n.d.). The Paris Agreement requires the countries to express their mitigation efforts through nationally determined contributions (NDCs), which should be reported every five years ('UNFCCC, Paris Agreement,' n.d.).

The European Union (EU) has played an active role in supporting the Paris Agreement as well as promoting ambitious climate targets for the region. The EU has developed a roadmap to achieve the transition to a low-carbon economy by cutting GHG emissions by 80-95% (below 1990 levels) by 2050 (European Commission, 2016d). In order to reach this target, the milestone GHG reduction targets of 40% by 2030 and 60% by 2040 were established.

Besides reducing the GHG emissions, the EU recognises the importance of supporting other climate policies such as production and promotion of renewable energy as well as improving energy efficiency in the region. The EU is committed to achieving at least 27% share of renewable energy and at least 27% improvement in energy efficiency by 2030 ('European Commission, Climate Action', 2016). In order to achieve these targets, different policy instruments exist at the EU and national level. Those policy instruments can be grouped into three broad categories reflecting the EU multiple climate targets: carbon pricing, renewable energy (RE) support schemes and energy efficiency (EE) measures (Dalhammar, Machacek, Mundaca, & Richter, 2017; Hood, 2013).

The main carbon pricing instrument to achieve GHG emissions' reduction in the EU is the Emission Trading Scheme (ETS), which covers around 45% of all GHG emissions in the region (European Commission, 2016f). The EU ETS sets a cap on a total amount of certain GHG emissions released by the covered installations (European Commission, 2016f). The covered installations can trade (i.e. buy and sell) their emission allowances, thus creating a carbon market. The price of allowance is set by the market forces (i.e. supply and demand of market allowances). However, the effectiveness of the scheme and its ability to set a price high enough to induce a change in the industry have been widely criticised (Knopf et al., 2014; Koch, Fuss, Grosjean, & Edenhofer, 2014). The sectors not covered by the EU ETS such as transport, buildings, agriculture, and waste will achieve GHG emissions' reductions through the Effort Sharing Decision, which sets annual binding targets for the Member States for period 2013-2020 (European Commission, 2016e).[1]

The Renewable Energy Directive establishes a framework for the promotion of the RE and states that at least 20% of the EU's total energy needs should come from the renewable sources by 2020 (Directive 2009/28/EC). This target is to be achieved through the individual national targets. To achieve the individual targets, different renewable technology support schemes are available at the Member State level to make renewable energy competitive and promote its deployment, including among others feed-in tariffs, feed-in premiums, quota obligations and tax exemptions (European Commission, 2013).

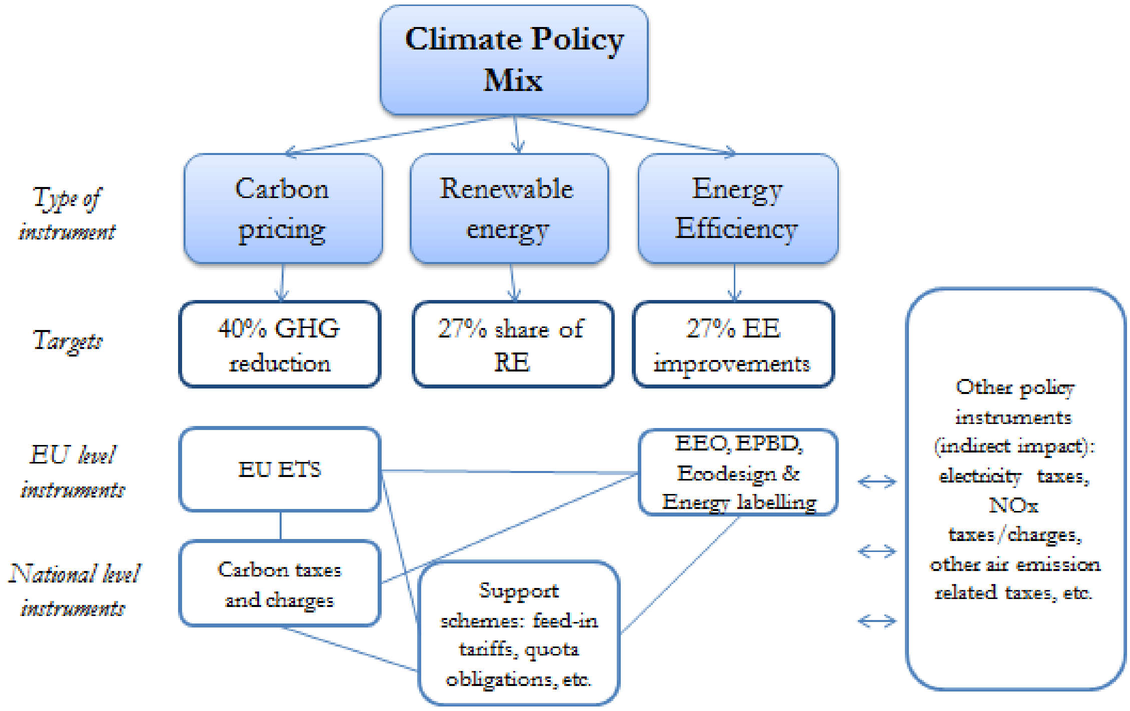
In the context of energy efficiency in the EU, mainly regulatory instruments together with information and awareness raising instruments are used (European Commission, n.d.). Those instruments include among others Energy Efficiency Obligations (EEO) (established in the Energy Efficiency Directive), Minimum Energy Performance Standards (MEPS) for buildings and a number of products (i.e. Energy Performance of Buildings Directive (EPBD) and Ecodesign Directive) and energy labelling of products (i.e. Energy Labelling Directive) (European Commission, n.d.).

All of these policy instruments interact together (see Figure 1), and those interactions[2] can affect - positively or negatively - the achievement of climate targets (Oikonomou & Jepma, 2008). There is a common understanding in the EU that all these policy instruments play a role in reaching the climate targets, however, it is still debatable how effective and cost-effective (i.e. achieving the goal at the lowest costs) the instruments are (Dalhammar et al., 2017). Furthermore, the performance of different climate policy instruments is often evaluated individually based on various criteria without taking into account how the instruments interact together or how the interactions affect their performance (Oikonomou, Flamos, & Grafakos, 2010; Sorrell, 2003; Sorrell, Harrison, Radov, Klevnas, & Foss, 2009). Thus, the impacts of policy interactions are often overlooked.

[1] The targets for period 2021-2030 are proposed in the Effort Sharing Regulation, which is at the moment under review.

[2] The climate policy mix and taxonomy of interactions are further elaborated in the conceptual framework of this thesis, see Chapter 2.

Figure 1 EU Climate policy mix and interactions between different policy instruments (targets for 2030)



Source: author

Interaction of climate and energy policy instruments

Policy making takes place in a complex environment, where multiple climate, energy, and environmental policies co-exist and interact together (van der Gaast, Clochard, Türk, Fujiwara, & Spyridaki, 2016). Climate policy instruments interact with policies outside the climate realm (e.g. climate and transport policies), with climate policy instruments with different main objectives (e.g. reduction of GHG emissions and increasing energy security) and policy instruments with the same objectives (e.g. EU ETS and carbon tax) (Somanathan et al., 2014). Furthermore, policy instruments can be designed at various jurisdictional levels, (i.e. international, EU, national and local) and their interactions can happen across different levels (Somanathan et al., 2014).

The interaction between different instruments can be complementary and mutually reinforcing, however, the interactions can also undermine the objectives and credibility of the instruments (Hood, 2013; Oikonomou & Jepma, 2008; Sorrell, 2003). In addition, the interactions can have both positive and negative impacts on the cost-effectiveness of different policy instruments (Böhringer et al., 2016; Konidari & Mavrakis, 2007; Somanathan et al., 2014). For instance, when multiple policies address the same market failure, it can lead to one policy being either redundant or compromising cost-effectiveness (Somanathan et al., 2014).

Therefore, it is crucial to identify the areas where the climate policy instruments overlap[3] and duplicate as well as understand how to manage those interactions, reduce trade-offs and enhance synergies in order to design well-integrated policies (Hood, 2013).

[3] For the purpose of this thesis, overlapping interaction are considered to be the ones that undermines the goals of another instrument, thus they are negative.

1.1.2 Current work on climate and energy policy interaction

However, climate policy interactions are often overlooked in academia (del Río González, 2007; Hood, 2013; Oikonomou, Flamos, & Grafakos, 2010), especially as there is a vast amount of literature looking into ex-ante and ex-post evaluations of individual climate and energy policy instruments in contrast to the studies assessing how those instruments interact together. This lack of research on policy interactions can be partially explained by the complexity of the instruments and a high degree of policy uncertainty and political sensitivity, which makes it difficult to assess those interactions (Oikonomou & Jepma, 2008; Spyridaki & Flamos, 2014). Furthermore, irreversibility, data scarcity, non-linear behaviour and multiple objectives of instruments make an evaluation of climate and energy policies more complex (Spyridaki & Flamos, 2014).

Despite this, a number of quantitative and qualitative studies have been conducted evaluating interactions between carbon pricing (mainly ETS), RE support schemes and EE measures. As the EU ETS is a cornerstone of the EU climate policy and the main instrument to reduce GHG emissions, most of the studies examine the interactions between the ETS and different energy policy instruments.

Interaction between all three categories

Some of those studies look into interactions between all the three categories: ETS, RE, and EE (Böhringer, Keller, Bortolamedi, & Rahmeier Seyffarth, 2016; Dusch & del Río, 2017; Hood, 2013; Sorrell, 2003; Strambo, Nilsson, & Månsson, 2015). One of the first projects looking into EU climate and energy policy interaction was the EU INTERACT project. The project examined how the proposed EU ETS (i.e. ex-ante) interacts with other climate and energy policy instruments, and demonstrated that different combinations would involve trade-offs between economic efficiency and political acceptability of the instruments (Sorrell, 2003). Furthermore, the project assessed that the policy instruments could potentially work effectively in combination, but it may be challenging to design the instruments to achieve desired interaction (Sorrell, 2003).

Strambo et al. (2015) assessed the coherence[4] of energy security with the EU ETS and renewable energy support schemes and identified that there are roughly as many inconsistencies as synergies present. In addition, Hood (2013) examined the interactions between carbon pricing and energy policies, without going in-depth into specific instruments. She identified that ETS could interact with EE and RE support schemes that reduce emissions in the same sector and over the same time, and argued that energy policy instruments can significantly impact ETS allowance price (Hood, 2013).

Dusch & del Rio (2017) claimed that despite a common perception that interactions of different climate and energy policy instruments can lead to conflicts, this might not be the case when evaluating the instruments based on various criteria (e.g. dynamic efficiency, political feasibility and others). They argued that adding additional policy instrument to a policy mix can worsen one criterion, but improve another (Dusch & del Río, 2017). Del Rio (2010) suggested that the policy mix and interactions between different instruments should be evaluated with respect to several objectives and criteria.

[4] As defined by Strambo (2015) coherence is '*an attribute of policy that reduces conflicts and promotes synergies between and within different policy areas to achieve the joint policy objective*'. This definition of coherence is used throughout the thesis.

Interaction between ETS and RE support schemes

Particular attention in academia is devoted to interactions between ETS and RE support schemes (Abrell & Weigt, 2008; Böhringer et al., 2016; Böhringer & Rosendahl, 2010; Del Río, 2007, 2014, 2017; Fankhauser, Hepburn, & Park, 2010; Jensen & Skytte, 2003; Lehmann & Gawel, 2013; Philibert, 2011). Del Rio (2014) claimed that the existence of ETS and RE support schemes inherently leads to either positive or negative interaction between those two categories of instruments.

In the literature, there is an ongoing debate among researchers supporting additional RE support schemes next to carbon pricing and researchers arguing against it. On the one hand, the researchers argued that introduction of RE support schemes next to the ETS undermines cost-effectiveness of reduction of GHG emissions, which can be achieved by the ETS alone (Abrell & Weigt, 2008; Böhringer et al., 2016; Böhringer & Rosendahl, 2010; Fankhauser et al., 2010). Abrell et al. (2008) claimed that the combination of the two instruments leads to drop in the carbon price, undermining the cost-effectiveness of abatement. Furthermore, Böhringer (2016) argued that additional policies to promote renewable energy make GHG emissions abatement more costly because RE is usually a high-cost option for GHG abatement. However, those studies mainly evaluated the cost-effectiveness of the interactions without taking into account other benefits of RE support schemes. Furthermore, the studies assumed that the only goal of the RE support schemes was a reduction of GHG emissions, thus, overlooking other important goals such as energy security (i.e. reduction of dependency on fossil fuels) and reduction of air emissions (i.e. air pollution).

On the other hand, Lehmann et al. (2013) and Del Rio (2007; 2017) justified the co-existence of both instruments and argued that the RE support is needed to reach a sufficient level of technology deployment and address existent market failures (Philibert, 2011). In the realm of low-carbon technologies at least three market failures can be identified: environmental externality (i.e. GHG externality), innovation externality (i.e. spill-over effects enabling copying of innovation) and deployment externality (i.e. companies can benefit the technology without initially investing into it) (Del Río, 2017). For example, the existence of innovation externality will lead to less R&D investment into RE technologies than the optimal level (Del Río, 2017). Furthermore, Lehmann et al. (2013) and Del Rio (2007; 2017) claimed that the greatest synergies could be achieved through coordination of targets of the instruments. Another argument for adding RE support schemes to already existing ETS is that RE provides benefits beyond climate change mitigation, including social benefits (Del Río, 2007, 2017; Lehmann & Gawel, 2013). Phillibert (2011) acknowledged that a single policy instrument works well when it targets a single goal, however, when multiple goals are pursued, there is a need for multiple instruments as in the case of RE support schemes and ETS.

Interaction between ETS and EE measures

Some studies have examined the interaction between ETS and EE measures (Dusch & del Río, 2017; Hood, 2013; IEA, 2011; Sorrell et al., 2009; Thema, Suerkemper, Grave, & Amelung, 2013). The lesser focus on the combination of ETS and EE measures comparing to RE support schemes can be partially explained by the fact that many EE policies have an impact on the sectors outside the ones covered by the ETS such as buildings and transport (Council of the European Union, 2017). Nonetheless, the EE policy instruments that lead to reduced electricity consumption, and as such reduce GHG emissions, have an impact on the power market that is covered by the EU ETS (Council of the European Union, 2017; IEA, 2011). Thema (2013), Hood (2013) and Sorrell et al. (2009) argued that reduction in electricity demand due to EE measures has an impact on ETS and that the ETS cap has to be adjusted accordingly. If the cap is not adjusted and GHG emissions abatement is achieved through EE measures, the price of allowances will drop. Thema (2013) stressed that for the EU ETS to be effective alongside the EE policies, ambitious emission reduction targets are needed. Furthermore, Sorrell et al. (2009) stressed that the impact of the interaction between the ETS and EE policy measures depends on specific design characteristics of the instruments.

A study conducted by the International Energy Agency (IEA) (2011) examined the justification for combining EE policies with carbon pricing. The study concluded that carbon pricing is needed to facilitate least-cost mitigation options (IEA, 2011). However, carbon pricing alone is not sufficient to achieve cost-effective EE actions, due to the existence of the market failures[5] such as imperfect information, principal-agent problems and behavioural failures (IEA, 2011).

Interaction between RE support schemes and EE measures

Finally, Del Rio (2010) examined the interaction between RE support schemes and EE measures and argued that some conflicts of interaction between the two categories of instruments can be mitigated through changes of the instruments or their design elements. For instance, the EE measures reduce demand for electricity, and by choosing a feed-in tariffs[6] instrument with a fixed tariff instead of a premium, the impact of EE measures can be mitigated (Del Río, 2010). The energy savings achieved by EE measures will not impact RE investments. Thus, the policy makers should coordinate between different targets and instruments taking into account their interaction (Del Río, 2010). However, the coordination may be challenging to achieve if the instruments interact at different jurisdictional levels (Del Río, 2010).

Furthermore, a recent study on synergies between RE and EE conducted by IRENA (2017) looked into the role of RE and EE in achieving decarbonisation of the energy sector by 2050. The study concluded that the combination of RE and EE plays a crucial in reaching the Paris Agreement objectives and that the synergies between the two are beneficial for all countries (i.e. the higher energy efficiency increases the share of renewables)(IRENA, 2017). The deployment of RE technologies in combination with EE technologies will lead to overall savings to the energy system (IRENA, 2017).

1.2 Problem definition

As demonstrated in the literature review, different RE support schemes and EE measures can have a negative or positive impact on the EU ETS. The research focus has been stronger on the interactions between the EU ETS and RE support schemes, and less research has been devoted to understanding the interactions between ETS and different EE instruments. Furthermore, the diversity of policy combinations evaluated remains limited (Spyridaki & Flamos, 2014) and the need to understand the interactions between ETS and EE instruments was reaffirmed during interviews[7] with the key experts. Despite the lesser focus on the interactions between EE measures and ETS in academia, the improvements in EE remain one of the key factors to achieve a low-carbon energy sector, especially in the short term (IEA, 2014). The energy efficiency measures provide cost savings for both consumers and society as

[5] Market failures to EE are further elaborated in the conceptual framework of this thesis.

[6] Feed-in tariff is a policy instrument used to encourage deployment of renewable energy technologies. Feed-in tariff works by providing a producer of renewable electricity (e.g. a home owner with solar panels on a rooftop) with a fixed price per kWh produced independently of the market price. However, the EC recommends phasing out the feed-in tariffs in favour of other instruments, see also http://ec.europa.eu/energy/sites/ener/files/com_2013_public_intervention_swd04_en.pdf

[7] The interviews were conducted in order to understand the perspectives of different stakeholders on interactions and to validate the findings, for more information please see Chapter 3 on Data collection. The list of the experts interviewed is provided in the Appendix 1.

well as reduce GHG emissions (Hood, 2013). Notably, the benefits of EE go beyond reduction of GHG emissions, including improved energy security, electricity management load, increased productivity and competitiveness as well as impacts on health and well-being (IEA, 2011; OECD/IEA, 2014).

One of the best performing EE measures in the EU and US is the Minimum Energy Performance Standards (MEPS) for vehicles and energy-using appliances (Kemna & Wierda, 2015; Sachs, 2012). This significant performance of the EE standards is not limited to the EU and the US. The IEA (2015) examined the evidence from a wide range of countries (e.g. Australia, China, South Korea, Vietnam, etc.) that have in place national energy efficiency standards for appliances and concluded that the improvements in EE have resulted in national energy savings and reductions in CO_2 emissions. Furthermore, the national benefits were three times higher than the costs associated with the standards (IEA, 2015).

In the EU, the MEPS are mandated by the Ecodesign Directive, which sets rules for improving the environmental performance of certain products (e.g. household appliances, information and communication technologies, industrial equipment, boilers, electric motors, etc.) (European Commission, 2017b). Besides energy efficiency of the products, the Ecodesign Directive promotes resource efficiency, focusing on materials used, water use, recyclability, recovery and other aspects (Directive 2009/125/EC). The Directive is complemented by Energy Labelling Directive that requires that energy-related products provide information on energy consumption (European Commission, 2017b). Kemna & Wierda (2015) estimated that the potential reduction in CO_2 emissions by 2020 attributed to the Ecodesign Directive in combination with the Energy Labelling Directive would be around 314 Mt CO_2 equivalent (i.e. around 7% of 2010 EU-total CO_2 emissions) while providing € 111 billion net savings for consumers. By 2030, these instruments are expected to deliver a reduction of 15% of EU energy consumption and 11% reduction of carbon emission totals (Kemna & Wierda, 2015). Taking into account these estimated achievements of the Ecodesign Directive and the fact that the instrument reduces energy consumption in the power sector that is covered by the EU ETS, there is a need to understand better the interactions between those instruments and mitigate potential conflicts and enhance synergies between the instruments.

Furthermore, there have been no studies performed specifically examining how the Ecodesign Directive interacts with the EU ETS[8], despite the fact that the Directive is considered to be one of the most effective policy instruments in the EU to promote energy efficiency (European Commission, 2016b). Thus, this thesis aims to fill in this research gap and understand better the interaction between the EU ETS and Ecodesign Directive.

1.3 Objective and research questions

The thesis aims to complement the existing literature on climate and energy policy interaction with a better understanding of how the EU ETS interacts with MEPS for products as mandated by the Ecodesign Directive. The potential implications of the identified interactions are examined. On a general level, the research contributes to a better understanding of how to design more integrated climate and energy policies that reduce negative overlaps and enhance synergies between instruments.

[8] One of the studies conducted by the IEA (2011) examined the impact of MEPS on the market failures: energy market failure, principal-agent problem, information failures and behavioural failures.

The thesis aims at answering the following research questions:

RQ1: How do the Minimum Energy Performance Standards (MEPS) mandated by Ecodesign Directive interact with the EU ETS?

RQ2: What are the potential policy implications of the identified interactions?

a) How can the potential negative overlaps between the two instruments be mitigated?

b) How can the potential synergies between the two instruments be enhanced?

In order to answer the research questions, the following tasks have been performed:

1. Establish the context of the EU ETS and Ecodesign Directive by looking into the EU climate policy and political context of both instruments
2. Assess stakeholders' perspective on the interactions between the ETS, RE, and EE through analysis of the responses submitted by different stakeholders during the public consultation on the revision of the EU ETS
3. Analyse the key findings from the interviews with the experts on the interaction between the EU ETS and EE
4. Identify the main elements of the EU ETS and Ecodesign Directive and assess their performance
5. Use the framework on climate and energy policy interactions (for more details on the framework, see section 3.3 and Table 3) to identify the areas where the EU ETS interacts with the Ecodesign Directive
6. Assess whether the interactions are complementary, overlapping and neutral
7. Discuss the interactions with the key experts and obtain their views on how the EU ETS interacts with EE measures
8. Identify potential policy implications taking into account the following: the literature review presented in section 1.1.2, the EU climate policy context, views of different stakeholders on climate and energy policy interaction and the opinions of the key experts.

1.4 Scope and limitations

The thesis examines the interactions between the climate and energy policies in the EU with a specific focus on the EU ETS and the Ecodesign Directive. As both instruments are implemented at the EU level, the EU context is examined. The research focuses only on the interaction of the two instruments, even though other climate and energy policies can influence the interaction and affect the overall effectiveness of the climate policy mix. Furthermore, the impacts of other policies, for example, transport or circular economy, are also not considered in this research.

The impact of the Ecodesign Directive is often examined together with the Energy Labelling Directive. Thus, some of the information presented in this thesis includes the effects from the Energy Labelling Directive. This is mainly due to the difficulty in attributing the effects to each of the policy instruments. Nevertheless, the main focus of this research is on the MEPS established by the Ecodesign Directive and as such the Energy Labelling Directive is not examined in this thesis.

The Ecodesign Directive primarily focuses on the energy performance of the products. Thus, less focus is devoted to other benefits of the Directive such as resource efficiency or obligations to provide information (e.g. content of mercury). Furthermore, the impact of the Ecodesign Directive is examined at the aggregate level without focusing on specific product groups and their achievements. The existence of the rebound effect from more energy efficient products is acknowledged, but its impacts are not discussed in detail.

One of the limitations encountered during the research was a lack of the interviewee's experience with both instruments. Majority of the interviewees had a stronger understanding in regard to the EU ETS and the impacts from EE measures in general. However, only a few interviewees could elaborate on the interaction between the EU ETS and the Ecodesign Directive.

1.5 Audience

This thesis is primarily intended for policy makers in the EU and researchers working with climate and energy policies. This research raises the awareness of interactions between different climate and energy instruments, provides an illustrative example of how two policy instruments interact and provides understanding on how overlaps can be mitigated and synergies enhanced. Furthermore, the thesis can be of the interest for different NGOs to further promote coherence among climate and energy policies.

1.6 Ethical considerations

The publically available data that have been collected by the EC during the public consultation on the revision of the EU ETS was used. This primary data was analysed to understand different stakeholders' perspectives in regard to the interaction between EU ETS and RE and EE. In addition, the interviews were conducted with the key experts. The interviews were recorded with consent from the participants and the key findings were summarised. As agreed with the interviewees, the participants are not directly referred to by name.

1.7 Disposition

Chapter 1 presents the background and significance of the thesis. The literature review on the current work on climate and energy policy interactions is presented. Based on the literature review, the research gap is identified, and the research objectives, as well as questions, are defined. The chapter also elaborates on the scope, limitations and audience for this thesis.

Chapter 2 presents the theoretical framework guiding the thesis. The chapter explains the rationale behind multiple climate instruments and justifies the need for a policy intervention.

Chapter 3 presents the methodology used in this thesis. The chapter examines different evaluation approaches existing in the literature, justifies the evaluation approach chosen to fulfil the aim of the thesis and elaborates on the research design.

Chapter 4 establishes the context in which both instruments operate with the focus on EU climate policy.

Chapter 5 examines how different stakeholders perceive interactions between climate and energy policies. The views of different stakeholders presented during the public consultation on the revision of the ETS are discussed. The key findings from the interviews are examined.

Chapter 6 examines the interaction between the EU ETS and the Ecodesign Directive, looking into different design elements of each instrument. Then, the framework for mapping interactions is used to identify the areas where the two instruments interact. The potential policy implications of those interactions are analysed.

Chapter 7 provides some general reflections on the EU climate policy with a focus on the role of the EU ETS and the Ecodesign Directive. The chapter also discusses the methodology used to fulfil the aim of this thesis.

Chapter 8 presents the final conclusions of the thesis. It answers the research questions as well as provides some recommendations for future research.

2 Conceptual framework

The aim of this chapter is to present a theoretical framework guiding the thesis. The chapter explains the rationale behind multiple climate instruments and justifies the need for a policy intervention. It elaborates on different climate mitigation policies with a specific focus on carbon pricing and regulatory approach to energy efficiency. Finally, the chapter discusses the importance of policy evaluation and elaborates on the taxonomy of climate and energy policy interactions.

2.1 Climate policy mix

According to Hall (1993), a policy contains three main elements: overall goals that the policy serves to achieve, policy instruments by which the goals are achieved and design characteristics of the instruments. The main assumption in policy formulation is that policy should target maximization of social welfare (Tinbergen, 1952). For the purpose of this thesis, this assumption is employed.

According to Tinbergen's theory of economic policy (1952, p.27), multiple market failures require multiple instruments to address them. Consequently, no single instrument can address many market failures simultaneously (Philibert, 2011). Furthermore, Bennear & Stavins (2007) argued that in some cases multiple policy instruments to address a single environmental problem can be justified on economic grounds. This thinking is based on the assumption that environmental policy is formulated and developed in a second-best setting, meaning that there are multiple constraints including political constraints, market failures and policy failures, and only some of which can be corrected or removed by one instrument (Bennear & Stavins, 2007).

Furthermore, one policy instrument can work well in achieving one objective, however, if several objectives are pursued, more instruments may be needed (Del Río, 2014; Philibert, 2011). Both RE support schemes as well as EE measures pursue other objectives than the reduction of GHG emissions. In case of EE, other objectives include improved energy security, air quality and other economic and social benefits (IEA, 2011; OECD/IEA, 2014).

2.2 Climate change as a market failure

The current and future costs of climate change are not borne by the ones who are responsible for releasing GHG emissions into the atmosphere, thus creating an externality. An externality occurs '*when one person's (entity's) actions affect other people, who neither receive compensation for harm done nor pay for benefit gained*' (Hanley, Shogren, & White, 2007, p. 49). In other words, the companies that release GHG emissions do not face the full consequences of the costs of climate change directly, but they impose the costs of climate change on the world and future generations (Stern, 2007). Climate can be considered to be a public good as the ones who fail to pay for it cannot be excluded from enjoying it, and the fact that one person enjoys climate does not diminish the capacity of others to enjoy it (Samuelson, 1954; Stern, 2007). As the markets do not automatically account for public goods and entities do not face economic incentives to reduce GHG emissions, this creates a market failure. A market failure exists when '*the market does not allocate scarce resources to generate the greatest social welfare*' (Hanley et al., 2007, p. 42). Furthermore, the climate change represents a different type of externality comparing to other negative externalities (e.g. air pollution): it is global in its causes and impacts, persistent and develops over time, uncertainties are considerable, and the impacts are likely to have significant effects on the world economy (Stern, 2007). These specific characteristics of climate change affect the choice of policy responses to address it (Stern, 2007).

Some actors see climate change mainly as a market failure that can be corrected by internalising the costs of GHG emissions through carbon pricing; others consider climate change to be an energy system problem to be tackled by decarbonising societal systems (Hildingsson, 2014). This difference in views on climate change impacts the choice of intervention policies to address the problem as well as the number of targets and measures in place (Hildingsson, 2014).

2.3 Climate change mitigation policies

According to IPCC (2014), climate change mitigation consists of policy responses that have the primary goal of reducing the GHG emissions or enhancing the sinks of GHG. Those policy responses can be classified into economic instruments, regulatory approaches (also known as command and control), information policies, government provision of public goods and services, and voluntary actions (for the overview, se*e Table 1*) (Somanathan et al., 2014) . Furthermore, sector-specific policies (e.g. transport or buildings) are often used instead of economy-wide policies due to political economy considerations (e.g. political feasibility) and need to overcome sector-specific market failures (Somanathan et al., 2014).

Table 1 Classification of climate mitigation policy instruments

Classification of policy instruments	Examples of instruments
Economic instruments (Market-based instruments)	Taxes, charges, subsidies and subsidy removal, emissions trading schemes
Regulatory approach (Command and Control)	MEPS, Emission standards, technology standards, product standards
Information policies	Eco-labelling, certification schemes, information disclosure, energy labelling
Government provision of public goods and procurement	Funding and investment, governmental programmes, Green Public Procurement (GPP)
Voluntary actions	Environmental agreements between companies, beyond compliance

Source: Somanathan et al. (2014)

Gunningham, Grabosky, & Sinclair (1998) argued that one single instrument is not enough to compensate for the weakness of stand-alone environmental policy. Thus, they developed a concept of smart regulation, which refers to *'a form of regulatory pluralism that embraces flexible, imaginative and innovative forms of social control'* (Gunningham, Grabosky, & Sinclair, 1998, p. 133). Smart regulation promotes a broader range of policy instruments involving different stakeholders (e.g. governments, business, and NGOs) in the policy development process (Gunningham et al., 1998). One of the core elements of smart regulation is improving effectiveness and efficiency of more traditional policy instruments.

Economic instruments, also known as market-based instruments and carbon pricing instruments, create economic incentives through a price mechanism to achieve a certain level of abatement (Somanathan et al., 2014). Those instruments include taxes, charges, subsidies and emission trading schemes. Regulatory approaches establish rules and/or objectives that must be fulfilled and non-compliance with those rules and objectives is penalised (Somanathan et al., 2014). They are common in environmental policies as well as climate policies and include instruments like emissions standards, technology standard, and product standards. Information policies are used to raise public awareness and provide relevant information for more informed consumption and production decisions (Somanathan et al., 2014). Labelling or certification schemes are examples of information policies. Furthermore, government provision of public goods and procurement can be used to remove institutional and legal barriers, for instance, to promote afforestation of state-owned forests. Finally, voluntary actions include actions taken by actors beyond the regulatory requirements.

As illustrated above, there are many policy responses to mitigate climate change, however, carbon pricing is considered by economists to be the core element of climate policy (Hood, 2013; Stern, 2007).

2.3.1 Carbon Pricing

The Stern Review on *Economics of Climate Change* (2007) argued that to internalize the cost of GHG emissions externality; market-based instruments are needed. Market-based instruments help to realise environmental, economic and social policy objective by taking into account the hidden costs of production in a cost-effective manner (European Environment Agency, 2006). These instruments provide economic incentives for the companies to achieve abatement where it is the cheapest to do so. For instance, for some companies it will be cheaper to pay for polluting or releasing GHG emissions, for others it will be cheaper to reduce pollution. Thus, market-based instruments provide flexibility for the companies regarding where abatement can be achieved (Stern, 2007). In theory, market-based instruments minimise the costs of complying with environmental regulation and at the same time stimulate technological innovation (Pearce, 2002).

Market-based instruments can be divided into quantity or price based instruments. A tax (also known as Pigouvian tax) on an activity that creates externality is an example of the price based instrument. Pigou argued that if an externality exists, an intervention in the form of tax is justified to maximise the economic welfare (Pearce, 2002). In theory, the tax level should be set to the marginal externality level. The notion of an environmental tax is that a polluter will abate until the point where the abatement costs are equal to environmental tax (Pearce, 2002), allowing for cost-effective abatement (i.e. achieving abatement where it is cheapest to do so). Collected taxes can also be used to generate revenues to be used in climate change mitigation efforts.

The EU ETS is an example of quantity based instrument as it set a cap on the total emissions allowed to release by the covered installations. The price of carbon is reflected in the price of emission allowances. The cost-effectiveness aspect of the EU ETS can be explained by the Coase Theorem (Coase, 1960). The theorem states that if the property rights are well defined and tradable, and transaction costs are low or none, then the trading will lead to an efficient outcome (Coase, 1960). This means that the trading provides flexibility to reduce pollution where it is cheapest to do so. The EU ETS created a previously non-existent market for carbon where property rights are well defined through allowances. The flexibility of the EU ETS to trade allowances leads to cost minimization of abatement.

2.3.2 Energy Efficiency

Energy policies do not necessarily have a GHG reduction as a primary goal but are also implemented for other reasons like energy development and energy security (Hood, 2013). The emissions reduction is usually a co-benefit of these policies. In case of energy efficiency, the primary motives behind these policies are cost savings to consumers and society as well as improved energy security (Hood, 2013). As energy efficiency can save money, the GHG emissions reductions can come at low or even negative costs (Gillingham, Newell, & Palmer, 2009). However, this potential for cost-effectiveness is often not realised and often is referred as the energy efficiency gap or the energy efficiency paradox (Jaffe & Stavins, 1994). The energy efficiency gap can be explained by the existence of economic, behavioural and organisational barriers (IEA, 2011).

2.3.3 Barriers to Energy Efficiency

The barriers to energy efficiency can be divided into the market and non-market failure barriers (Jaffe & Stavins, 1994). Within the context of energy efficiency, a market failure implies that more energy is consumed for a specific service than a rational allocation of resources would require (IEA, 2011). Non-market failure barriers include among others private information costs, high discount rates, access to capital and others. For example, some consumers may choose less energy efficient product due to lack of access to capital, as a more efficient product often cost more (Gillingham et al., 2009).

Market failure barriers consist of imperfect information, principal-agent problems, externalities and behavioural failures (IEA, 2011). Imperfect information together with behavioural failures are often named as the main barriers to energy efficiency (Gillingham et al., 2009). Lack of information about the availability of energy efficient product as well as their saving potential can lead to sub-optimal decisions by consumers and investors when selecting the products (Gillingham et al., 2009). Information can also be insufficient, inaccurate and costly to make an optimal decision (IEA, 2011).

Another barrier to energy efficiency is the principal-agent problem or agency dilemma that encompasses two market failures: split incentives and asymmetric information (Eisenhardt, 1989). The principal-agent problem exists when one party (the principal) delegates work to another (the agent) who performs the work (IEA, 2011). This relationship can lead to two problems: the principal and the agent can have conflicting incentives or goals, and it may be difficult and/or expensive for the principal to verify the work the agent performs (i.e. asymmetric information) (IEA, 2011). In the energy efficiency literature, a landlord-tenant relationship is often used to illustrate the principal-agent problem. The principal, in this case, the tenant, often pays the electricity bills, but the landlord (i.e. the agent) selects the appliances like a refrigerator or a dishwashing machine for the housing. The tenant has incomplete information about the energy efficiency of the appliances installed by the landlord. In this situation, a problem of split incentives exists as the benefits from lower energy bills do not occur to the ones making the investment (e.g. buying a refrigerator). The split incentives problem also exists when the electricity bill is included in the rent, as the tenant does not have the incentive to save energy even if the landlord purchases energy-efficient appliances. For instance, Levinson & Niemann (2004) found that tenants whose electricity bill is included in the rent consume significantly more energy than the ones who pay the electricity bill separately.

Behavioural failures prevent consumers from utilising the cost-saving potential from energy efficiency (IEA, 2011). In the energy efficiency literature, one of the widely discussed behavioural failures is bounded rationality (Gillingham et al., 2009). Contrary to the main neo-classical economics assumption that people behave rationally, bounded rationality explains that decision-makers do not always make rational choices. This bounded rationality can be attributed to cognitive limitations of decision-makers (e.g. limitation of knowledge or computational skills) (Simon, 1990).

The costs of GHG emissions from the energy sector (as well as costs of other externalities such as pollution) are also not borne by the ones producing and consuming energy, which leads to more energy being used than it is socially desirable (IEA, 2011).

Finally, one study mentions that other barriers such as the market power barrier and the innovation market failure exists (Houde & Spurlock, 2016).

2.3.4 Regulatory approaches to Energy Efficiency

The existence of the market failures for utilising the potential of energy efficiency can justify a public policy intervention, however, the cost associated with the intervention should not exceed the benefits (Jaffe & Stavins, 1994). The regulatory approaches, especially sector-specific, are widely used to remove the barriers to energy efficiency (Somanathan et al., 2014). For example, energy labelling regulation aims to address the information barrier by providing consumers with information on energy efficiency of different products. Nevertheless, the regulatory approaches have also been criticised for lack of effectiveness and cost-effectiveness (Somanathan et al., 2014).

2.3.5 Minimum Energy Performance Standards for appliances

The global consumption of electricity for consumer electronics and ICT has been growing by more than 7% annually since 1990, and it is expected to increase by 250% by 2030, even with the significant improvement in energy efficiency (OECD/IEA, 2009). Furthermore, the carbon price alone may not remove the EE barriers such as among others lack of time for consumers to search for information and split incentives (OECD/IEA, 2009). Thus, the regulatory measures like setting Minimum Energy Performance Standards (MEPS) become crucial for improving EE in products. MEPS are specifications of different requirements for the energy performance of products.

MEPS not only deliver energy savings but also provide cost savings for consumers (Siderius & Nakagami, 2013). Looking into the literature on energy standards for appliances, Gillingham et al. (2006) concluded that in general appliance standards tend to be cost-effective due to positive net benefits from energy savings without taking into account other benefits such as GHG emissions reduction. Furthermore, the study conducted by the IEA (2016) on different MEPS and labelling schemes worldwide concluded that the benefits exceed the costs three times. This indicates that MEPS offer cheapest energy savings as well as GHG emissions reductions (IEA, 2015). Furthermore, an extensive study on EE standards for appliances in the US concluded that the standards would reduce residential primary energy consumption and CO_2 emissions by 8–9% by 2020 (Meyers, McMahon, McNeil, & Liu, 2003). There, the overall cumulative benefit from the standards exceeded the costs by 2.75 times in the period from 1987-2050 (Meyers et al., 2003).

However, it is important to note that the existence of the rebound effects (i.e. direct and indirect) can limit the effectiveness of the EE policies (Greening, Greene, & Difiglio, 2000). The rebound effects imply that the gains achieved in the improvement of energy efficiency of a product will be partially offset by an increase in consumption of energy services (Greening et al., 2000). There is a general agreement that rebound effects exist, but the magnitude of those effects is debatable (IPCC, 2014).

2.4 Policy evaluation

Policy evaluation is an essential part of the policy-making process. It provides possibilities for learning and development of better policies as well as ensures accountability for the resources used (Mickwitz, 2005). As defined by Mickwitz (2005) policy evaluation is *'the process of determining the merit, worth, or value of something, or the product of that process'*. As it is a process of determining the value of something, the evaluation has a normative nature (Mickwitz, 2005; Vedung, 1998). Therefore, evaluation criteria are needed to be defined. In the literature, there are many different criteria used for policy evaluation. Mickwitz (2005) advocates for using multiple evaluation criteria (see examples of evaluation criteria in *Table 2*). He argues that the use of multiple criteria facilitates a broader debate about the policy and also allows for a more context-specific evaluation (Mickwitz, 2005).

Table 2 Criteria and guiding questions for evaluation of environmental policies

Criterion	Guiding questions
Impact	Is it possible to identify impacts that are clearly due to the policy and its implementation?
Effectiveness	To what degree do the achieved outcomes correspond to the intended goals of the policy?
Cost-effectiveness (efficiency)	Could the results have been achieved with fewer resources?
Acceptability	To what extent do individuals and organisations accept the environmental policy?
Transparency	To what extent are the outputs and outcomes of the environmental policies, as well as the processes used in the implementation, observable for outsiders?
Participatory rights	Who can participate in the processes through which the environmental policies are implemented?
Equity	How are the outcomes and costs of the environmental policy instrument distributed?
Predictability	Is it possible to predict the administration, outputs and results of the policy instrument?
Persistence	Are the effects persistent in such a way that they have a lasting effect?
Flexibility	Can the policy instrument cope with changing conditions?
Relevance	Do the goals of the instruments cover key problems of environmental policy?

Source: Mickwitz (2005)

2.5 Taxonomy of interaction

The literature review of the studies on policy interactions indicates that there is no common taxonomy for interactions. In addition, Del Rio (2014) confirms that there is no consensus in the academic literature on how conflicts, complementarities, and synergies are defined. Some authors refer to interactions as either positive or negative (Somanathan et al., 2014), others as complementary/mutually reinforcing or undermining (Hood, 2013; Oikonomou & Jepma, 2008). Somanathan et al. (2014) define positive interactions as interactions that reinforce the goals of another instrument. For instance, the policies supporting RE reinforce the policies dealing with congestion or local air pollution, as the deployment of RE improves air quality (Somanathan et al., 2014). Negative interactions can happen when multiple instruments address the same market failure, as it undermines the cost-effectiveness of the instruments (Somanathan et al., 2014). If both policies aim at reducing GHG emissions in the same sector, it can lead to negative interactions. Del Rio (2014) describes policy interactions as leading to conflicts ('one plus one is less than two') and synergies ("one plus one is more than two").

Furthermore, Oikonomou & Jepma (2008) and Sorrell (2003) make a distinction between horizontal and vertical policy interactions, depending on the level of governance of the policies. Horizontal interaction is between policies that exist at the same level of governance, for instance, the EU ETS and Ecodesign Directive (Oikonomou & Jepma, 2008). Vertical interactions occur between policies at different governance levels (e.g. the EU ETS and feed-in electricity tariffs in Germany) (Oikonomou & Jepma, 2008).

3 Methodology

The purpose of this chapter is to present the methodology used in this thesis. First, the chapter examines different evaluation approaches existing in the literature to assess climate and energy policy interaction. Then, the chapter presents and justifies the evaluation approach chosen to fulfil the aim of the thesis. It describes the research design used to answer the research questions. Finally, the data collection methods as well as techniques employed to analyse the data are presented.

3.1 Evaluation approaches to policy interaction

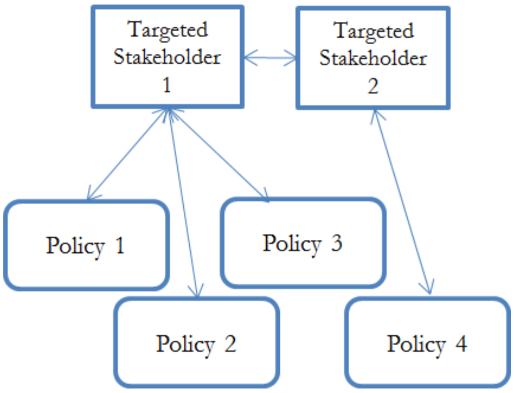
Spyridaki et al. (2014) conducted a review of the existing evaluation approaches to climate and energy policy interactions. There, they suggested that policy interactions can be identified and assessed at two levels: 1) policy instrument level and 2) market or stakeholders' level.

At a policy instrument level, interactions can be assessed at the level of instrument goals/targets and specific design characteristics of the instruments (Spyridaki et al., 2014). A number of studies looked into policy interactions at the instrument level, e.g. Oikonomou et al. (2010), Oikonomou & Jepma (2008), Sorrell, (2003). Sorrel (2003) proposed that policy interactions can be evaluated through a systematic comparison of the scope, objectives, operation, implementation, and timing of each instrument. Oikonomou and Jepma (2008) further developed the framework for assessing climate and energy policy interactions at instrument level. They suggested that the interactions can be examined by comparing the following characteristics of the instruments: *measure identification, objectives, scope, market arrangements, market flexibility, financing, technological parameters, timing, compliance parameters and institutional setup* (Oikonomou & Jepma, 2008) *(*these parameters are further elaborated in section 3.3*)*.

At a market or stakeholders level, interactions can be analysed through stakeholders' response to their simultaneous implementation and those interactions can potentially be driven by conflicting interests and objectives of the interacting policies (Spyridaki et al., 2014). The EU-funded APRAISE project[9] examined interactions between different EU environmental policies at stakeholders level using in-depth case study analysis (Joanneum Research, 2012). Their approach to assessing interactions is illustrated in Figure 2. The targeted stakeholder 1 is affected by the three policies at the same time, thus his/her behaviour is determined by all three policies instead of just one, and may differ from what was initially expected by a policy-maker. The APRAISE project looked into how stakeholders respond to different environmental policy instruments and how that impacts the implementation and outcomes of the instruments (Joanneum Research, 2012).

[9] 'Assessment of Policy Impacts on Sustainability in Europe' (APRAISE) project, for more information on the project, see http://cordis.europa.eu/project/rcn/100557_en.html

Figure 2 Policy interaction through the behaviour of the targeted stakeholders



Source: van der Gaast et al. (2016)

In the literature, various evaluation approaches are utilised to assess the interactions, and Spyridaki et al. (2014) categorise these approaches into quantitative, qualitative and hybrid, depending on the type of data each approach employs. The quantitative approach works well for narrowly specified policy combinations and quantifiable processes, while the qualitative approach is used to understand the contextual implications, cause-impact effect and non-quantifiable processes (Spyridaki & Flamos, 2014). The hybrid approach employs both quantitative and qualitative data and can utilise the benefits of both approaches (Spyridaki & Flamos, 2014).

As quantitative approach works well for a limited number of policy combinations, Abrell & Weigt (2008) used this approach to assess the impact of the ETS and two RE support schemes (i.e. green certificate trading scheme and feed-in tariff in Germany) on the carbon price. Often quantitative approach makes use of bottom-up energy system models focusing on the entire energy sector and top-down sectoral models focusing on the interaction of the energy sector with the rest of the economy (Spyridaki & Flamos, 2014).

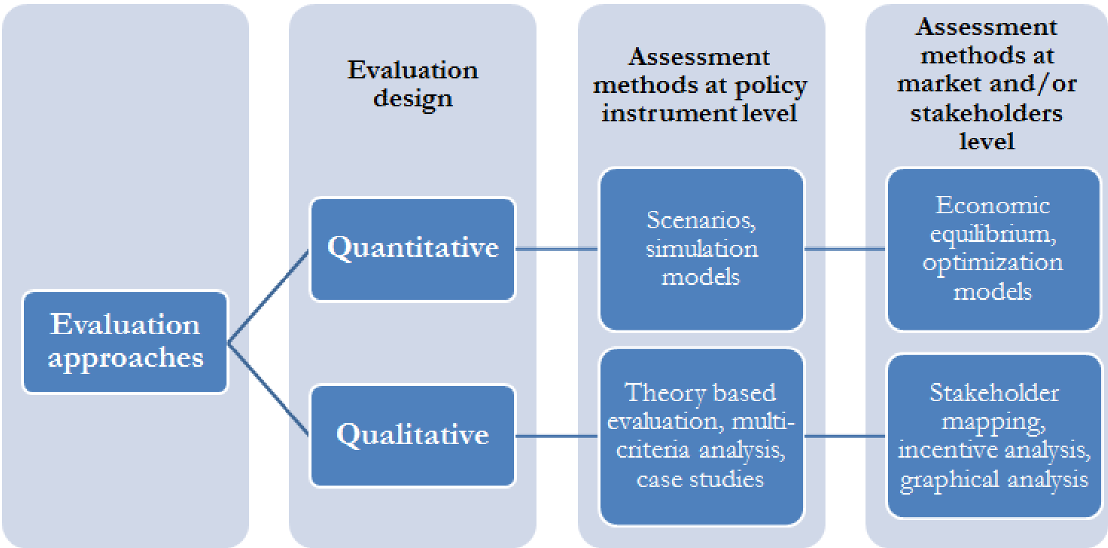
The qualitative approach tends to provide explanatory descriptions of interactions (Spyridaki & Flamos, 2014). This approach can help to identify the effects of institutional, social and political factors on policy success (Somanathan et al., 2014). The qualitative approach employs different evaluation theories, among others theory-based evaluation, theoretical-concept analysis and multi-criteria evaluation (Spyridaki & Flamos, 2014). Multi-criteria evaluation is among widely applied methods to assess interactions between climate and energy policies and have been implemented in the following studies: Del Río (2010), Dusch & del Río (2017), Konidari & Mavrakis (2007), Del Río (2010), Dusch & del Río (2017), Konidari & Mavrakis, 2007; Oikonomou et al. (2010) and Oikonomou & Jepma (2008). For instance, Dusch & del Rio (2017) used a qualitative approach to assess interactions between a large number of climate and energy policies in the EU employing multi-criteria evaluation. This approach allowed them to evaluate the key effects of interactions based on multiple criteria such as effectiveness, cost-efficiency, distributional effects, and social acceptance and political feasibility. Another widely applied method is a case study analysis (Spyridaki & Flamos, 2014), which allows examining the interacting policies in their specific context. The ongoing CARISMA project[10] employs qualitative case study analysis examining different climate and energy policy interactions in their context (van der Gaast et al., 2016). For example, one of the

[10] "Coordination and Assessment of Research and Innovation in Support of climate Mitigation Actions" – CARISMA – is an EU-funded Horizon 2020 project running from 2015 to 2018, see also http://www.carisma-project.eu/

case studies examines implications of the interaction between EU ETS and the Renewable Energy Directive at the EU level.

Depending on the view on policy interactions, i.e. whether they are examined at instrument level or market/stakeholder level, different assessment methods can be employed by various approaches (see *Figure 3*). For instance, qualitative approach employs methods like theory-based evaluation, multi-criteria analysis, and case studies to understand interactions at a policy instrument better, whereas methods like stakeholder mapping, incentive, and graphical analysis are used for assessing interactions from the stakeholders' perspective.

Figure 3 Evaluation approaches to policy interactions and assessment methods



Source: adapted from Spyridaki & Flamos (2014)

3.2 Choice of evaluation approach

As the aim of the thesis is to provide a better understanding of how the Ecodesign Directive interacts with the EU ETS, the qualitative evaluation approach was used. Even though the quantitative approach works well for narrowly specified policy combination, as in the case of this thesis, the qualitative approach enables a descriptive, explanatory analysis of how the two instruments interact, allowing to focus on the simultaneous implementation of the two instruments. In addition, the qualitative approach can be needed to provide evidence about policy impacts and to understand the factors driving those impacts (Kemp & Pontoglio, 2011).

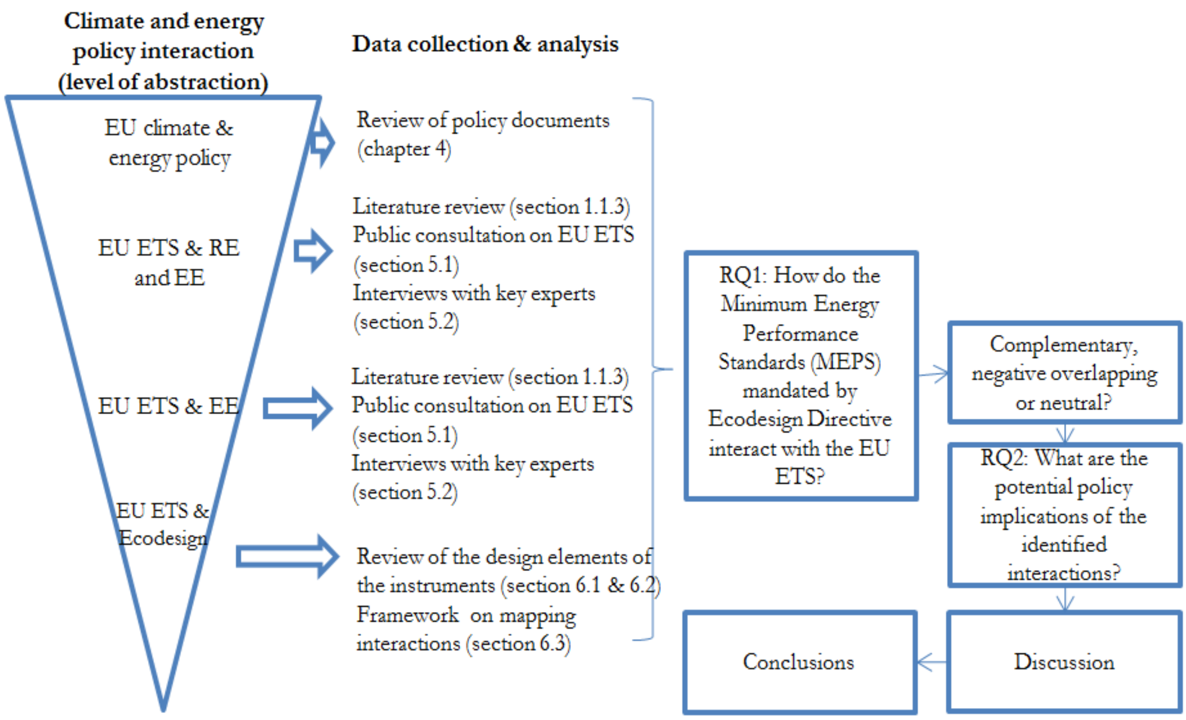
The quantitative approach may not account for the context in which instruments operate, and as such may be too simplified to provide for policy input. On the other hand, the qualitative approach allows understanding the context in which the two instruments function, capturing the effects of social and political factors on policy success. As demonstrated by the two EU-funded projects APRAISE and CARISMA, the context in which the instruments operate may determine whether the interactions are positive or negative(Joanneum Research, 2012; van der Gaast et al., 2016).

As the effectiveness of the instruments depends on the specific design elements of those instruments (Del Río, 2010; Dusch & del Río, 2017; Oikonomou & Jepma, 2008; Sorrell et al., 2009), the interaction between the Ecodesign Directive and the EU ETS was examined at the policy instrument level. The assessment method was inspired by a single case study method, as it allows assessing the instruments in their context. According to Yin (1993), the case study method is used when the studied phenomenon is not distinguishable from its context, and the inclusion of context plays a major part of the research. In the context of policy evaluation, the case study method allows answering 'how' questions (Yin, 1993).

3.3 Research design

The research design guiding this thesis is illustrated in Figure 4. The figure presents the level of abstraction used when discussing climate and energy policy interactions. It also elaborates on what type of data was used to obtain which information. For example, the review of policy documents was used to understand the EU climate and energy policy context.

Figure 4 Research design of this thesis



Source: author

In order to understand how the Ecodesign Directive interacts with the EU ETS (RQ1), the context in which both instrument operate was assessed first. As both instruments operate at the same jurisdictional level, the EU context was examined in relation to each instrument. Here, the development of the EU climate policy was reviewed to understand the strategic focus of the climate policy and what role two instruments play in the overall policy context. The assessment of context was inspired by the CARISMA project. Second, the perception of different stakeholders in regard to the interaction between the EU ETS and RE and EE policies was assessed, as it can determine whether the policy interactions are positive or negative (Joanneum Research, 2012; van der Gaast et al., 2016).

In order to assess the perception of the various stakeholders, written opinions submitted for the public consultation on the revision of the EU ETS were discussed in details. There, the different stakeholders including the energy sector, energy-intensive industries, NGOs, academia and public institutions presented their opinions in regard to the interaction of the

EU ETS with other policy instruments. The views in regard to the interaction between EU ETS and RE and EE were scrutinised.

Next, the interviews with the key experts were used to understand how they perceive interactions between the EU ETS and EE measures.

Once the context was established, and perceptions of different stakeholders analysed, the design elements of the EU ETS and the Ecodesign Directive, and their performance were examined. The design elements were assessed by reviewing the policy documents establishing the instruments as well as analysing the studies conducted. Then, the framework to map the two policy instruments was used to help to identify potential interactions between the two instruments. The framework incorporates a number of studies on climate and energy policy interactions (Oikonomou et al., 2010; Oikonomou & Jepma, 2008; Sorrell, 2003; Spyridaki & Flamos, 2014). The initial framework included 10 different categories: *measure identification, objectives, scope, market arrangements, market flexibility, financing, technological parameters, timing, compliance and institutional setup*. However, during the application of the framework, it became apparent that two categories, namely market arrangements and market flexibility can be combined into one category called market. Furthermore, the technological parameters category was omitted as it was not relevant for both instruments. The final framework with the key indicators used in the thesis is illustrated in Table 3.

Table 3 Framework for mapping interactions between climate and energy policy instruments with key indicators

Category	Indicators
Measure identification	Measures type, Voluntary/Mandatory
Objectives	Nature of targets, Quantitative targets, Type of targets, Threshold, Emissions covered, Climate/energy
Scope	Covered entities, Sectors, Sites, Opt-in/opt-out
Market	Number of participants, Trading commodity
Financing	Cost recovery, Revenue generated
Timing	Compliance period, Operational changes planned
Compliance	Penalty
Institutional setup	Body for setting up the scheme, Body for administration, Body for verification (enforcement)

Source: author's interpretation of the framework developed by Oikonomou & Jepma (2008)

The EU ETS and the Ecodesign Directive were analysed in a comparable way based on these categories and indicators (presented in Table 3) to identify which elements are complementary, negatively overlapping and neutral. Complementary interaction means that one policy reinforces the goals of another policy instrument, whereas overlapping interaction undermines the goals of another instrument. For the purpose of this thesis, overlapping is always considered to be negative. Neutral interaction means that they do not affect each other in a negative or positive way.

Once the potential overlaps and complementarities were identified, the potential policy implications were discussed (RQ2) to mitigate the overlaps and enhance synergies. The potential policy implications were identified through the literature, review of the answers submitted during the consultation and the interviews, and their feasibility was discussed with the experts during the interviews.

3.4 Data collection and analysis

In order to identify the research gap as well as define relevant research questions, a systematic review of the academic literature was conducted (see section 1.1.2). The academic literature was identified using the following term '*energy and climate policy interaction'* published in English between 2000-2017. The literature included both qualitative and empirical studies with the focus on the EU ETS, RE and EE policies. Furthermore, the references used in the key academic articles (e.g. a review article on energy and climate policy interaction by Spyridaki & Flamos (2014)) were examined. The academic literature was supplemented with the relevant studies conducted by the IEA and IRENA.

In order to answer the research questions, several data collection methods were employed, ensuring data triangulation. First of all, the EU climate policy context was established by reviewing policy and legal documents available in the EC official website. The review of policy documents was complemented with the identification and analysis of the relevant studies conducted by the EU, EEA, IEA, IRENA and OECD as well as academic papers and other grey literature. Specific focus was devoted to the documents presenting opinions of different stakeholders in regard to the two instruments.

Secondly, the data on the stakeholders' perspective was collected through a review of the opinions submitted for the public consultation on the revision of the EU ETS.[11] One of the questions covered in the consultation was: '*How well does the EU ETS Directive fit with other relevant EU legislation?*. In total, 436 entries submitted to this question by different stakeholders were examined. Only entries discussing how the EU ETS interacts with RE and EE policies were selected for thorough analysis. Furthermore, the identical entries submitted by the same group of stakeholders were counted as one entry to avoid overrepresentation. After a careful review, 63 opinions of different stakeholders were selected and analysed in detail. The opinions were reviewed with regard to the following criteria: supporting a single or multiple EU climate targets, perception on the EU ETS, perception on the interaction between the EU ETS and RE and EE (overlapping or complementary, positive or negative), policy coherence, potential solutions to mitigate overlaps and mitigate synergies. Once the opinions were coded, they were categorised into different stakeholder groups to identify perceptions within and among the groups.

Thirdly, semi-structured interviews with the key experts on climate and energy were conducted to understand their perspectives on climate and energy policies, and how the EU ETS interacts with EE policies (where possible specifically with the Ecodesign Directive). Semi-structured interviews provided an opportunity for discussing specific issues in details, when relevant. The main purpose of the interviews was to understand their perceptions, assess the feasibility of the policy implications and fill in the existing information gaps. The list of the interviewees is included in Appendix 1. The interviewees were carefully selected to ensure that they have necessary knowledge on climate and energy policy interactions. As climate and energy policy instruments are often complex due to their design details, they are not easily understood by different stakeholders (Spyridaki & Flamos, 2014). When selecting the interviewees, it was important to ensure that they had a neutral position towards interactions.

[11] The public consultation on the revision of the EU ETS as well as all the contributions submitted can be found on: https://ec.europa.eu/clima/consultations/articles/0024_en

Finally, the data on the specific design elements of the EU ETS and Ecodesign Directive was collected through analysis of the main legal and policy documents establishing the instruments (particularly, Directive 2003/87/EC, Directive 2009/125/EC and Decision (EU) 2015/1814) as well as supporting documents prepared by the EC. The performance of the instruments was assessed by examining both academic and grey literature. This data was used to fill in the framework on climate and energy policy interaction (see Table 5). The framework was used to systematically compare different design elements of the two instruments and identify the areas where they interact.

4 EU climate policy context

The purpose of this chapter is to establish the context in which both instruments operate. The chapter discusses the objectives and priorities of the EU's climate policy. Then, the political context of the EU ETS and the Ecodesign Directive is examined.

4.1 EU Climate Policy

Since the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 and ratification of the Kyoto Protocol, the EU's climate focus has been on reduction of GHG emissions through cost-effective policy initiatives. One of those policy initiatives was the EU ETS, which was launched in 2005 and remains the cornerstone climate policy in the EU.

In 2009, the Climate and Energy Package for 2020 was adopted as a part of Europe 2020 strategy for smart, sustainable and inclusive growth (European Commission, 2016c). The targets included 20% reduction of GHG, 20% share of renewables and 20% improvement in energy efficiency by 2020. Thus, the focus has shifted from a single GHG emissions target to multiple targets on energy (i.e. renewable energy and energy efficiency). According to the European Environmental Agency (EEA) (2016), the EU is on track with meeting these targets by 2020, despite some discrepancies across different Member States. The data for 2014 show that the GHG emissions have already decreased beyond the 20% target, the share of renewable energy is growing faster than predicted and energy consumption is decreasing sufficiently to reach the energy efficiency target (European Environmental Agency, 2016).

In 2011, the EC developed a long-term roadmap for becoming a competitive low-carbon economy by 2050 (European Commission, 2011a). The roadmap covers the power, transport, buildings, industry and agriculture sectors, and sets a target to reduce domestic GHG emissions by 80% by 2050 compared to 1990 levels (European Commission, 2011a). The power sector will play a crucial role in reaching this target, as it can significantly eliminate CO_2 emissions with the deployment of renewable energy, whereas energy efficiency will play a key role in the buildings and industry sectors.

The EC estimated that the shift towards a low-carbon economy not only tackles climate change but also creates additional benefits for the EU's economy. Those benefits include reduction of the EU annual energy costs by €175–320 billion, an increase of energy security, structural change and creation of new jobs and improved air quality (European Commission, 2011a). The roadmap for a low-carbon economy is complemented with an energy roadmap for 2050, which examined different scenarios for a transition of the energy sector in line with the GHG emission target (European Commission, 2011b). The roadmap highlights that the prime focus for decarbonising energy sector should be on energy efficiency and increasing share of renewables (European Commission, 2011b). Thus, the climate policy is not only focused on the reduction of GHG emissions, but also on contribution to the European Energy Union (van der Gaast et al., 2016).

In 2014, building on the Climate and Energy Package for 2020, a framework for 2030 with new targets was agreed in the EU (European Council, 2014). Two binding targets, 40% reduction of GHG emissions and 27% share of renewable energy, were set. An indicative target of 27% of improvement in energy efficiency[12] was agreed at the EU level, with a

[12] In November 2016, the EC proposed to update the Energy Efficiency Directive, suggesting new 30% EE target for 2030. For more information on the proposed package, see https://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition.

reduction of primary energy consumption by about 20 % and reduction in final energy consumption by 12% compared to 2005 levels. Primary energy consumption refers to the total energy demand for the EU, whereas final energy consumption is the total energy consumed by end-users such as households or industry (Eurostat, 2014). Despite being on track in reaching 2020 targets, the EEA (2016) highlights that the efforts need to be considerably increased for meeting 2030 and particularly 2050 targets. The EEA estimates that planned GHG reduction may not reach 40% by 2030 and RE deployment may not achieve the target without additional effort to boost investors' confidence in RE and remove market barriers (European Environmental Agency, 2016). Furthermore, a number of NGOs stressed that the current EU efforts are not in line with the Paris Agreement on limiting the increase in temperature to below 2°C and aiming to limit it below 1.5 °C (CAN Europe, 2017; Climate Action Tracker, 2017). For example, Climate Action Network (CAN) Europe has been advocating on behalf of other NGOs and stakeholders to set more ambitious 2030 targets, including 55% of GHG reduction, 45% RE and 40% of EE.

The main instrument to achieve the GHG reduction target is the EU ETS, however, both the European Commission and the European Council confirmed the need to reform the scheme (European Council, 2014). In July 2015, the European Commission proposed to revise the EU ETS for the period after 2020, but no agreement has been reached so far. There has been some resistance from the industry to implement more ambitious changes to the ETS (Anonymous personal communication, 2017). In addition, both Renewable Energy Directive and Energy Efficiency Directive were proposed for revision to ensure that they incorporate the targets for 2030.

In line with the climate objectives, the European Commission proposed a Clean Energy for All Europeans package to contribute to a competitive clean energy transition (European Commission, 2016a). The top priorities of the package are putting energy efficiency first and becoming a global leader in renewable energy while providing a fair deal for consumers (European Commission, 2016a). The European Commissioner for Climate Action and Energy Miguel Arias Cañete highlights that *'the cheapest energy, the cleanest energy, the most secure energy is the energy that is not used at all and that energy efficiency needs to be considered as a source of energy in its own right'* (European Commission, 2017a). Thus, energy efficiency plays a crucial role in the EU's strategy for transitioning towards a low carbon-economy.

4.1.1 Political context of the EU ETS

The EU ETS was designed in response to the commitment under the Kyoto Protocol to reduce GHG emissions by 8% below 1990 levels after the unsuccessful initiative to introduce a carbon energy tax in the EU (Ellerman, Convery, & de Perthuis, 2010). The development of the scheme started with the European Commission's green paper[13] on the design of the EU ETS in 2000, and three years later the directive establishing the EU ETS was adopted (Directive 2003/87/EC). The EU ETS was launched in 2005 with a pilot phase, and since then it has been adjusted a number of times. Currently, the EU ETS is in the third phase of its development (for the key features of different EU ETS phases see section *6.1.2* and *Figure 5*).

Despite many criticisms towards the scheme's ability to provide a proper price signal to achieve decarbonisation of the energy-intensive sectors (Knopf et al., 2014), the EU ETS remains the main instrument to achieve GHG emissions reductions (European Commission, 2017c). According to the market survey conducted in 2016, the majority of European

[13] Green paper is a document by the EC that facilitates discussion on a specific topic at the EU level. Green papers can lead to legislative developments usually outlined in White papers, see also http://eur-lex.europa.eu/summary/glossary/green_paper.html

stakeholders perceive the EU ETS as the most cost-effective way to reduce emissions and believe the scheme will continue to be the main instrument of EU climate policy (Fujjiwara, Karakosta, Szpor, Tuerk, & Hofman, 2015; Nordeng & Kolos, 2016). Although the EU ETS is still seen as the main climate instrument, it will not be the only climate instrument in the EU (van der Gaast et al., 2016)

4.1.2 Political context of the Ecodesign Directive

In 2001, the EU introduced a green paper on the Integrated Product Policy (IPP)[14], where the EC proposed to strengthen product-focused environmental policies and facilitate the development of a greener product market. As a part of this initiative, the Ecodesign concept with life-cycle thinking was proposed. In 2005, the Ecodesign Directive was adopted in 2005 after a long and controversial legal process (Dalhammar, 2014) and it was revised in 2009. One of the reasons for promoting the Directive was that different instruments in place at the time (e.g. eco-labels, consumer information) were not enough to facilitate cost-efficient product design changes (Dalhammar, 2014).

The Ecodesign Directive is a framework directive that does not set binding requirements for products but allows for setting compulsory implementing measures for energy-related products (Directive 2009/125/EC). The energy efficiency requirements remain the key focus of the Directive. However, other aspects of product life-cycle phases are regulated as well (e.g. material and water use, polluting emissions, recyclability). The Directive has elements of so-called *New approach* for harmonising product-related standards, which combines law-setting with industry-driven standardization (Dalhammar, 2014). Every three years the EC after the consultation with interested parties (through Consultation Forum, Art.18) establishes a working plan with an indicative list of product groups that set a priority for implementing measures (Art.16). The working plan for 2016-2019 focuses on ongoing and upcoming reviews of the measures and identifies additional product groups that should be further assessed with regard to their inclusion in the requirements for energy performance (European Commission, 2016b).

In the Clean Energy for all Europeans package, the EC reaffirmed the importance of Ecodesign Directive in combination with Energy Labelling in achieving energy and resource efficiency as well as creating new business opportunities for the industry (European Commission, 2016a). The EC decided to reinforce the focus on products with the highest energy saving potential as well the emphasis on the circular economy (European Commission, 2016a). Furthermore, the Directive contributes to the Energy Union and energy efficiency targets for 2030 (European Commission, 2016b).

However, consumers in some countries have complained regarding the energy requirements for specific products, which resulted in a media backlash (Barford & Dalhammar, 2015). This was particularly an issue for vacuum cleaners in the UK (Barford & Dalhammar, 2015) and phasing out of incandescent light bulbs in Germany (Jung, 2009), where consumers complained against less energy consuming products. When it comes to the industry's perspective, the recent study conducted by Dalhammar (2016) on industry attitudes in the Nordic countries concluded that many EU companies are becoming more positive about MEPS.

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[14] IPP focuses on minimizing environmental impacts from products taking into account all phases of products' life-cycle, for more information on IPP see http://ec.europa.eu/environment/ipp/index_en.htm

5 Stakeholders' position on climate & energy policy interactions

The purpose of this chapter is to understand how different stakeholders perceive interactions between climate and energy policies. First, different stakeholders' views presented during the public consultation on the revision of the EU ETS are discussed. Then, the key findings from the interviews with key experts are examined. Finally, the findings from the consultation are compared with the findings obtained during the interviews.

5.1 Key findings from the consultation

The public consultation on the revision of the EU ETS was conducted in 2015. One of the questions covered in the consultation was: '*How well does the EU ETS Directive fit with other relevant EU legislation?*'.[15] In this question, many of the stakeholders addressed the interaction between the EU ETS and RE, and EE policies. The opinions of those stakeholders were thoroughly reviewed, and the main findings are presented in Table 4.

After analysing the opinions of different stakeholders, it became apparent that there is a division in opinions between the traditional energy sector (including the majority of energy-intensive industries) supporting a single EU climate target and other stakeholders (including RE sector, insulation industry, NGOs and academia) supporting the multiple climate targets and policies. However, both groups acknowledge the need to ensure coherence among different climate and energy policies and mitigate potential negative impacts.

5.1.1 Energy sector & energy-intensive industries

The majority of the stakeholders from the energy industry support a single EU climate target with a focus on GHG emissions reduction and the EU ETS as the main instrument to achieve the target. They argue that other policies like RE, EE, and Ecodesign Directive, undermine the functioning of the EU ETS. Some stakeholders in the energy sector also support RE and EE policies in the non-ETS sectors (e.g. transport and buildings). Many stakeholders in the energy sector recognise the need to strengthen the EU ETS and improve its flexibility to adjust to external shocks and believe that the Market Stability Reserve (MSR) can achieve that. They also believe that once the scheme is strengthened, it can trigger the needed investments in RE and EE to move to a low-carbon economy. In addition, the energy-intensive industries are concerned that the cumulative burden from other policies will drive the costs for the industry.

Nonetheless, the stakeholders from the insulation sector support multiple climate targets and policies. They acknowledge that the EU ETS needs to be better coordinated with RE and EE policies. The targets for the ETS should take into account the impacts of those policies. Furthermore, they raise a concern that the impacts of RE and EE on emission reduction have been used as an argument to weaken the RE and EE Directives as well as the RE and EE targets in the EU.

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[15] The whole questionnaire can be found on https://ec.europa.eu/eusurvey/runner/ETS_revision.

Table 4 Key findings from the review of opinions of different stakeholders on interaction of the EU ETS with other climate policies

Stakeholder	Nr of opinions	Main findings
Energy sector	27 opinions from companies and trade associations	*Traditional energy sector* - Large portion of stakeholders support a single GHG target - Acknowledge the need to minimize negative impacts from other policies (RE & EE) and ensure coherence - Acknowledge the need for flexibility in the ETS and support MSR - Some of the stakeholders support RE & EE measures outside the EU ETS sectors - Believe that the strengthen EU ETS would trigger investments into RE & EE
		Renewable energy sector - Support a multi-target approach (GHG, RE, and EE) - Mention the need to ensure coherence between the policies
Energy-intensive industries	20 opinion from companies and trade associations	*Building materials industry* - Acknowledge that the EU ETS needs to account for effects of RE & EE policies
		Cement industry - Support a single GHG target - Believe that the EC should set targets and establish policies accounting for their mutual interactions - Believe that the cumulative burden of especially the EE and Ecodesign should be carefully assessed
		Chemicals and fertilizers - Support a single GHG target - Believe that other policies are driving costs for the industry and that EE & RE policies should be applied in a smart way to avoid counterproductive effects
		Ceramic industry - Acknowledge the existence of overlapping policies - Mention the need to ensure coherence between the policies
		Glass industry - Support a single GHG target - RE & EE policies can support this target when applied in a smart way
		Metallurgical industry - Support a single GHG target - Believe that other policies are driving costs for the industry and that EE & RE should be implemented in a smart way
		Pulp and paper industry - Support the ETS as the main climate instrument - Believe that the ETS triggers investments in EE

		- Believe that separate RE support schemes undermine the efficiency of the ETS *Insulation industry*: - Support a multi-target approach - Believe that the ETS needs to be better coordinated with RE & EE - Believe that the targets should take into account the impacts of those policies - Believe that other policies complement the EU ETS. However, they also have secondary impacts on carbon price set by the ETS. This has led to numerous attempts to weaken several of other directives (RE & EE) and to weaken or discontinue several EE and RE targets
Other business	7 opinions from companies and trade associations	- Acknowledge that other policies contribute to GHG emission reductions and this affects the EU ETS
IETA		- Believe that other policies (RE & EE & Ecodesign) undermine the ETS - Believe that MRS could be useful to address overlaps - Transparency of effects of other policies is needed
NGOs	4 opinions	- Support a multi-target approach - Believe that other policies are complementary and that the ETS needs to be better coordinated with RE & EE Acknowledge the need to adjust the supply of allowances, potentially through MSR
Academia	2 opinions	- Acknowledge the existence of overlapping policies - Justify the policies that address different market failures - Believe that legislation should explicitly state which market failures it addresses in order to justify overlaps with the ETS - Support MSR
Public institution	2 opinions	- Acknowledge the interaction between ETS and RE & EE - Mention that those policies include other goals besides GHG

Source: author's interpretation of submissions to the public consultation on the revision of the EU ETS

5.1.2 International Emissions Trading Association (IETA)

Logically, IETA, who is a business voice for promoting the emissions trading system as a solution to climate change, supports the EU ETS as the main instrument to reduce GHG emissions in a cost-effective way. The association argues that other climate policies (RE and EE) undermine the scheme and that overlaps have to be avoided. IETA estimates that policies like EE Directive and RE Directive will lead to a significant reduction of allowances (IETA, 2015). The impact of the two Directives will potentially result in a reduction of allowances by more than 700 million tonnes of CO_2 by 2020, which will undermine the demand for allowances and such the carbon price (IETA, 2015). Furthermore, IETA recommends that any additional climate policies introduced should be reviewed on their impact on the reduction of GHG prior to their implementation to ensure that the emissions are reduced cost-effectively (IETA, 2015).

5.1.3 Renewable energy sector

Contrary to the traditional energy sector and energy-intensive industries, the RE sector supports multiple climate targets and instruments. Naturally, the RE targets promote deployment and development of the technologies, which is often favourable for the RE sector. They also argue for a need to ensure coherence between the policies and mitigate potential overlaps.

5.1.4 NGOs and public institutions

The NGOs support multiple climate targets and have been advocating for the more aspiring 2030 targets for the EU as well as for the more ambitious reform of the EU ETS to ensure a proper price signal for investors. They believe that RE and EE policies are complementary to EU ETS and that the policies need to be better coordinated to ensure coherence. One of the NGOs raised a concern that the EU ETS itself can be an obstacle to more ambitious climate targets, suggesting that the EU should reconsider positioning the ETS as the main climate policy instrument or as a solution to decarbonisation. Furthermore, some NGOs argue that the argument of negative interactions between the policies has been used to promote less ambitious RE & EE targets.

The public institutions mention that RE and EE policies have other goals besides GHG emission reduction such as energy security, energy conservation, and air emissions.

5.1.5 Academia

The stakeholders from academia acknowledge that EU ETS and RE and EE overlap, but those overlaps can be justified due to the existence of multiple market failures. One of the recommendations from the academia was that the legislation should explicitly mention which market failures it addresses. The RE and EE policies contribute to the reduction of GHG emissions, thus they are complementary to the ETS. However, at the same time, the reduction of GHG will have a lowering effect on the price of European Allowance (EUA), which can undermine the functioning of the ETS. The fact that the EU ETS can be both complementary and overlapping with RE and EE policies is in line with the findings from the literature review on climate and energy policy interactions (see section 1.1.2).

5.2 Key findings from the interviews

The interviews have been conducted with the experts working on climate and energy policies. Thus all the respondents were aware of the interactions between the EU ETS and EE measures. The list of experts is provided in Appendix 1 List of the interviewees, and the interview guide can be found in Appendix 3 Interview guide. The key findings from the interviews are divided into themes and are summarised below.

5.2.1 The EU ETS

Overall, the experts agree that the EU ETS has a role to play in decarbonisation of the energy sector. However, they also acknowledge that the current price does not provide a necessary signal to invest in low-carbon technologies, in particular for promoting technologies that are still in research and development phase.

Some experts also point out that the ETS may not be appropriate instruments for all sectors (e.g. transport and buildings). Thus, other policy instruments are needed to address those sectors as well as remove the existent market barriers. Furthermore, all the experts highlight the need to reform the ETS to improve its flexibility and as such ensure that it can adjust to external shocks. The effectiveness of the EU ETS in mitigation of climate change is questioned by many experts, especially if the system is not strengthened. Another important aspect brought by many experts is the need to make the cap level more stringent to account for other policies reducing GHG emissions. However, the political feasibility of introducing a more stringent cap is questioned by some experts. The lack of more stringent cap can lead to the introduction of other carbon pricing instruments at the Member State level, for example, an introduction of a tax on carbon. This is particularly the case if the EU ETS is not reformed urgently.

One expert also points out that due to political economy reasons, it is challenging to have a very high CO_2 price. The expert argues that if the carbon price was around 40-50 euros per tonne of CO_2, the industry would heavily oppose the system. In his/her opinion, a high carbon price would never happen as it is not politically feasible. Thus, the expert argues that the complementary policies are needed alongside the carbon pricing instrument.

One of the experts suggests that the EU should stop promoting the ETS as a flagship climate policy, as it is not reaching its potential. In addition, the expert mention that the interaction of the EU ETS with other policies have been used as an excuse to promote less ambitious targets for RE and EE.

5.2.2 Energy Efficiency measures

All the experts acknowledge the importance of EE measures in mitigating climate change. They highlight that improving EE has other benefits besides energy savings and reduction of GHG emissions. Though, one expert notes that other benefits of EE are often forgotten during discussions on overlapping policies.

Some experts mention that EE measures also help to achieve other climate targets, for example, the RE target (i.e. 27% of RE share by 2030). One of the experts argues that a 100% share of renewable energy can be achieved only with very effective policies that limit energy demand. In this case, the expert claims that the Ecodesign Directive plays a major role in the electricity sector through setting MEPS for products. However, the Directive '*would need to be much more aggressively implemented and supported by national implementation*' (Anonymous personal communication, 2017).

Furthermore, one expert mentions that the fact that the EU sets a non-binding target for EE (i.e. 27% by 2030) sends a wrong signal. The expert also stresses that at the moment, the EU target setting is not coherent as it does not take into account complementarity of the policies (e.g. complementarity between RE and EE targets).

5.2.3 Multiple instruments

All experts agree that multiple instruments are needed to mitigate climate change and to transition towards a low carbon economy, but the instruments have to be complementary. Policies focusing on different aspects and sectors are needed, including among others setting a high enough price on carbon, promoting technologies for long-term decarbonisation, addressing the transport and building sector as well as helping consumers to make optimal decisions. Some of the experts also note that there is a shift in the EU from focusing mainly on GHG emission reductions to focus on energy security and other benefits of both RE and EE.

5.2.4 Interactions between the EU ETS and EE

All experts acknowledge that climate and energy policies interact and that those interactions can have positive or negative impacts on the instruments. They also recognise that it is important to understand those interactions and mitigate negative overlaps. Many experts mention the complexity of the interactions and difficulty in quantifying the impacts. They stress that it is challenging to attribute those impacts to a specific policy instrument.

A few experts highlight that the design elements of the policies, as well as their implementation, can affect the outcome of the interaction. Furthermore, one expert mentions that it is crucial to consider how policy context affects the functioning of the instruments. For example, context such economic situation, policy practice, public acceptance, is essential, as it may determine whether the policy interactions are positive or negative.

Some experts mention that performance of a single policy instrument can be affected if multiple instruments target the same sectors. This can happen when the effectiveness of one instrument (e.g. the ETS) is perceived insufficient, and as such, an additional policy instrument is introduced. Furthermore, if the instruments cover different sectors, the coexistence of multiple instruments can be justified. Many of the experts justify coexistence of multiple instruments, especially when those instruments pursue different objectives and address different market failures.

Many of the experts recognise that both the EU ETS and EE policies lead to a reduction of GHG emissions and as such many consider those policies to be complementary. When it comes to the interaction of the EU ETS and the Ecodesign Directive, only a few experts could elaborate a bit more on the two instruments. Those experts recognise that both instruments reduce GHG emissions in different sectors. However, as the Ecodesign Directive leads to lower electricity consumption in households (i.e. through MEPS for products), the instruments interact through the energy sector that is covered by the ETS. This can impact the functioning of the EU ETS by reducing demand for allowances and as such decreasing the price of allowances. However, a few experts mention that the current low price of allowances is not due to EE policies, but other external factors such abundant issuance of free allowances, the economic crisis and use of international credits[16].

All the experts stress the importance in ensuring coherence between climate and energy policies. One of the experts mentions that '*we have to find a way to make sure that climate and energy framework is coherent, and coherent in a way that incentivises more ambitious behaviour and more ambitious policy, rather than dis-incentivising it*' (Anonymous personal communication, 2017). Furthermore, the expert expresses the need for discussion on overlaps to be alive on a political level.

5.2.5 Policy implications

All the experts acknowledge the need for the EU ETS to be reformed. Some highlight the need to adjust the cap to make it more stringent, others argue that the Market Stability Reserve (MSR) should provide the scheme with needed flexibility.

When it comes to the stringency of the cap level, some argue that it may not be politically feasible to adjust it to a more ambitious level. Furthermore, the complexity of the policy making in the EU[17] makes the adjustment of the cap even more challenging.

[16] International credits have been established under the Kyoto Protocol through two mechanisms: Clean Development Mechanism and Joint Implementation. The credits represent a tonne of CO_2 removed as a result of an international project outside the EU and can be used to meet obligations under the EU ETS. For more information, see https://ec.europa.eu/clima/policies/ets/credits_en

[17] For more information on policy making and legislative procedures in the EU, see https://europa.eu/european-union/eu-law/decision-making/procedures_en.

Some experts expect that the MSR will help to improve the scheme's flexibility and reduce negative impacts from other policies. Others, on the other hand, are less optimistic about the MSR and its ability to adjust to external shocks fast enough. They argue that due to the existence of a large surplus of allowances at the moment, the MSR will be busy addressing those allowances and will not account for other policies such as RE and EE. The expert also mentions that the MSR will only temporarily remove the allowances from the circulation without actually cancelling them. Furthermore, some experts mention the need to remove allowances from the circulation faster and that the effectiveness of the MSR will be visible only by the end of the next trading period (i.e. 2021-2030).

One expert stresses the importance for the EU to clarify what role the EU ETS will play in moving to a low carbon economy to send a proper signal to investors. The expert mentions that the EU needs to be more realistic in regard to the ETS' ability to set a price on carbon. Another expert comments that strong governance is necessary to ensure that both policies and targets are adjusted to mitigate negative impacts and improve effectiveness.

Finally, some of the experts observe that the Member States are taking the initiative in their own hands by considering their own measures, for example, a Nordic carbon price floor[18] or a carbon tax in Germany. The UK has already implemented a price floor on carbon since 2013.

[18] In the light of the revision of the EU ETS, Nordic countries consider alternative options for the ETS, for more information see: https://euobserver.com/nordic/138365

5.3 Comparing the findings – industry and experts

Comparing the findings from the public consultation on the revision of the ETS and the interviews with the experts, the opinions of the industries (i.e. energy sector, energy-intensive industries and IETA) significantly vary compared to the experts, which can be explained by the self-interests driving the industries.

On the one hand, the industry sees the EU ETS as the main instrument to address GHG emissions and promote a single climate target. The majority of the representatives from the industry argue that RE and EE policies undermine the functioning of the EU ETS. Some of them also believe that the EE measures should be applied only in the non-ETS sectors. On the other hand, the experts acknowledge the role of the EU ETS but also mention that the current scheme does not provide a necessary price signal to invest in low-carbon technologies and decarbonise the energy sector. The experts argue that the complementary policies are needed to address multiple market failures (i.e. not only GHG emissions externality) and pursue different objectives. They argue that RE and EE policies complement the EU ETS as those policies reduce GHG emissions. Nevertheless, both groups mention the importance of ensuring coherence between the instruments.

The industry believes that once the EU ETS is strengthened, the scheme will trigger the needed investments in RE and EE. However, some of the experts argue that the price will never be high enough to incentivise a long-term transition to a low-carbon economy, mainly due to political economy reasons.

Furthermore, the industry believes that the MSR will provide the needed flexibility to adjust to external shocks and help to reduce negative overlaps from other policies. The industry doesn't mention the need to account for RE and EE in the cap setting. The experts, on the other hand, highlight the importance of setting stringent enough cap to account for GHG emissions reductions achieved by other policies.

6 Interaction between EU ETS & Ecodesign Directive

This chapter examines the interaction between the EU ETS and the Ecodesign Directive. First, the chapter assesses different design elements of the EU ETS and the Ecodesign Directive separately. Once the design characteristics of the instruments are established, the framework for mapping interactions is used to identify the areas where the two instruments interact. Then, the interaction between the two instruments is examined whether it is complementary, overlapping or neutral. Finally, the potential policy implications of those interactions are analysed.

6.1 Design elements of EU ETS

6.1.1 Scope

The EU ETS operates in 31 countries (i.e. EU-28, Iceland, Lichtenstein, and Norway), covers around 11 000 energy-intensive installations and airlines[19], and it is the largest emission trading system in the world (European Commission, 2016f). The scheme operates by setting a cap on the total emissions from covered installations, which is reduced annually (Directive 2003/87/EC). Since 2005, the operators covered by the scheme have to surrender emission allowances also known as European Emission Allowances (EUA) for the amount of GHG emitted (Directive 2003/87/EC). A single EUA permits the operator to emit 1 tonne of CO_2 or equivalent amount of other GHGs covered by the scheme. The operators can buy and sell emission allowances, thus creating a market for allowances also known as the carbon market.

6.1.2 EU ETS development in phases

At the moment, the EU ETS is in the third phase of its development, and since the establishment of the scheme, it has undergone a number of significant changes comparing to the previous phases (see the main features of each phase in *Figure 5*). The first phase was a pilot phase where 'learning by doing' approach was employed, and as such malfunctioning was not avoided. In both first and second phases (2005-2007 and 2008-2012 respectively), most of the allowances were allocated for free. The number of allowances was determined through the National Allocation Plans (NAPs) prepared by the Member States. The generous allocation of allowances through NAPs, as well as the lack of verified historical data on emissions from installations, led to an oversupply of allowances and as such EUA price drop close to zero (Boasson & Wettestad, 2016). In the second phase, to address this problem, the number of allowances was reduced by 6.5%. However, due to the 2008 economic crisis, the emissions decreased further, which led to a large surplus of allowances and a further decrease in the carbon price. The decrease in price is also attributed to the increased use of international credits and impacts from the renewable energy policies (Koch et al., 2014), and some argue that political factors and regulatory uncertainty also played a role (Knopf et al., 2014).

In the third phase, the NAPs were replaced by a centralised system with a single EU-wide cap that is reduced by 1.74 % annually. Since the beginning of the third phase, an increasing use of auctioning of allowances was introduced. The EC estimates that around 57% of the total allowances will be an auction during the third phase (European Commission, 2016f). That implies that the operators have to buy an increasing portion of allowances through auctions. The majority of the revenues (i.e. more than 80%) is planned to be used for climate and

[19] The flights within European Economic Area are covered by the EU ETS until end of 2016. In the light of the actions taken by the International Civil Aviation Organisation from 2020, the EC proposed to prolong the coverage of the scheme beyond 2016.

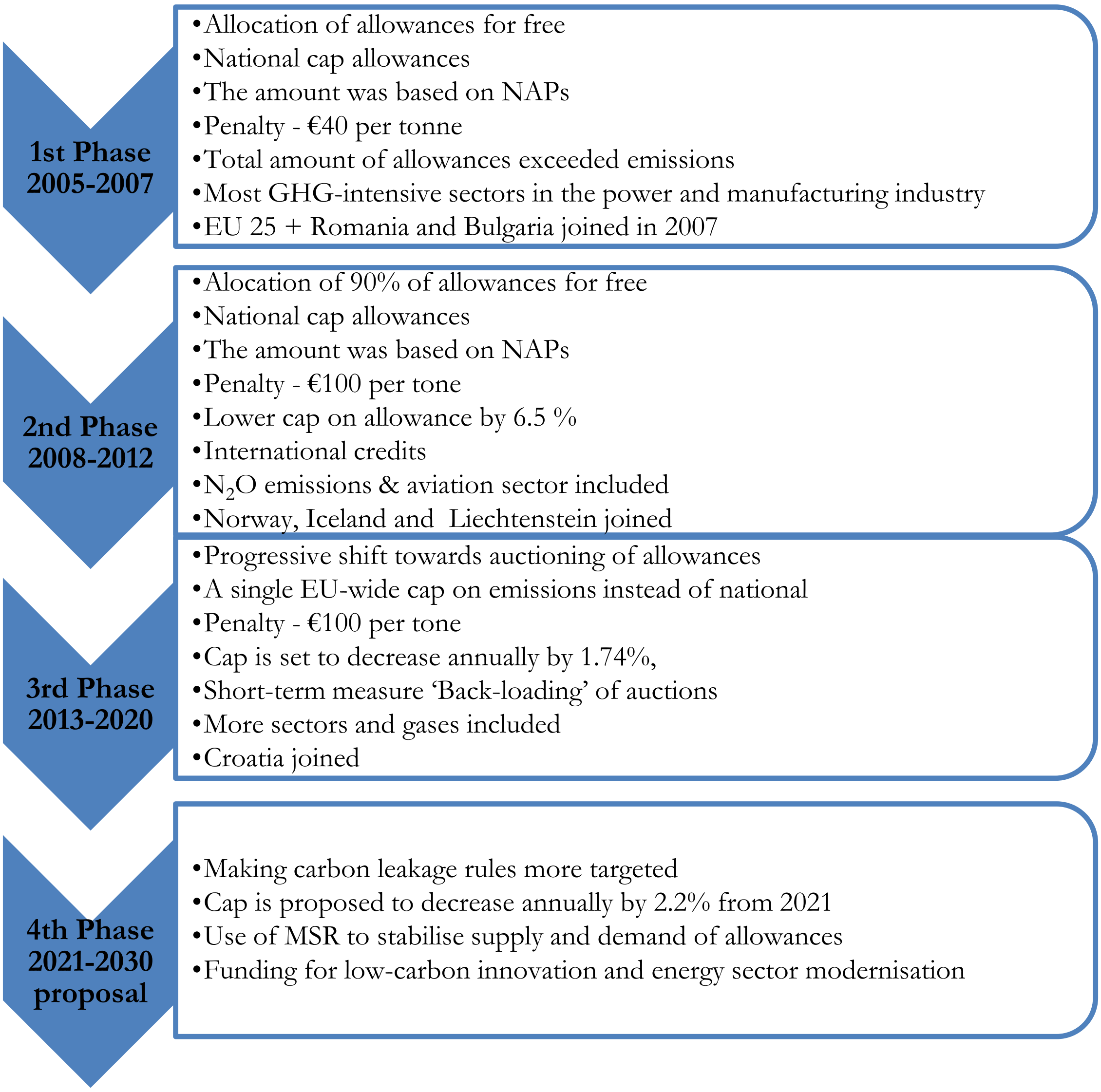
energy purposes such as energy efficiency, renewable energy, research and sustainable transport (European Commission, 2016f).

6.1.3 Market Stability Reserve

The EC estimated that the surplus of the allowances was around 2 billion in the start of the third phase (European Commission, 2016f). To address this challenge, the EC proposed a short-term and a long-term measure. The short-term measure includes so-called a 'back-loading' measure postponing the auctioning of 900 million of EUA until 2019-2020 (Regulation (EU) No 1210/2011). The measure does not remove the allowances from the scheme, it only affects their distribution. The long-term measure, on the other hand, includes the establishment of the Market Stability Reserve (MSR) that can potentially take allowances from the circulation by placing them in the reserve (Decision (EU) 2015/1814), however, the overall amount of allowances remains unchanged. The MSR aims to tackle structural supply and demand imbalances of the allowances (European Council, 2015). The MSR will start operating from January 2019, and the postponed allowances from back-loading will be eventually transferred to the MSR (Decision (EU) 2015/1814).

The MSR will be operating according to the predefined rules, ensuring that the Member States or the EC cannot influence the implementation. Each year the EC will publish a total number of allowances in circulation (Decision (EU) 2015/1814). The amount equal to 12% of the allowances in circulation will be deducted from the auctioning and placed in the reserve unless the amount is less than 100 million of allowances (Decision (EU) 2015/1814, Art 1(5)). If the total amount of allowances in circulation is less than 400 million, 100 million should be released from the reserve (Decision (EU) 2015/1814, Art 1(6)). In case there are less than 100 million of allowances in circulation, all allowances should be released and added to the auctioning.

Figure 5 Overview of the main features of different phases of the EU ETS



Source: European Commission (2015a) and European Commission (2015b)

6.1.4 EU ETS beyond 2020

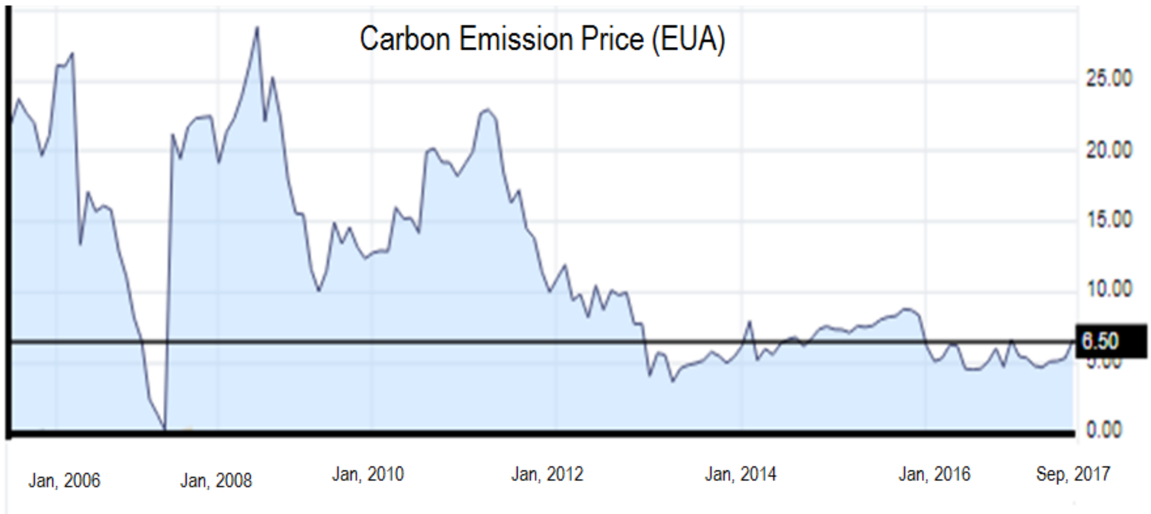
In 2015, the EC proposed to revise the ETS for the fourth phase (2021-2030)(European Commission, 2015b). One of the main changes proposed is to increase the annual reduction rate of the cap from 1.7% to 2.2% from 2021, which would lead to 43% reduction in GHG emissions by 2030 (i.e. compared to 2005 levels). Another focus of the proposal is on better targeting of the allocation of the free allowances, focusing on the sectors with the highest carbon leakage potential (i.e. the sectors that due to the costs of the climate policy would relocate their production to another country where emission requirements are lower). The proposal suggests establishing two funds, Innovation Fund and Modernisation Fund, to meet the investment challenges into a low-carbon economy. Furthermore, the preamble of the proposal mentions that the RE and EE policies are complementary policies as they support environmental-effectiveness of the EU ETS. The proposal also mentions that the synergies between these policies and the EU ETS can be enhanced through the MSR, however it does not elaborate on how this can be achieved.

6.1.5 Performance

The EU ETS has been highly criticised for its inability to set a price on carbon and as such to send a proper signal to investors. The price of EUA dropped from around 30 €/tCO_2 in middle of 2008 to below 5 €/tCO_2 in the middle of 2013 (See Figure 6). The current carbon price is around 6.5 €/tCO_2. Such a low price throughout the second and the third phase can be attributed to external factors and the EU ETS' inability to adjust to them (Koch et al., 2014) Those factors include over-allocation of allowances, the economic crisis and extensive use of international credits (Knopf et al., 2014; Koch et al., 2014). However, some argue that policies such as RE and EE policies, have contributed to the abatement and reduced the need for allowance (Mulder, 2016), which in return led to the lower carbon price.

This low price does not promote needed investment into RE and EE to move to a low-carbon economy and decarbonise the energy sector (Nordhaus, 2011; Sonnenschein, Richter, Dalhammar, & Buskirk, 2017). The EU ETS may work well for supporting low-emission technologies that are ready for the market, but it does not provide enough incentive to invest in technologies that are still in research and development phase (Anonymous personal communication, 2017).

Figure 6 Price of European Emission Allowance for the period of 2006-2017



Source: adapted from www.investing.com

6.2 Design elements of Ecodesign Directive

6.2.1 Scope

Ecodesign Directive is a framework directive, establishing rules for improving the environmental performance of energy-related products taking into account the life-cycle thinking (Directive 2009/125/EC). The main focus of the directive is on energy-efficiency of the products, which is achieved by setting the EU-wide Minimum Energy Performance Standards (MEPS) for energy-related products. One of the main life-cycle impacts for most energy-related products is the use phase, and as such setting MEPS for those products can lead to significant overall energy savings (Dalhammar, 2014). The main role of the MEPS is to remove the worst energy performing products from the market. Besides energy consumption, the Directive also allows for standards to be set with regard to other significant environmental aspects such as water consumption, noise, material content (e.g. mercury in lamps) and resource efficiency[20]. The Directive itself does not set binding requirements for specific products; the requirements are set in the implementing measures also called regulations.[21]

There are two types of implementing measures: specific requirements and generic requirements. Specific requirements set in the form of limit for products, for example, a limit on energy consumption, whereas generic requirements do not set a specific limit. Generic requirements include the need to provide consumers with information, for example, on mercury content or how to use the product in energy efficient way. Setting of the implementation measures is based on the technical, environmental and economic analysis.[22] It is a complex process that can take quite a few years. For the first 12 implementing measures to be published, it took on average around 5 years with the time span between 3.5 and 6.7 years (Dalhammar, 2014). The main issue with this lengthy process is that by the time the implementing measures are adopted, the energy efficiency standards can become obsolete (Dalhammar, 2014).

The products that should be covered by the implementing measures are identified and selected through the working plans (Directive 2009/125/EC, Art 16). A current working plan is for the period 2016-2019.

The initial scope of the Directive was on energy-using products, but this scope was extended to energy-related products in 2009. Energy-related products refer to any good that has an impact on energy consumption, including energy-using products and energy-related products. Energy-using products are consumer goods (e.g. light bulbs, computers, washing machines, refrigerators, etc.) and industrial products (e.g. transformers, industrial fans, motors, etc.). Energy-related products do not necessarily consume energy, but they have an impact on energy consumption. Those products include windows, insulation material or bathroom devices.

The Directive sets criteria for the product groups to be covered by the implementing measures (see Directive 2009/125/EC, Art.15(2)). One of the criteria is that the product should represent a significant volume of sales and trade in the EU, which corresponds to more than 200 000 units per year. The products should also have a significant environmental impact as well as significant potential for improvement.

6.2.2 Enforcement

All manufacturers and importers of energy-related products have to comply with the implementing measures in order to be able to sell products in the EU. Member States are responsible for the enforcement of Ecodesign regulations through the market surveillance. Each Member State has an authority responsible for ensuring that products comply with the requirements. Products that do not comply with the regulations should be removed from the market. The penalties for not complying with the requirements should be effective, proportionate and dissuasive, considering the extent of the violation (Directive 2009/125/EC, Art 20). The EC estimated that around 10%-25% of products on the market do not comply with the Ecodesign and Energy Labelling requirements and therefore around 10% of

[20] For more information of how the Ecodesign Directive can be used to promote resource efficiency, see (Dalhammar, 2014)

[21] A list with the implementing regulations for different products can be found here: https://ec.europa.eu/energy/sites/ener/files/documents/list_of_ecodesign_measures.pdf

[22] The detailed methodology on whether energy-using products fulfil the criteria to be included in the implementing measures can be found here: https://publications.europa.eu/en/publication-detail/-/publication/be880e05-7528-415d-b592-e9f29e787635

predicted energy savings are being lost (European Commission, 2016b).[23] The main issues in enforcement of the Directive are a lack of resources in the Member States, lack of cooperation among the countries as well as limited coordination at the EU level (Ecofys, 2014).

6.2.3 Energy Labelling and Energy Star

The Ecodesign Directive is complemented by the Energy Labelling Directive (Directive 2010/30/EU). The Directive is applied to energy-related products having an impact on energy use. The main rationale behind energy labelling is to help remove the imperfect information barrier and provide consumers with the needed information to choose more energy efficient products. The current labelling scheme ranges from A+++ (most efficient) to G (least efficient) products. Since July 2017, the Energy Labelling Directive will be gradually replaced by the Energy Labelling Regulation (Regulation (EU) 2017/1369). One of the reasons for the revision of the Directive was to ensure future relevance and effectiveness of the label (Ecofys, 2014) .

Another labelling scheme is the European Energy Star, which is a voluntary labelling programme for energy efficient office equipment (EU Energy Star, n.d.). The inclusion of the European Energy Star (or similar performance scheme) in the public procurement of the office equipment is encouraged by the Energy Efficiency Directive (EU Energy Star, n.d.).

6.2.4 Performance

The Ecodesign Directive is one of the few policy instruments that successfully addresses energy efficiency and reduces CO_2 emissions in the EU (Dalhammar, 2014; Kemna & Wierda, 2015). The energy savings achieved by the Ecodesign Directive directly contribute to the EU energy efficiency target (i.e. 27% by 2030) set in the Energy Efficiency Directive. The Directive also reduces energy dependency as well provides economic benefits (Kemna & Wierda, 2015). Furthermore, the strengthening of the MEPS for products would not undermine the competitiveness of the EU manufacturers, as the requirements are applied to all manufacturers that want to sell their products in the EU (Molenbroek, Cuijpers, & Blok, 2012).

The effects of Ecodesign Directive and Energy Labelling are usually evaluated together, due to difficulty in attributing the effects to each policy (Dalhammar et al., 2017). According to the ex-ante study conducted by Kemna & Wierda (2015) accounting for the impacts of Ecodesign as well as Energy Labelling, the following benefits are estimated by 2020:

- ✓ Around 6800 PJ or 1890 TWh of primary energy saving, i.e. an energy saving of 18% for the average product
- ✓ 314 Mt CO_2 equivalent (7% of 2010 EU-total)
- ✓ 336 million m^3 drinking water and 0.4 Mt printer paper saving; 205 kt less NOx emissions
- ✓ € 111 billion net saving for consumers
- ✓ € 55 billion extra revenue for industry, wholesale, retail and installation sector
- ✓ 0.8 million extra direct jobs created for industry, wholesale, retail and installation sector

[23] At the moment, a number of projects are implemented in the EU to improve compliance with the Ecodesign Directive and Energy Labelling Directive; those include projects like ECOPLAINT (more information http://www.eepliant.eu/) and COMPLAIN TV (more information http://www.compliantv.eu/eu/about-the-project/home).

The energy savings achieved by the two policy instruments represent around 9% of the EU energy consumption total in 2010 and 7% of the CO_2 emission total (Kemna & Wierda, 2015). By 2030 the savings are projected to grow to 15% of energy consumption and to 11% of CO_2 emissions (Kemna & Wierda, 2015).

Another study conducted by Ecofys claims that a proper implementation of the Ecodesign Directive can lead to annual savings of up to 600 TWh of electricity and 600 TWh of heat in 2020 (Molenbroek et al., 2012). This corresponds to approximately 17% of the EU total electricity consumption and 10% of heat consumption (Molenbroek et al., 2012). Furthermore, it would lead to around 400 Mt of CO_2 saved by 2020. However, the study also identifies that the Directive does not realise its full potential for energy saving, mainly due to persistent delays in approval of implementing measures for some products as well as the insufficient ambition of some products (Molenbroek et al., 2012). For example, the level of ambition of MEPS for TVs was not sufficient, because, by the time when the standards were in place, the majority of TVs were already more efficient (Molenbroek et al., 2012).

A recent empirical study on savings achieved for six product groups (i.e. boilers, water heaters, light sources, electric motors, household cold appliances, and ventilation units) in Germany highlights that the potential national savings can be significant, but smaller than expected in the assessment presented by Kemna & Wierda (2015) (Fischer et al., 2017). The authors explain that difference in savings can potentially be attributed to overestimates of the savings at the EU level, the fact that appliances in Germany are already quite efficient, the increase in sales and relative high consumption of old appliances in stock (Fischer et al., 2017). The study also stresses that the measures under the Ecodesign Directive and Energy Labelling can be more stringent (Fischer et al., 2017).

6.3 Mapping the interactions

6.3.1 Measure identification

Both instruments operate at the same jurisdictional level – the EU. The ETS is a market-based instrument, which supports GHG emission reduction in a cost-effective way. The ETS sets a price on carbon, though the price signal does not remove the market barriers to promote the energy savings in products. The price signal is used to internalise the costs of GHG emissions, however it does not remove the barriers (i.e. imperfect information, principal-agent problem) to promote EE. Thus, the regulatory approach used by the Ecodesign Directive is needed to set MEPS for energy-related products. Both instruments are mandatory instruments for the covered industries/products.

Table 5 Areas of policy interaction between EU ETS and Ecodesign Directive

Category	Design elements	EU ETS (3rd phase)	Ecodesign Directive
Measure identification	Measure type	Tradable allowances	MEPS for energy-related products and other requirements (e.g. water use, noise, etc.)
	Voluntary/ mandatory	Mandatory	Mandatory
Objectives	Nature of targets	Absolute quantity of GHG	Energy saved per product category
	Quantitative targets	Cap is reduced by 1.74% yearly; 21% lower GHG emissions by 2020 (compared to 2005)	Maximum energy consumption set per product group, no overall targets
	Type of targets	Cap on total emissions	Energy reduction in households and industrial facilities (co-benefit CO_2 emissions reduction)
	Threshold	>20MWh thermal rated input	> 200 000 units per year sold in the EU, products have a significant environmental impact as well as significant potential for improvement
	Emissions covered	CO_2, N2O from all nitric, adipic, glyoxylic acid and glyoxal production and perfluorocarbons (PFC) emissions from aluminium production	Indirectly, CO_2 and NO_x emissions, potentially other emissions
	Climate/energy	Climate	Energy
Scope	Covered entities	Energy-intensive industries (e.g. power stations and other combustion plants, with >20MW thermal rated input, oil refineries, iron and steel, cement clinker, glass, etc.), aviation sector only for the flights within EEA until end of 2016	Manufacturers and importers of energy-related products
	Sectors	Energy sector, energy-intensive industries	Manufacturers and importers of energy-related products (users of products - households)
	Sites	Installations located in the EU Member States	All manufacturers and importers who want to sell their products in the EU (specific groups of products)
	Opt-in/opt-out	Member States may add additional sectors and GHG	Industry sectors may propose voluntary agreements as alternatives to potential regulations
Market	Number of participants	11 000 installations	All manufacturers and importers who want to sell their products in the EU (specific group of products)

	Trading commodity	EUA – European Emission Allowances (1 tCO_2)	not relevant
Financing	Cost recovery	Cost-recovery via electricity or product increased price	Cost-recovery via increased price for consumers
	Revenue generated	Revenues generated through auctioning	Economic savings for consumer
Timing	Compliance period	2005–2007 (1st phase), 2008–2012 (2nd phase), 2013-2020 (3rd phase); Annual EUA to cover emissions by installations	Working plans (2009-2011, 2012-2014, 2016-2019) and different time schedules for different product groups, preparatory studies take years
	Operational changes planned	Progressive shift towards auctioning of allowances	Inclusion of more energy-related products (not only energy-using)
Compliance	Penalty	€100 per tonne of CO_2	Member States set different penalties taking into account the extent of non-compliance, number of units of non-complying products.
Institutional setup	Body for setting up the scheme	European Commission (Co-legislators)	European Commission (Co-legislators)
	Body for administration	National competent authorities issue the permits	Self-regulatory (depending on a product an independent conformity assessment may be needed)
	Body for verification (enforcement)	National authorities	National authorities

Source: author's interpretation of the framework developed by Oikonomou & Jepma (2008)

6.3.2 Objectives

The EU ETS is a climate instrument with the main goal of reducing GHG emissions, whereas the Ecodesign Directive is primarily focused on energy efficiency of the selected products. The ETS targets GHG emissions from the energy sector and energy-intensive industries (more than 20MWh thermal rated input), while the Ecodesign Directive addresses energy consumption of products used in all sectors. For the products to be covered by the Ecodesign Directive, they should have a substantial amount of sales in the EU (i.e. more than 200 000 units per year) and have a significant environmental impact as well as significant potential for improvement.

The EU ETS target on GHG emissions is set in absolute terms, whereas the energy saved under the MEPS is relative to a specific product. At first glance, it seems like both instruments have different targets. However, the majority of the products covered by Ecodesign are household appliances, thus the final energy consumption (through the electricity market) is reduced. The reduced energy consumption contributes to a CO_2 emission reduction from the power sector, which is covered by the EU ETS, and as such, the Directive contributes to the EU ETS target of reducing GHG emissions. As both instruments reduce GHG emissions, they interact through the energy market in the EU. Whether this interaction is complementary or overlapping needs to be further assessed.

6.3.3 Scope

The ETS covers the energy sector as well as energy-intensive industries (e.g. oil refineries, glass, cement, etc.), while the Ecodesign Directive mainly addresses the manufacturers and importers of energy-related (at the moment mainly energy-using) products. The requirements set in the implementing measures target all manufacturers and importers, who want to sell their products in the EU. Thus, it does not undermine the competitiveness of the EU industry as all manufacturers have to comply with the requirements. Furthermore, the compliance with the Ecodesign Directive may have a positive effect outside the EU. This is based on the logic that once a manufacturer develops a more energy efficient product for the EU market, it may also be offering this product for other markets, where energy efficiency standards are less stringent or non-existent.[24] On the other hand, as the EU ETS covers only the installations located in the EU, there is a risk that some sectors would relocate their production outside the EU with lower emission requirements (i.e. carbon leakage). As the EU ETS does not cover the manufacturers of energy-related products, both instruments have different scopes.

6.3.4 Market & Financing

The ETS established a market, where allowances can be traded. Initially, most of the allowances were allocated for free through grandfathering, but in the current phase of the scheme, a higher share of allowances is auctioned. This provides for a possibility to generate revenues for climate and energy purposes. The Ecodesign Directive does not create an additional revenue source but provides significant economic savings for consumers (estimated € 111 billion net saving by 2020). In both instruments, the costs are transferred to consumers through a higher price of electricity or products. However, in case of the MEPS there is some empirical evidence that the actual price of appliances decreases after the introduction of the standards as well as the quality of the products improves (Brucal & Roberts, 2017; Taylor, Spurlock, & Yang, 2015).

6.3.5 Timing

The EU ETS is developed in phases. Before and after each phase, the ETS is evaluated to assess the needed design changes in the scheme to improve its effectiveness and its ability to set a price on carbon. When it comes to the covered installations, they have to submit the needed amount of EUA to cover their emissions annually. Contrary, the development of the implementing requirements under the Ecodesign Directive is a very lengthy process, which can range between 3.5 and 6.7 years. This process can impede the development of up-to-date standards with regard to technological progress, and it can undermine the possibility of utilising the full potential of energy efficiency. However, once the implementing measures are adopted, they become immediately enforceable in all Member States.

6.3.6 Compliance & Institutional setup

Both instruments have established penalty systems to ensure enforcement. In the case of the ETS, a fine of €100 per tonne of CO_2 is imposed. The fines are imposed on installations in case they fail to comply by surrendering sufficient amount of allowances to cover their emissions in time. The fines are imposed by the relevant national authorities. For the Ecodesign Directive, Member States are in charge of setting different penalties taking into account the extent of non-compliance and number of units of non-complying products. The compliance with the implementing measures is self-regulatory, meaning that manufacturers need to ensure that their products comply with the requirements to be able to use CE mark.

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[24] This effect that the EU has on other markets outside the region is known in the literature as the Brussels Effect. See also (Bradford, 2012)

This approach provides less administrative burden for manufacturers, but it also entails a higher risk of non-compliance. It is estimated that around 10% to 25%[25] of the products on the market are not compliant with the requirements, which undermines the potential energy savings. The ETS requires considerable effort for monitoring and verification by the Member States, whereas the implementing measures are directly applicable in the Member States (Molenbroek et al., 2012). It is estimated that at a national level, the ETS requires 10-20 times more people than the implementation of the requirements under the Ecodesign Directive (Molenbroek et al., 2012). As both instruments are set-up by the EC, it enhances the possibilities for coordination between the instruments.

6.4 Impacts of the Ecodesign Directive on the EU ETS

The Ecodesign Directive reduces the final energy consumption in the EU due to the energy savings achieved through the MEPS for certain products. The estimated energy savings for the current 12 implementing measures are around 376 TWh by 2020 (see Appendix 2 Expected energy savings from Ecodesign). This equivalence to around 400 Mt of CO_2 emissions saved by 2020 (Molenbroek et al., 2012). Another study estimated a bit lower savings in CO_2 emissions equivalent to 314 Mt of CO_2 (Kemna & Wierda, 2015). As those emissions savings are achieved in the energy sector (i.e. some being achieved through electricity savings and some from fossil fuel savings), they will contribute to the reduction of GHG emissions covered by the EU ETS. But it is not apparent from the Ecodesign Impact Accounting study by Kemna & Wierda (2015) what share of the reduction of CO_2 emissions comes from the sectors covered by the EU ETS. However, it is clear that the interaction between the Ecodesign Directive and the EU ETS can be considered complementary as the Directive reinforces the goals of the ETS by reducing CO_2 emissions.

Nonetheless, if the energy savings achieved by the Ecodesign Directive (as well as other EE measures) are not embedded in the cap level, they can potentially undermine the price of the allowances in the ETS, causing potential policy overlaps.[26] More specifically, as a part of CO_2 emissions savings will be achieved by the Ecodesign Directive, less effort will be needed to achieve reductions from the energy sector. This will lead to a reduction in demand for allowances. As the ETS cap is fixed (i.e. the supply of allowances is inelastic), the decrease in the demand for allowances will lead to a decrease in the price of allowances. The reduced demand for electricity can potentially reduce the electricity price (Thema et al., 2013).

These potential impacts of other EE measures, in general, are acknowledged in academia (Dusch & del Río, 2017; Sorrell et al., 2009; Thema et al., 2013) as well as by the EC (European Commission, 2014). However, for the current phase of the ETS, the number of allowances allocated in 2009 did not take into account the potential achievements of EE policies in the reduction of GHG emissions (Thema et al., 2013). Furthermore, the experts confirmed through the interviews that the Ecodesign Directive together with other EE policies could potentially lead to a decrease price of allowances.

In addition, the analysis of the opinions submit to the public consultation on the revision of the ETS has demonstrated that the energy sector and the energy-intensive industries, as well as IETA, argue that the Ecodesign Directive together with other EE and RE measures undermine the functioning of the ETS. The experts, on the other hand, claim that the interactions are complementary. The energy industry and energy-intensive industries mention

[25] This number includes the non-compliance with both Ecodesign Directive and Energy Labelling.

[26] This is based on an assumption that the GHG emissions savings achieved by Ecodesign Directive from the ETS sectors are significant. There is a need for an additional research to quantify the impacts of Ecodesign Directive on the ETS sectors.

that the accumulative burden of various EE policies including Ecodesign Directive leads to increased costs for the industry. However, as the Ecodesign Directive covers all the manufacturers and importers of energy-related products who want to sell their products in the EU, so the MEPS are the same for all manufacturers whether they are located in the EU or not. Contrary to the argument placed by the industry, the Ecodesign Directive makes it easier for the energy sector to achieve the GHG reduction.

6.5 Impacts of the EU ETS on the Ecodesign Directive

The EU ETS does not appear to have an influence on the functioning of the Ecodesign Directive, as the scheme does not influence manufacturers of energy-related products. Thus, the interaction can be considered neutral. However, one of the concerns raised during the public consultation and interviews with of the experts was that the existence of overlapping policies is often used as an argument to undermine the EE and RE targets and instruments. The stakeholders from insulation industry mentioned that the impacts of RE and EE policies had been used to weaken the RE Directive as well as EE Directive. Thus, there could be potential resistance from the energy and energy-intensive industries to set more ambitious targets for EE, which in return can negatively affect the Ecodesign Directive.

6.6 Policy implications

This section discusses potential policy implications to improve synergies between the Ecodesign Directive and the ETS as well as needed actions to mitigate the negative impacts on the price of allowances.

6.6.1 Need to adjust the cap

As demonstrated by the literature (Hood, 2013; Sorrell et al., 2009; Thema et al., 2013) and the findings from the interviews (see section 5.2.5), there is a need for the EU ETS to account for the effects of EE policies, including the Ecodesign Directive. This can be achieved through an adjustment of the cap. Adjusting the cap to account for the emission reductions achieved by the EE policies, in general, would allow enhancing the synergies between the EU ETS and EE measures. For instance, van der Gaast et al. (2016) suggests that ex-ante analysis should be performed at the start of each ETS phase to account for EE improvements. The ex-post analysis could also be performed after each phase to assess whether cap was adjusted correctly and the impacts from other policies have been captured.

One expert also mentions that the cap setting should anticipate the effects of other policies, but due to the complexity of the policy making in the EU, it may be difficult to implement it in practice. Furthermore, some of the experts support a more ambitious cap level, but they argue that it will not be politically feasible. The energy industry and energy-intensive industries will oppose any changes to implement a more stringent cap, as it will result in a reduction of a number of allowances and increase in the price of allowances. This opposition from the industry is mainly because the costs for the industry will increase with a higher price of allowances.

6.6.2 Use of Market Stability Instrument (MSR)

Another potential option to mitigate the negative impact on the price of allowances would be through the MSR. The MSR can take allowances out of circulation and place them in the reserve, this will address the structural supply and demand imbalances of the allowances. The MSR will be operating according to the predefined rules, ensuring that the Member States or the EC cannot influence the implementation. This will ensure that less political constraints are in place.

The energy industry supports the MSR and argues that the mechanism will provide the needed flexibility to adjust to external shocks and help to reduce negative overlaps from other policies. This view is also supported by some of the experts. However, other experts are less optimistic about the MSR's ability to adjust to external shocks in due time. They argue that due to a large surplus of allowances, the MSR will not manage to account for the effects of other policies, but will be busy addressing the already existing surplus.

6.6.3 Need for transparency

One of the aspects mentioned in the literature (Hood, 2013; van der Gaast et al., 2016), consultation and interviews was a need to account for the impact of different policy instruments on the EU ETS, including the impacts from the Ecodesign Directive. There is a need to ensure that the impact of new and existing policies on the EU ETS is systematically assessed.

7 Discussion

This chapter provides some general reflections on the EU climate policy with a focus on the role of the EU ETS and the Ecodesign Directive. The implications of the findings presented in the previous chapter are examined. The chapter also reflects upon the methodology used to fulfil the aim of this thesis.

7.1 EU climate policy

The EU climate policy encompasses a wide range of policy instruments and targets different sectors. The ETS is still seen as the main climate instrument to address GHG emissions in a cost-effective way by many stakeholders, being able to cover around 45% of all GHG emissions in the EU. However, the scheme has been widely criticised for its inability to adjust to external shocks and set a high enough price of carbon to promote a shift towards a low-carbon economy. Due to the pressure and resistance from the industry (i.e. energy sector and energy-intensive industries) (section 5.1.1), it will be challenging to change the scheme to ensure that the price of carbon is ambitious enough to decarbonise the energy sector.

Meanwhile, other climate and energy policies are gaining momentum. This is particularly the case for energy efficiency measures discussed in this thesis. The proposed Clean Energy for All European package puts the energy efficiency first in the EU's clean energy transition strategy. As stated by the European Commissioner for Climate Action and Energy Miguel Arias Cañete, energy efficiency should be considered as a source of energy on its own (section 4.1). The energy efficiency measures provide multiple benefits for consumers and society in general. Those benefits go beyond the energy savings and GHG emissions reduction, including economic savings, improved energy security and electricity management load, positive impacts on health and well-being as well as impacts on macroeconomic factors. Furthermore, EE plays a crucial role in decarbonising the energy sector as the deployment of RE with EE measures will lead to overall savings to the energy system. Nevertheless, the fact that the EE target of 27% by 2030 is non-binding target sends a wrong signal to the market and questions the EU's commitment to prioritise the energy efficiency.

The Ecodesign Directive is considered to be one of the most effective policy instruments in the EU to promote energy efficiency. It provides multiple benefits (section 6.2.4) including energy savings, CO_2 and NO_x emissions reduction, resource efficiency, monetary saving for consumers, additional revenue for the industry and creates jobs. As demonstrated in the literature (section 2.3.5), the benefits of setting MEPS for products outweigh the costs three times. The Ecodesign Directive removes the worst energy performing products from the market. In combination with the Energy Labelling Directive, Ecodesign removes the information barriers as well as other barriers (section 2.3.3) on energy consumption and allows consumers to make more informed choices. Consequently, consumers can play a more active role in promoting energy and resource efficiency.

The EU ETS and the Ecodesign Directive are both important climate instruments in the EU. The first instrument ensures that there is a price on carbon, even if it is currently very low, whereas the second instrument saves energy from products, so less energy is needed in the first place. However, while the EU ETS remains the main climate instrument in the EU, the Ecodesign Directive and its climate potential remain in the shadow. The Ecodesign Directive receives less attention in the literature than the EU ETS. Fewer resources are devoted to the Ecodesign Directive comparing to the EU ETS.

7.2 Findings

It is clear from the previous chapter that the Ecodesign Directive interacts with the EU ETS through the energy market covered by the ETS. The Directive reduces GHG emissions in the energy sector and as such decreases the demand for allowances. This, in return, decreases the price of the ETS allowances, if the cap is not adjusted accordingly. These findings are in line with the literature. However, an interesting aspect of the findings is how the interactions are perceived by different stakeholders and how those perceptions can impact whether the interactions are seen as complementary or overlapping.

In the literature, the complementary interactions mean that the one policy instrument reinforces the goals of another one. In this case, as the Ecodesign Directive reinforces the reduction of the GHG emissions covered by the ETS, the interactions can be considered complementary. This complementarity of the two policy instruments is also acknowledged by the EC and the experts (through the interviews). Nevertheless, the industry (i.e. the energy and energy-intensive industries) argues that EE policies (together with RE support schemes) undermine the functioning of the EU ETS by reducing the price of allowances. In order to mitigate this negative impact and enhance the synergies between the two instruments, the ETS cap should take into account the reductions achieved by other policies. This is widely supported in the literature. Nevertheless, this argument seems to be missing from the industry debate on policy interactions. Some experts even claim that the argument of negative impacts of RE and EE policies was used to undermine the targets and instruments for those policies. Thus, there is a division on how the interactions between the EU ETS and EE measures are perceived (i.e. complementary or overlapping). This confirms the findings from the literature that the context of the instruments can determine whether the interactions are positive or negative.

Furthermore, some experts argue that if the cap is not stringent enough under the EU ETS, other carbon pricing instruments will be introduced by the Member States. The debate is currently ongoing on the introduction of a carbon tax in Germany and on the development of a carbon price floor in the Nordics. This signals that some Member States see the need for additional pricing instruments on carbon, especially if the major reform to the EU ETS is not going to happen in the near future. The current reform of the EU ETS focuses on the functioning of the MSR among other things. However, whether the MSR is effective will be visible only by the end of the next trading period. This uncertainty can lead to the introduction of other pricing instruments.

All stakeholders and experts confirm the need to ensure coherence between the climate and energy policies. However, how to achieve this coherence remains unclear. The literature and experts argue for the stringency of the cap under the EU ETS, whereas the industry believes that the Market Stability Reserve (MSR) will mitigate the structural imbalances of the supply and demand of allowances. One thing is clear, in order to transition to a low-carbon economy by 2050, the EU needs a coherent climate and energy framework that incentivise more ambitious targets.

7.3 Methodology

This research employed the qualitative evaluation approach to assess the interactions between the Ecodesign Directive and the EU ETS. This section reflects upon the choice of the evaluation approach, data collection and analysis.

7.3.1 Choice of evaluation approach

The qualitative evaluation approach to examine the interactions between the two instruments allowed to account for the context in which both instruments operate as well as understand the perception of different stakeholders towards the climate and energy instruments in general. This provided a valuable understanding of how the stakeholders' perception can influence the view on policy interactions.

Furthermore, the specific design elements of the two instruments were examined using the framework presented in section 3.3. The framework was designed to assess different types of climate and energy policies and systematically compare them. Thus some categories were not relevant for the two instruments. The framework was adapted to the EU ETS and the Ecodesign Directive to ensure that only relevant design elements are presented.

7.3.2 Data collection & analysis

This research relied on three sources of information: literature (both academic and grey), opinions submitted during the consultation of the revision of the EU ETS and interviews with the experts working on climate and energy policy interactions.

One of the important limitations of this research is the level of abstraction of the data collected. In the public consultation, many stakeholders reflected upon the interaction between the ETS, and RE and EE policies. Only a few stakeholders mentioned the Ecodesign Directive. During the interviews with experts, a stronger focus was devoted to the interaction between the EU ETS and EE policies. The initial focus of the interviews was on the interaction between the Ecodesign Directive and the EU ETS, however, after a few interviews and responses from the contacted people, it became apparent that it is difficult to find experts who understand both instruments well. Thus, the experts provided a better understanding of the interaction of the EU ETS and EE policies. The interaction at the instrument level was examined using the framework presented in section 3.3. When the experts working with the Ecodesign Directive were contacted, they could not elaborate on the potential interactions with the EU ETS. One of the reasons for that could be that the impact of the EU ETS on the Ecodesign Directive is neutral (see section 6.5) as the ETS does not have an impact on the manufacturers of energy-using products.

The review of opinions submitted during the consultation focused on the stakeholders who mention the interactions between the ETS and other policies. It is not clear how many stakeholders do not realise that the interactions take place. Furthermore, it would have been interesting to support the review of opinions with follow-up interviews. The interview with the IETA was requested, as it represents the interest of the industries, but no response was received.

Finally, the interviewees were carefully selected to ensure neutrality in their position towards interactions between climate and energy policies. Nevertheless, the results of the interviews should be taken with caution as it is not always possible to ensure full neutrality.

7.3.3 Generalisability of the findings

The findings focus on the two specific instruments, the Ecodesign Directive and the EU ETS. Due to the fact that every instrument is different in its design and context in operates; the findings cannot be applicable to all EE policies. However, the findings point out to the need to understand better the interactions between different EE measures and the EU ETS as well as understand how the stakeholders can impact the perception towards interactions.

8 Conclusions

This thesis examined the interaction between the EU ETS and the Ecodesign Directive. Both instruments play an important role in the EU climate policy. The EU ETS sets a price on carbon and allows for cost-effective reductions of GHG emissions in the industry. The Ecodesign Directive promotes energy efficiency of different energy-related products through the MEPS and helps to achieve energy savings in households. The Directive is considered to be one of the most effective policy instruments to promote energy efficiency in the EU. At the same time, both instruments lead to a reduction of GHG emissions in the EU. The primary goal of the EU ETS is to reduce GHG emissions, whereas the MEPS reduce GHG emissions in addition to energy and monetary savings as well as other benefits. As both instruments contribute to the reduction of GHG emissions in the energy sector, they interact together.

1. *How do the Minimum Energy Performance Standards (MEPS) mandated by Ecodesign Directive interact with the EU ETS?*

The two instruments interact together through the energy sector covered by the ETS. The Ecodesign Directive reduces GHG emissions in the energy sector and as such decreases the demand for allowances. The decreased demand for allowances leads to a decrease in price, as the supply of allowances is inelastic (i.e. fixed).

The interaction between the two instruments can be considered complementary, as both instruments contribute to the reduction of GHG emissions. However, if the achievements of the Ecodesign Directive and other policies (RE & EE) are not taken into account in the cap setting, it will lead to a negative impact on the carbon price. For the current third phase of the EU ETS, the achievements of EE policies were not taken into account in the cap setting. Furthermore, different stakeholders can influence how the interactions are perceived, i.e. whether they are considered to be negative or positive. On the one hand, the energy sector and energy-intensive industries perceive that the interactions between the ETS and EE and RE policies undermine the functioning of the EU ETS. On the other hand, the stakeholders from NGOs, public institutions and academia, see the interactions as complementary. The latter also argue that there is a need for multiple policy instruments to address multiple market failures as well as to pursue different climate and energy objectives. As the Ecodesign Directive removes the existing market barriers, for example, the imperfect information and principal-agent problem, it allows consumers to make more informed choices.

2. *What are the potential policy implications of the identified interactions?*

In order to avoid the negative impacts on the price of allowances, the ETS' cap should take into account the reductions achieved by other policies (i.e. RE and EE), including the Ecodesign Directive. The ex-ante analysis could be performed at the start of each ETS phase to account for the EE reductions in GHG emissions. After each phase, the ex-post analysis could also be conducted to assess whether the impacts of other policies have been captured. However, the findings from the interviews illustrate that it may be politically challenging to introduce a more stringent cap, as the industry will oppose any changes made.

Another potential way to mitigate the negative impact of the EU ETS is through the Market Stability Reserve (MSR). The mechanism could help to remove the allowances from the circulation and as such adjust the supply and demand of allowances. This option is supported by the energy sector, but the experts are less optimistic about the MSR's ability to adjust to external shocks and account for impacts of other policies in due time. The MSR will be operating according to the predefined rules, ensuring that the Member States or the EC cannot influence the implementation. Consequently, it will be less constrained by the interested parties.

Target audience

For policy makers at the EU level, the thesis raises the awareness of the interactions between the EU ETS and EE measures, and specifically the Ecodesign Directive. It highlights the importance of taking into account views of different stakeholders and how those views can impact the way interactions are perceived. The thesis illustrates the need to account for the impacts of Ecodesign Directive on the EU ETS as well as presents potential policy implications to address the synergies and overlaps.

For researchers, the thesis provides a perspective on how the EU ETS interacts with the Ecodesign Directive as well as identifies some interesting areas for future research.

For NGOs, the thesis provides several arguments for supporting multiple climate and energy policy instruments as well as promoting coherence between those policies in the EU.

Recommendations for future research

This thesis only briefly examined the policy implications of the interactions between the EU ETS and the Ecodesign Directive. A more thorough analysis of different political implications can be needed in order to understand the feasibility of various options to mitigate negative impacts and enhance synergies between the instruments.

One of the interesting areas for future research is to quantify the emissions reductions expected by the Ecodesign Directive in the sectors covered by the EU ETS. This would provide a better picture of the magnitude of the impact of the Ecodesign Directive on the EU ETS and the level of adjustment of the cap needed.

Some of stakeholders and experts mentioned that the overlapping policies are sometimes used as an argument to undermine the targets of RE and EE policies. It would be interesting to investigate this claim further to understand whether the existence of the EU ETS can be an obstacle to more ambitious climate and energy policies in the EU.

In general, more research is needed to understand the impacts of different EE measures on the EU ETS and how to mitigate the negative impacts and enhance synergies. This can become particularly pertinent with the electrification of the transport and heating sectors.

Bibliography

Abrell, J., & Weigt, H. (2008). The Interaction of Emissions Trading and Renewable Energy Promotion (SSRN Scholarly Paper No. ID 1317310). Rochester, NY: Social Science Research Network. Retrieved from https://papers.ssrn.com/abstract=1317310

Barford, A., & Dalhammar, C. (2015). Climate change and energy efficiency standards: a study of the UK media backlash to EU Ecodesign standards for vacuum cleaners. IIIEE Working paper.

Bennear, L. S., & Stavins, R. N. (2007). Second-best theory and the use of multiple policy instruments. Environmental and Resource Economics, 37(1), 111–129.

Boasson, E. L., & Wettestad, J. (2016). EU climate policy: Industry, policy interaction and external environment. Routledge.

Böhringer, C., Keller, A., Bortolamedi, M., & Rahmeier Seyffarth, A. (2016). Good things do not always come in threes: On the excess cost of overlapping regulation in EU climate policy. Energy Policy, 94, 502–508.

Böhringer, C., & Rosendahl, K. E. (2010). Green promotes the dirtiest: on the interaction between black and green quotas in energy markets. Journal of Regulatory Economics, 37(3), 316–325.

Bradford, A. (2012). Brussels Effect. Northwestern University Law Review, (1), 1.

Brucal, A., & Roberts, M. (2017). Do energy efficiency standards hurt consumers? Evidence from household appliance sales. Working Paper No. 266. Grantham Research Institute on Climate Change and the Environment. Retrieved from http://www.lse.ac.uk/GranthamInstitute/publication/do-energy-efficiency-standards-hurt-consumers-evidence-from-household-appliance-sales/

CAN Europe. (2017). Climate & Energy Targets. Retrieved 2 September 2017, from http://www.caneurope.org/energy/climate-energy-targets

Climate Action Tracker. (2017). EU - Climate Action Tracker. Retrieved 2 September 2017, from http://climateactiontracker.org/countries/eu.html

Coase, R. H. (1960). The problem of social cost. The Journal of Law and Economics, 56(4), 837–877.

Council Directive. (2003). Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC. Official Journal of the European Union, 275, 32–46.

Council Directive. (2009). Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products. Official Journal of the European Union, 285, 10–35.

Council Directive. (2010). Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products. Official Journal of the European Union, 153, 1–12.

Council of the European Union. (2017). Working paper on the interaction of energy efficiency with ETS and Effort Sharing. Retrieved from http://www.politico.eu/wp-content/uploads/2017/03/03-07-WK-2519-2017-INIT-copy.pdf

Council Regulation. (2011). Regulation (EU) No 1210/2011 of 23 November 2011 amending Regulation (EU) No 1031/2010 in particular to determine the volume of greenhouse gas emission allowances to be auctioned prior to 2013. Official Journal of the European Union, 308, 2–14.

Council Regulation. (2017). Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017 setting a framework for energy labelling and repealing Directive 2010/30/EU. Official Journal of the European Union, 198, 1–23.

Dalhammar, C. (2014). Promoting energy and resource efficiency through the ecodesign directive. Scand Stud Law, 59, 147–179.

Dalhammar, C. (2016). Industry attitudes towards ecodesign standards for improved resource efficiency. Journal of Cleaner Production, 123, 155–166.

Dalhammar, C., Machacek, E., Mundaca, L., & Richter, J. L. (2017). Energy efficiency regulations, market and behavioral failures, and standardization.

Del Río, P. (2007). The interaction between emissions trading and renewable electricity support schemes. An overview of the literature. Mitigation and Adaptation Strategies for Global Change, 12(8), 1363–1390. https://doi.org/10.1007/s11027-006-9069-y

Del Río, P. (2010). Analysing the interactions between renewable energy promotion and energy efficiency support schemes: The impact of different instruments and design elements. Energy Policy, 38, 4978–4989.

Del Río, P. (2014). On evaluating success in complex policy mixes: the case of renewable energy support schemes. Policy Sci, 47, 267–287. https://doi.org/10.1007/s11077-013-9189-7

Del Río, P. (2017). Why does the combination of the European Union Emissions Trading Scheme and a renewable energy target makes economic sense? Renewable & Sustainable Energy Reviews, 74, 824–834.

Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. (n.d.). Official Journal of the European Union, 140(5.6.2009), 16–62.

Dusch, V., & del Río, P. (2017). An economic analysis of the interactions between renewable support and other climate and energy policies. Energy & Environment, 28(1/2), 11–33.

Ecofys. (2014). Evaluation of the Energy Labelling Directive and specific aspects of the Ecodesign Directive. Retrieved from http://www.ecofys.com/files/files/final_technical_report-evaluation_eld_ed_june_2014.pdf

Eisenhardt, K. M. (1989). Agency theory: An assessment and review. Academy of Management Review, 14(1), 57–74.

Ellerman, A. D., Convery, F. J., & de Perthuis, C. (2010). Pricing Carbon: The European Union Emissions Trading Scheme. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9781139042765

EU Energy Star. (n.d.). EU ENERGY STAR programme: Labelling Energy Effieicient Office Equipment. Retrieved from http://eu-energystar.org/

European Commission. (2011a). Communication from the European Commission: A Roadmap for moving to a competitive low carbon economy in 2050. Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011DC0112&from=EN

European Commission. (2011b). Communication from the European Commission: Energy Roadmap 2050. Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011DC0885&from=EN

European Commission. (2013). European Commission guidance for the design of renewables support schemes. Retrieved from http://ec.europa.eu/energy/sites/ener/files/com_2013_public_intervention_swd04_en.pdf

European Commission. (2014). Impact Assessment on A policy framework for climate and energy in the period from 2020 up to 2030. Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014SC0015&from=EN

European Commission. (2015a). EU ETS Handbook. Retrieved from https://ec.europa.eu/clima/sites/clima/files/docs/ets_handbook_en.pdf

European Commission. (2015b). Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments. Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015PC0337

European Commission. (2016a). Communication from European Commission: Clean Energy for All Europeans. Retrieved from http://eur-lex.europa.eu/resource.html?uri=cellar:fa6ea15b-b7b0-11e6-9e3c-01aa75ed71a1.0001.02/DOC_1&format=PDF

European Commission. (2016b). Ecodesign Working Plan 2016-2019. Retrieved from https://ec.europa.eu/docsroom/documents/20375/attachments/1/translations/en/renditions/pdf

European Commission. (2016c, November 23). 2020 climate & energy package [Text]. Retrieved 17 August 2017, from https://ec.europa.eu/clima/policies/strategies/2020_en

European Commission. (2016d, November 23). 2050 low-carbon economy [Text]. Retrieved 24 July 2017, from https://ec.europa.eu/clima/policies/strategies/2050_en

European Commission. (2016e, November 23). Effort Sharing Decision [Text]. Retrieved 2 August 2017, from https://ec.europa.eu/clima/policies/effort_en

European Commission. (2016f, November 23). The EU Emissions Trading System (EU ETS) [Text]. Retrieved 14 June 2017, from https://ec.europa.eu/clima/policies/ets_en

European Commission. (2017a). Clean energy for all Europeans: Good practice in energy efficiency- for sustainable, safer and more competitive Europe. Retrieved from https://ec.europa.eu/energy/sites/ener/files/documents/good_practice_in_ee_-web.pdf

European Commission. (2017b). Ecodesign - Vækst - European Commission. Retrieved 3 August 2017, from http://ec.europa.eu/growth/industry/sustainability/ecodesign_en

European Commission. (2017c). Report on the functioning of the European carbon market. Retrieved from https://ec.europa.eu/commission/sites/beta-political/files/report-eu-carbon-market_en.pdf

European Commission. (n.d.). Energy Efficiency Directive - Energy - European Commission. Retrieved 2 August 2017, from /energy/en/topics/energy-efficiency/energy-efficiency-directive

European Commission, Climate Action. (2016, November 23). [Text]. Retrieved 13 June 2017, from https://ec.europa.eu/clima/policies/strategies/2030_en

European Council. (2014). Conclusions on 2030 Climate and Energy Policy Framework. Retrieved from http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/145397.pdf

European Council. (2015). Decision (EU) 2015/1814 of the European Parliament and of the Council of 6 October 2015 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and amending Directive 2003/87/EC (Text with EEA relevance). Official Journal of the European Union, 264, 1–5.

European Environment Agency (Ed.). (2006). Using the market for cost-effective environment policy: market-based instruments in Europe. Luxembourg: Office for Official Publications of the European Communities.

European Environmental Agency. (2016). Trends and projections in Europe 2016 - Tracking progress towards Europe's climate and energy targets. Retrieved from https://www.eea.europa.eu/themes/climate/trends-and-projections-in-europe

Eurostat. (2014). Category:Energy glossary - Statistics Explained. Retrieved 27 August 2017, from http://ec.europa.eu/eurostat/statistics-explained/index.php/Category:Energy_glossary

Fankhauser, S., Hepburn, C., & Park, J. (2010). Combining multiple climate policy instruments: how not to do it. Climate Change Economics, 1(03), 209–225.

Fischer, C., Baron, Y., Blepp, M., Hesse, T., Rudenauer, I., Stratmann, B., & Sutter, J. (2017). Living up to expectations? Monitoring the effects of ecodesign and energy labelling in Germany. In ECEEE Summer Study Proceedings on Energy Efficiency. European Council of Energy Efficient Economy (ECEEE).

Fujjiwara, N., Karakosta, C., Szpor, A., Tuerk, A., & Hofman, E. (2015). European Stakeholders' Perspectives on the EU ETS. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2861122

Gillingham, K., Newell, R. G., & Palmer, K. (2009). Energy efficiency economics and policy. Annu. Rev. Resour. Econ., 1(1), 597–620.

Gillingham, K., Newell, R., & Palmer, K. (2006). Energy efficiency policies: a retrospective examination. Annu. Rev. Environ. Resour., 31, 161–192.

Greening, L. A., Greene, D. L., & Difiglio, C. (2000). Energy efficiency and consumption—the rebound effect—a survey. Energy Policy, 28(6), 389–401.

Gunningham, N., Grabosky, P., & Sinclair, D. (1998). Smart regulation. REGULATORY THEORY, 133.

Hall. (1993). Policy Paradigms, Social Learning, and the State: The Case of Economic Policymaking in Britain. Comparative Politics, (3), 275. https://doi.org/10.2307/422246

Hanley, N., Shogren, J. F., & White, B. (2007). Environmental economics in theory and practice. Basinstoke: Palgrave Macmillan, 2007. Retrieved from http://ludwig.lub.lu.se/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=cat01310a&AN=lovisa.001677888&site=eds-live&scope=site

Hildingsson, R. (2014). Too Many Targets or Too Few Measures? Discourses on Decarbonisation in Swedish Climate Policy Making. Lund University.

Hood, C. (2013). Managing interactions between carbon pricing and existing energy policies: guidance for policymakers. IEA Insight Series, IEA/OECD. Retrieved from http://www.iea.org/publications/insights/insightpublications/managinginteractionscarbonpricing_final.pdf

Houde, S., & Spurlock, C. A. (2016). Minimum energy efficiency standards for appliances: Old and new economic rationales. Economics of Energy & Environmental Policy, 5(2).

IEA. (2011). Energy Efficiency and Carbon Pricing. Retrieved from https://www.iea.org/publications/freepublications/publication/EE_Carbon_Pricing.pdf

IEA. (2014). The Way Forward: 5 key actions to achieve a low-carbon energy sector. Retrieved from https://www.iea.org/publications/freepublications/publication/The_Way_forward.pdf

IEA. (2015). Achievements of appliance energy efficiency standards and labelling programs. Retrieved from http://www.iea.org/publications/freepublications/publication/4E_S_L_Report_180915.pdf

IETA. (2015). Overlapping Policies with the EU ETS. Retrieved from http://www.ieta.org/resources/EU/IETA_overlapping_policies_with_the_EU_ETA.pdf

IPCC. (2014). Summary for Policy Makers. Climate Change 2014: Mitigation of Climate Change, Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

Retrieved from https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_summary-for-policymakers.pdf

IRENA. (2017). Synergies between renewable energy and energy efficiency. Abu Dhabi. Retrieved from http://www.irena.org/DocumentDownloads/Publications/IRENA_REmap_Synergies_REEE_2017.pdf

Jaffe, A. B., & Stavins, R. N. (1994). The energy-efficiency gap What does it mean? Energy Policy, 22(10), 804–810.

Jensen, S. G., & Skytte, K. (2003). Simultaneous attainment of energy goals by means of green certificates and emission permits. Energy Policy, 31, 63–71.

Joanneum Research. (2012). Assessment of Policy Impacts on Sustainability in Europe: Taking stock of environmental policies and existing interactions. Retrieved from http://apraise.org/sites/default/files/d3.1_-_report_on_interactions_of_environmental_policiy_instruments_0.pdf#overlay-context=Deliverables

Jung, A. (2009, July 27). Getting Around the EU Ban: Germans Hoarding Traditional Light Bulbs. Spiegel Online. Retrieved from http://www.spiegel.de/international/germany/getting-around-the-eu-ban-germans-hoarding-traditional-light-bulbs-a-638494.html

Kemna, R., & Wierda, L. (2015). Ecodesign Impact Accounting. Retrieved from https://ec.europa.eu/energy/sites/ener/files/documents/Ecodesign%20Impacts%20Accounting%20%20-%20final%2020151217.pdf

Kemp, R., & Pontoglio, S. (2011). The innovation effects of environmental policy instruments — A typical case of the blind men and the elephant? Ecological Economics, 72, 28–36. https://doi.org/10.1016/j.ecolecon.2011.09.014

Knopf, B., Koch, N., Grosjean, G., Fuss, S., Flachsland, C., Pahle, M., … Edenhofer, O. (2014). The European Emissions Trading System (EU ETS): ex-post analysis, the market stability reserve and options for a comprehensive reform.

Koch, N., Fuss, S., Grosjean, G., & Edenhofer, O. (2014). Causes of the EU ETS price drop: Recession, CDM, renewable policies or a bit of everything?—New evidence. Energy Policy, 73, 676–685.

Lehmann, P., & Gawel, E. (2013). Why should support schemes for renewable electricity complement the EU emissions trading scheme? Energy Policy, 52, 597–607.

Levinson, A., & Niemann, S. (2004). Energy use by apartment tenants when landlords pay for utilities. Resource and Energy Economics, 26(1), 51–75.

Meyers, S., McMahon, J. E., McNeil, M., & Liu, X. (2003). Impacts of US federal energy efficiency standards for residential appliances. Energy, 28(8), 755–767.

Mickwitz, P. (2005). Environmental policy evaluation : concepts and practice. Helsinki : Finnish Society of Sciences and Letters, 2006. Retrieved from http://ludwig.lub.lu.se/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=cat01310a&AN=lovisa.001816309&site=eds-live&scope=site

Molenbroek, E., Cuijpers, M., & Blok, K. (2012). Economic benefits of the EU Ecodesign Directive: improving European economies. Retrieved from https://dspace.library.uu.nl/bitstream/handle/1874/281000/ecofys_2012_economic_benefits_ecodesign.pdf?sequence=1

Nordeng, A., & Kolos, M. (2016). Thomson Reuters the carbon market survey 2016. Thomas Reuters. Retrieved from http://share.thomsonreuters.com/assets/forms/carbon-market-report-2016.pdf

Nordhaus, W. (2011). Designing a friendly space for technological change to slow global warming. Energy Economics, 33(4), 665–673.

OECD/IEA. (2009). Gadgets and Gigawatts: Policies for Energy Efficiency. Retrieved from https://www.iea.org/publications/freepublications/publication/gigawatts2009.pdf

OECD/IEA. (2014). Capturing the multiple benefits of energy efficiency. Retrieved from http://www.iea.org/publications/freepublications/publication/Captur_the_MultiplBenef_ofEnergyEficiency.pdf

Oikonomou, V., Flamos, A., & Grafakos, S. (2010). Is blending of energy and climate policy instruments always desirable? Energy Policy, 38, 4186–4195.

Oikonomou, V., & Jepma, C. J. (2008). A framework on interactions of climate and energy policy instruments. Mitigation and Adaptation Strategies for Global Change, 13(2), 131–156. https://doi.org/10.1007/s11027-007-9082-9

Pearce, D. (2002). AN INTELLECTUAL HISTORY OF ECONOMICS. Annual Review of Energy and the Environment, 27(1), 57–81. https://doi.org/10.1146/annurev.energy.27.122001.083429

Philibert, C. (2011). Interactions of policies for renewable energy and climate. Retrieved from http://www.oecd-ilibrary.org/energy/interactions-of-policies-for-renewable-energy-and-climate-policy-interactions_5kggc12rmkzq-en

Sachs, N. (2012). Can We Regulate Our Way to Energy Efficiency? Product Standards as Climate Policy.

Samuelson, P. A. (1954). The pure theory of public expenditure. The Review of Economics and Statistics, 36(4), 387–389.

Siderius, P., & Nakagami, H. (2013). A MEPS is a MEPS is a MEPS: comparing Ecodesign and Top Runner schemes for setting product efficiency standards. Energy Efficiency, 6(1), 1–19.

Simon, H. A. (1990). Bounded rationality. In Utility and probability (pp. 15–18). Springer.

Somanathan, E., Sterner, T., Sugiyama, T., Chimanikire, D., Dubash, N. K., Essandoh-Yeddu, J. K., … Jaffe, A. (2014). National and sub-national policies and institutions: Chapter 15 in Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Retrieved from http://pure.iiasa.ac.at/11112

Sonnenschein, J., Richter, J. L., Dalhammar, C., & Buskirk, R. V. (2017). When prices don't steer – mimicking ambitious carbon pricing with energy performance standards. In ECEEE Summer Study Proceedings on Energy Efficiency. European Council of Energy Efficient Economy (ECEEE).

Sorrell, S. (2003). Interaction in EU climate policy. SPRU, Sussex. Retrieved from http://www.sussex.ac.uk/sussexenergygroup/documents/interact-final-report---summary.doc

Sorrell, S., Harrison, D., Radov, D., Klevnas, P., & Foss, A. (2009). White certificate schemes: Economic analysis and interactions with the EU ETS. Energy Policy, 37, 29–42.

Spyridaki, N.-A., & Flamos, A. (2014). A paper trail of evaluation approaches to energy and climate policy interactions. Renewable and Sustainable Energy Reviews, 40, 1090–1107. https://doi.org/10.1016/j.rser.2014.08.001

Stern, N. H. (2007). The economics of climate change: the Stern review. Cambridge University Press.

Strambo, C. (1), Nilsson, M. (1, 2), & Månsson, A. (3). (2015). Coherent or inconsistent? Assessing energy security and climate policy interaction within the European Union. Energy Research and Social Science, 8, 1–12. https://doi.org/10.1016/j.erss.2015.04.004

Taylor, M., Spurlock, C. A., & Yang, H.-C. (2015). Confronting regulatory cost and quality expectations: An exploration of technical change in minimum efficiency performance standards. Lawrence Berkeley National Laboratory Report.

Thema, J., Suerkemper, F., Grave, K., & Amelung, A. (2013). The impact of electricity demand reduction policies on the EU-ETS: Modelling electricity and carbon prices and the effect on industrial competitiveness. Energy Policy, 60, 656–666. https://doi.org/10.1016/j.enpol.2013.04.028

Tinbergen, J. (1952). On the Theory of Economic Policy. North-Holland Publishing Company, Amsterdam. Retrieved from http://hdl.handle.net/1765/15884

UNFCCC, Paris Agreement. (n.d.). Retrieved 13 June 2017, from http://unfccc.int/paris_agreement/items/9485.php

van der Gaast, W., Clochard, G.-J., Türk, A., Fujiwara, N., & Spyridaki, N.-A. (2016). CARISMA Working Document 3 - Effects of Interactions between EU Climate and Energy Policies. Retrieved from http://www.carisma-project.eu/Portals/0/Documents/CARISMA%20Working%20Document%203%20-%20Policy%20Interactions.pdf

Vedung, E. (1998). Policy instruments: typologies and theories. Carrots, Sticks, and Sermons: Policy Instruments and Their Evaluation, 5, 21–58.

Yin, R. K. (1993). Application of Case Study Research (Vol. 34). SAGE Publications.

Appendix 1 List of the interviewees

National Research Council of Spain, personal communication with Pablo Del Rio, Head of Environmental Economics Unit. 26th July, 2017.

European Environmental Agency, personal communication with Francois Dejean, Climate Change Mitigation and Energy Expert. 15th August, 2017.

Joint Implementation Network Climate and Sustainability, personal communication with Dr Wytze van der Gaast, Senior Researcher and Policy Advisor. 24th August, 2017.

Wuppertal Institut, personal communication with Johannes Thema, Project Manager for Energy, Transport and Climate Policy. 28th August, 2017.

Climate Action Network (CAN) Europe, personal communication with Klaus Röhrig, Climate and Energy Policy Coordinator. 30th August, 2017.

International Energy Agency (IEA), personal communication with Christina Hood, Head of Unit, Environment and Climate Change. 31st August, 2017.

Institute 4 Climate Economics (I4CE), personal communication with Dr Emilie Alberola, Program Director for Industry, Energy and Climate. 30th August, 2017.

Appendix 2 Expected energy savings from Ecodesign

Table 6 Expected energy savings from the first 12 implementing measures adopted under the Ecodesign Directive

Adopted regulations	***Estimated savings (yearly by 2020)***
Standby and off mode losses, electric & electronic equipment	35 TWh
Simple set top boxes	9 TWh
Domestic lighting	39 TWh
Tertiary sector lighting (office and street)	38 TWh
External power supplies	9 TWh
Televisions	43 TWh
Electric motors	135 TWh
Circulators	23 TWh
Domestic refrigeration	8 TWh
Domestic dishwashers	2 TWh
Domestic washing machines	1.5 TWh
Fans	34 TWh
Total:	**376 TWh**

Source: (Dalhammar et al., 2017)

Appendix 3 Interview guide

Introduction

I am a Master candidate in Environmental Management and Policy at International Institute of Industrial Environmental Economics at Lund University in Sweden. As a part of my master thesis, I am looking into how climate and energy policies interact, examining two specific policy instruments in the EU: Emission Trading Scheme (ETS) and Ecodesign Directive (setting Minimum Energy Performance Standards for products). The thesis contributes to the project '*Promoting Ecodesign for the advancement of innovation, competitiveness and environmental improvements*' funded by the Swedish Energy Agency.

Objectives of this interview

- ✓ to understand how different stakeholders perceive interactions between climate and energy policies
- ✓ to understand how different stakeholders perceive interactions between EU ETS and Ecodesign Directive
- ✓ to understand the potential policy implications of the identified interactions

Questions

Climate and energy policies

1. Which climate and energy policies do you consider to be crucial for mitigating climate change? Why?
2. In your opinion, what is the role of the EU Emission Trading Scheme in mitigation of climate change?
3. In your opinion, what is the role of Energy Efficiency measures in mitigation of climate change? *Please elaborate on the role of Ecodesign Directive if you have experience with it.*

Climate and energy policy interactions

4. In your opinion, how does the existence of multiple climate policies affects their performance (e.g. effectiveness)?
5. Do you see any potential synergies or/and overlaps from the existence of both EU ETS and Energy Efficiency measures (e.g. Ecodesign Directive)? *Please elaborate on Ecodesign Directive, if you have experience with it.*
6. How can we resolve these overlaps in cases where they are negative? How can we strengthen the positive synergies?
7. If energy efficiency policies over-perform, and renewable energy technologies become very cheap, can this undermine the EU ETS? If so, how do we resolve this issue?
8. Does the existence of both EU ETS and Energy Efficiency measures impact stringency of climate targets (e.g. ambitiousness of cap level)? *Please elaborate*
9. Looking into the future: how would you like the EU climate and energy policies to develop in the coming years?

Additional questions

1. In case the ETS cap needs to be adjusted because of the GHG reduction achieved by other climate and energy policies, how politically feasible it is to negotiate more stringent cap? MEPS for products?