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## **D5.1: Report on climate change mitigation policy mapping and interaction**

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## PREFACE

The **CARISMA** project (“**C**oordination and **A**ssessment of **R**esearch and **I**nnovation in **S**upport of climate **M**itigation **O**ptions”) intends, through effective stakeholder consultation and communication leading to improved coordination and assessment of climate change mitigation options, to benefit research and innovation efficiency, as well as international cooperation on research and innovation and technology transfer.

Additionally, it aims to assess policy and governance questions that shape the prospects of climate change mitigation options and discuss the results with representatives from the target audiences to incorporate what can be learned for the benefit of climate change mitigation.

Knowledge gaps will be identified for a range priority issues related to climate change mitigation options and climate policy making in consultation with stakeholders.

## PROJECT PARTNERS

No	Participant Name	Short Name	Country Code
<b>CO1</b>	Radboud University	RU	NL
<b>CB2</b>	University of Piraeus Research Center	UPRC	EL
<b>CB3</b>	JIN Climate and Sustainability	JIN	NL
<b>CB4</b>	Institute for Climate Economics	I4CE	FR
<b>CB5</b>	University of Graz	UNI Graz	AT
<b>CB6</b>	Stockholm Environment Institute	SEI	SE
<b>CB7</b>	Centre for European Economic Research	ZEW	DE
<b>CB8</b>	Center for European Policy Studies	CEPS	BE
<b>CB9</b>	ENVIROS S.R.O.	ENVIROS	CZ
<b>CB10</b>	Technical University of Denmark	DTU	DK



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## Abbreviations

APRAISE	Assessment of Policy Interrelationships and Impacts on Sustainability in Europe, an EU funded project in the 7th Framework Programme
CEPS	Centre for European Policy Studies
CO <sub>2</sub>	Carbon dioxide
CO <sub>2</sub> eq	Carbon dioxide equivalent
€	Euro
EC	European Commission
EEA	European Environment Agency
EED	Energy Efficiency Directive
EEO	Energy Efficiency Obligation scheme (Greece)
EIONET	European Environment Information and Observation Network
EPBD	Energy Performance of Buildings Directive
ETS	EU Emissions Trading Scheme
EU	European Union
EUA	EU allowance
FiP	Feed-in-Premiums
FiT	Feed-in Tariff
g	Gram
GDP	Gross domestic product
GHG	Greenhouse gas
Gt	Gigatonne
GW	Gigawatt
IEA	International Energy Agency
INTERACT	Interaction in EU Climate Policy 2001-2003, an EU funded project in the 5th Framework Programme
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency
JIN	Joint Implementation Network
Ktoe	kilo tonne oil equivalent
kWh	Kilowatt hour
kWhel	Kilowatt hour electricity production
MMR	Monitoring Mechanism Regulation
MSR	Market Stability Reserve
Mt	Megatonne
Mtoe	Million tonne oil equivalent
MWh	Megawatt
NAZCA	Non-State Actor Zone for Climate Action
NDC	Nationally determined contribution
NECP	National Energy and Climate Plans
NGO	Non-governmental organisation
NLCS	National Low-Carbon Strategy (France)
NREAP	National Renewable Energy Action Plan (Austria)

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OECD	Organisation for Economic Co-operation and Development
PPC	Public Power Corporation (Greece)
RES	Renewable energy sources
SEI	Stockholm Environment Institute
t	Tonne
TWh	Terawatt hour
RED	Renewable Energy Directive
UNFCCC	United Nations Framework Convention on Climate Change
UPRC	University of Piraeus Research Centre

## **1 Introduction and overview of this report**

This report presents the main findings of two tasks under Work Package 5 (“Mapping and assessing climate change mitigation policies”) of the CARISMA project.

The first task concerns the mapping of climate change mitigation policies. Through various initiatives undertaken at multiple levels, information about climate change mitigation policies (including policies on cooperation with emerging economies and developing countries) has become increasingly available. This includes notably a variety of databases listing information on such policies. The question is whether this wealth of information is useful for decision-makers and other relevant stakeholders interested in the performance of climate change mitigation policies. Do these data sources contain information on the aspects that matter? And is the level of information such that informed decisions can be made, or is more (or less) information required? Chapter 2 of this report offers insights from a study carried out by the Stockholm Environment Institute (SEI) addressing these questions. The study consisted of (1) an analysis of existing climate change mitigation policy databases; (2) a survey soliciting the views of climate change mitigation policy information users on existing databases; and (3) in-depth interviews with database users.

The second task focused on how climate and energy policies interact with each other in the European Union (EU). Chapter 3 presents the results from four case studies (France, Austria, Greece and EU-wide). The case studies were coordinated by the Joint Implementation Network (JIN), and carried out by the Institute for Climate Economics (I4CE), the University of Graz, the University of Piraeus Research Centre (UPRC) and the Centre for European Policy Studies (CEPS). The case studies aim to complement the existing literature on policy interactions by addressing a set of aspects of policy interactions related to: the policy levels at which interactions may occur (EU, national or regional levels), inter-temporal interactions (e.g. short term versus long term policy interactions), and interactions that occur if stakeholders are indirectly affected by a policy instrument (even if they are explicitly excluded from the policy).



## 2 Mapping and analysing climate change mitigation policy databases

### 2.1 Introduction

With the Paris Agreement having entered into force on 4 November 2016, international politics is entering the next phase of tackling climate change. Attention will need to rapidly shift to implementing the nationally determined contributions (NDCs) of countries, which form the core of the agreement. Effective implementation of NDCs depends on a variety of factors, ranging from finding the right economic incentives to questions of social acceptance and equity. This implies that policy makers need a wide range of information in order to adopt the best possible policies to act on climate change. At the international level, robust information and data can help to determine whether the NDCs, taken together, are sufficient to reach the goal to stay well below 2 degrees Celsius above pre-industrial levels. At the national or sub-national level, information on other countries' policies can help policy makers to make competent decisions on climate change mitigation actions (Aldy and Pizer, 2016). For private sector players, clear and authoritative information on climate policies is vital to guide investments in low-emission solutions, while civil society and concerned citizens might use information about climate policies to exercise pressure on policy makers for more ambitious policies.

Throughout the years, a variety of databases and other data sets have emerged, compiling information about climate change mitigation policies in a variety of countries. These databases can help meet the needs of a variety of stakeholders post-Paris. However, it is unclear whether this large variety of data sources and the available information match the expectations and needs of stakeholders at these different levels.

To address this gap, we undertook an analysis of existing databases containing information on climate change mitigation policies. In a first step, we sought to uncover what kind of information was available and aimed at categorising this information according to commonly accepted parameters found in literature. After an initial desk-based analysis of the databases (Section 2.2), we designed a survey to gauge what kind of databases are already used by stakeholders and whether there were some gaps between user needs and information available (Section 2.3). We followed up this survey with selected interviews with database users from a variety of professional backgrounds, again to learn more about user needs and expectations (Section 2.4).

## 2.2 Initial database analysis

### 2.2.1 Methodology

Our sample consists of 24 databases (Table 1).<sup>1</sup> Our focus was on databases that contained information about climate change mitigation *policies*. We therefore excluded databases (e.g. World Resources Institute's CAIT) containing data and indicators relevant for climate action, such as emissions, projections, energy consumption, gross domestic product (GDP), etc. In addition, we only included databases that compile and present information related to climate change mitigation policies, thus *allowing for a cross-country comparison*. We therefore also excluded the national reports (i.e. National Communications, Biennial Reports and Biennial Update Reports) submitted under the auspices of the United Nations Framework Convention on Climate Change (UNFCCC). In addition, we focused on national-level climate policies. We therefore excluded databases such as the UNFCCC's Non-State Actor Zone for Climate Action (NAZCA) platform,<sup>2</sup> the Climate Initiatives Platform,<sup>3</sup> or the action plans submitted by participants to the Covenant of Mayors.<sup>4</sup>

**Table 1. Overview of climate change mitigation policy databases analysed.**

Name	Main focal area	Link
Odyssee-MURE II	Energy Efficiency	<a href="http://www.measures-odyssee-mure.eu/">http://www.measures-odyssee-mure.eu/</a>
Reegle	Multiple	<a href="http://www.reegle.info/">http://www.reegle.info/</a>
Climate Action Tracker	General	<a href="http://climateactiontracker.org/">http://climateactiontracker.org/</a>
IEA/IRENA Renewable Energy Policies & Measures Database	Renewables	<a href="http://www.iea.org/policiesandmeasures/renewableenergy">http://www.iea.org/policiesandmeasures/renewableenergy</a>
IEA Addressing Climate Change Policies and Measures Database	Multiple; General	<a href="http://www.iea.org/policiesandmeasures/climatechange">http://www.iea.org/policiesandmeasures/climatechange</a>
IEA Energy Efficiency Policies and Measures Database	Energy Efficiency	<a href="http://www.iea.org/policiesandmeasures/energyefficiency">http://www.iea.org/policiesandmeasures/energyefficiency</a>
IEA Energy Building Energy Efficiency Policies Database	Buildings; Energy Efficiency	<a href="http://www.iea.org/beep/">http://www.iea.org/beep/</a>
London School of Economics	General; Multiple	<a href="http://www.lse.ac.uk/GranthamInstitute/legislation/">http://www.lse.ac.uk/GranthamInstitute/legislation/</a>

<sup>1</sup> The main analysis was carried out between September and November 2015.

<sup>2</sup> <http://climateaction.unfccc.int>.

<sup>3</sup> <http://climateinitiativesplatform.org/index.php/Welcome>.

<sup>4</sup> [http://www.covenantofmayors.eu/actions/sustainable-energy-action-plans\\_en.html](http://www.covenantofmayors.eu/actions/sustainable-energy-action-plans_en.html).

and Political Science Global Climate Legislation Database		
Sabin Center Climate Change Laws Database	General; Multiple	<a href="http://web.law.columbia.edu/climate-change/resources/climate-change-laws-world">http://web.law.columbia.edu/climate-change/resources/climate-change-laws-world</a>
World Energy Council Database on Energy Efficiency Policies	Energy Efficiency	<a href="https://www.wec-policies.enerdata.eu/">https://www.wec-policies.enerdata.eu/</a>
CLASP Global Standards and Label Information Database	Energy Efficiency;	<a href="http://clasp.ngo/en/Tools/Tools/SL_Search">http://clasp.ngo/en/Tools/Tools/SL_Search</a>
RES Legal	Renewables	<a href="http://www.res-legal.eu/home/">http://www.res-legal.eu/home/</a>
DIACORE Database on Cost and Benefits of Deployments	Renewables	<a href="http://diacore.eu/databases">http://diacore.eu/databases</a>
DIACORE Database on Technology Costs	Renewables	<a href="http://diacore.eu/databases">http://diacore.eu/databases</a>
Industrial Efficiency Policy Database	Energy Efficiency;	<a href="http://iepd.iipnetwork.org/">http://iepd.iipnetwork.org/</a>
BPIE Energy Performance of Buildings Database	Buildings; Energy Efficiency	<a href="http://www.buildingsdata.eu/">http://www.buildingsdata.eu/</a>
OECD Database on Environmental Policy	General	<a href="http://www2.oecd.org/ecoinst/queries/">http://www2.oecd.org/ecoinst/queries/</a>
Building Rating Database	Buildings; Energy Efficiency	<a href="http://www.buildingrating.org/">http://www.buildingrating.org/</a>
Global Buildings Performance Network Database for New Buildings	Buildings; Energy Efficiency	<a href="http://www.gbpn.org/databases-tools">http://www.gbpn.org/databases-tools</a>
Global Buildings Performance Network Database on Renovation	Buildings; Energy Efficiency	<a href="http://www.gbpn.org/databases-tools">http://www.gbpn.org/databases-tools</a>
EEA Database on Policies and Measures	General; Multiple	<a href="http://pam.apps.eea.europa.eu/">http://pam.apps.eea.europa.eu/</a>

<sup>5</sup> These databases are part of an ongoing EU research project. The data availability and scope changed significantly from initial CARISMA WP 5.1 analysis and the final deliverable. Although they would not necessarily meet the above-mentioned inclusion criteria, we included them in the initial analysis since a wide scope was desired in order to be as exhaustive as possible.

PV Grid Database	Renewables	<a href="http://www.pvgrid.eu/database.html">http://www.pvgrid.eu/database.html</a>
Southeast Asia Network of Climate Change Offices Database	General; Multiple	<a href="http://accad.sean-cc.org/">http://accad.sean-cc.org/</a>
NewClimate Institute's Climate Policy Database	General; Multiple	<a href="http://climatepolicydatabase.org/index.php?title=Climate_Policy_Database">http://climatepolicydatabase.org/index.php?title=Climate_Policy_Database</a>

Each database was analysed using a variety of attributes, including:

- temporal coverage (in terms of years covered; as well as coverage of past/ongoing/planned policies);
- sectoral coverage;
- geographical coverage (both regional and country-level);
- policy instruments;
- level of detail and visualisation;
- the extent to which the database allows for assessment and evaluation (e.g. by ranking policies, or allowing for comparison); and
- interconnections with other databases.

These attributes will be addressed in detail in the following paragraphs. Moreover, we collected basic background information, including the year of creation, the lead organization managing the database (including contact details), and the frequency of updates. The vastness of available information meant that this initial analysis is unlikely to cover all the available data sources on climate change mitigation policies, and limitations of language and available time might have driven the sample towards a Western and English-speaking bias. Nevertheless, several observations can be made on the basis of our sample.

### 2.2.2 Temporal coverage

Most (13) of the databases in our sample were launched after 2008. This could be explained by a number of factors. While advancement in internet and communication technologies may be one small factor, another is a growing interest in the performance of policies, accompanying an increase in the actual number of policies (Dubash et al., 2013). Similarly, although no data are available on this point, an increase in the allocation of resources to document and better understand policies may help explain this trend. Finally, another factor may be the recent shift towards bottom-up climate governance, involving a larger group of stakeholders on many levels. Businesses, non-governmental organisations and citizens' initiatives increasingly act alongside governments on climate change, both globally and locally, and they generate a wealth of data and information. Moreover, reporting requirements – including under the UNFCCC and the European Union (e.g. the EU's

Monitoring Mechanism Regulation) – have likely helped to bring more information out in the open. In addition, increasing awareness of the causes and consequences of climate change, following several assessment reports by the Intergovernmental Panel on Climate Change (IPCC), and mounting attention in mainstream media, may have led to further demand for transparency about the policies implemented to address the problem. In the wake of the Paris Agreement and given the increasing central importance of NDCs, it is to be expected that the supply of climate policy information will grow even further, thus increasing the need for providing systematic and understandable information on climate change policies.

### 2.2.3 Sectoral coverage

As far as the policy sector<sup>6</sup> is concerned, most (18) databases focus on energy sector policies,<sup>7</sup> while 14 databases cover the buildings sector and 13 the transport sector. Within the energy sector, half of the databases analysed cover energy efficiency policies, while seven focus on renewable energy policies. Information on industry policies is in the middle of the spectrum with eight data sources dealing with this sector. At the lower end, we find the agricultural and the waste policy sector with only four data sources covering agricultural and two data sources covering waste policies. Other policy sectors, such as maritime transport or heavy industry, may be included in the databases analysed; however, no database specifically stated that it contains information about those sectors. However, further analysis is needed to discern whether this is due to the fact that policy makers focus, for example, on the energy sector and eschew the agricultural sector, or because information on climate change mitigation policies in, for instance, the agricultural sector is scarce. Shedding light on this question may point to the need for further transparency of the policies in this sector, which is responsible for roughly 24% of greenhouse gas emissions worldwide (Smith et al., 2014). Moreover, successful implementation of the NDCs under the Paris Agreement will require mitigation actions across multiple sectors, including agriculture.

### 2.2.4 Geographical coverage

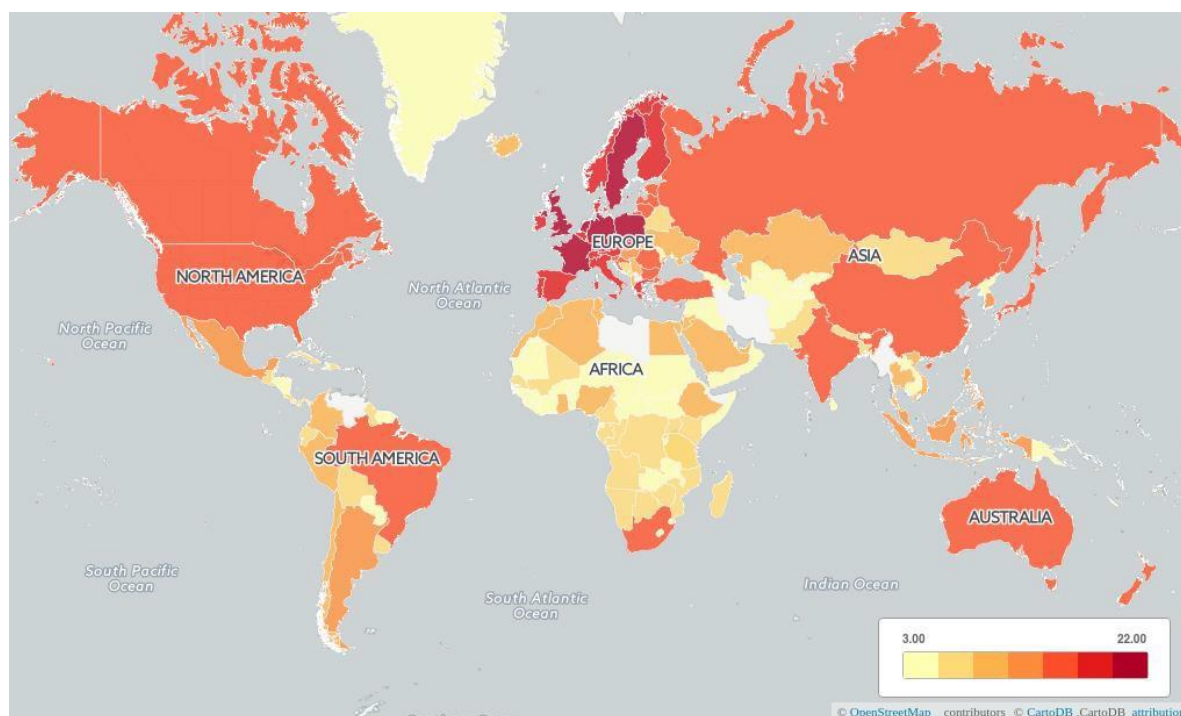
With regard to the geographical coverage, 15 databases cover policies worldwide. Only one database (the *Southeast Asia Network of Climate Change Offices Database*) targets the Asian region specifically, and no database specifically covers sub-Saharan Africa or Latin America. Seven databases focus exclusively on Europe and/or the European Union. A country-by-country analysis shows that Germany is the country covered by most databases: 22 databases provide some information on German climate change mitigation policies. India, China and the United States feature in 15 databases, Turkey and Canada

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<sup>6</sup> We used the classification also employed by the IPCC: “energy”, “buildings”, “transport”, “agriculture”, “LULUCF”, “waste”, “industry”, “crosscutting” and “not specified”.

<sup>7</sup> Including energy efficiency and renewable energy support. We were concerned with the main focus of each database. Almost every database included some information about energy policies.

in 14, and Russia and Brazil in 13.<sup>8</sup> Figure 1 illustrates the number of times a specific country is covered in databases, with darker shades indicating more appearances than lighter colours.



**Figure 1. Country coverage of climate change mitigation policy databases.**

Explanations for this uneven geographical coverage were not sought at this stage. However, further research as well as subsequent interviews suggest that some countries might be under more stringent reporting requirements. For example, EU member states have multiple reporting requirements under many policies such as the Energy Efficiency Directive (2012/27), the Renewable Energy Directive (2009/28) or the Monitoring Mechanism Regulation (MMR, Regulation 525/2013) (Umpfenbach, 2015). Moreover, it might simply be the case that some countries simply have more policies in place, which can be expected to lead to more information becoming available.

## 2.2.5 Policy Instruments

Following existing classifications of policy instruments (Jordan et al., 2011), the databases can be organised according to the types of policy instruments that are covered, including “regulatory”, “economic/market”, “informational,” voluntary”, “procedural” and “other” instruments. An analysis of our sample shows that most (19) databases described some sort of regulatory instrument such as energy efficiency requirements mandated by specific laws. Also, 19 databases included information on “economic” and “market instruments”

<sup>8</sup> One database focusing only on federal states of the United States was excluded from the sample.

such as emissions trading. Data on “informational” instruments, such as appliance labelling, could be found in 16 databases and 10 data sources also described voluntary instruments. Only seven databases contained information on procedural instruments, such as information on how certain national institutions (e.g. ministries) address climate change or on how educational policies could shape climate change mitigation.

### 2.2.6 Visualisation and level of detail

Some of the databases use figures, tables or other forms of visual representation. However, options for interactivity with database users are rather limited. Among the 15 data sources including some sort of visualisation, simple graphs, pie charts and maps prevail as the types of visual support used.

As far as the level of detail is concerned, 16 out of 24 databases contain relatively detailed descriptions of policies. Some data sources simply provide the general objective of any specific policy or just the name of a law or policy, while others offer detailed information across a wide range of policy aspects. Overall, databases covering Europe or industrialised countries tend to describe policies more in detail, whereas data sources describing policies on a global level tend to be less detailed when it comes to policies in developing countries.

### 2.2.7 Assessment and evaluation of policies

Most of the data sources refrain from assessing and evaluating policies, with only seven databases in our sample offering some type of evaluation of the policies covered. With one exception, the *Odysee-Mure II* database, those databases also included country comparisons, but information remains rudimentary and/or aggregated. For example, the *Global Buildings Performance Network* database compares countries’ energy efficiency in buildings according to a rating system based on indicators such as “capacity building” or “financial instruments”, which is then presented in pie chart form.

Databases furthermore rarely provide information on the costs of mitigation policies or other indicators of the impacts or effectiveness of policies, such as actual emission reductions. Only five data sources provide some information about the costs of mitigation policies but only one provided this information for most policies included. Five databases include estimates of emissions savings for the policies, but this data is often only found for some policies, and most of the estimates are made *ex ante*. While this information might be hard to obtain, given the challenging nature of assessing the mitigation effects of individual climate policies, this kind of data can be of great use to policy makers and other stakeholders. This is particularly the case following the adoption of the Paris Agreement, where information about the policies put in place to achieve NDCs can provide an indication of whether a country is on track towards its NDC.

### 2.2.8 Interconnections with other databases

Databases are mostly disconnected from each other. There are exceptions, such as the IEA databases, which are linked to one institution. Likewise, the LSE Global Climate Legislation



Database and the Sabin Center Climate Change Laws database are in the process of being integrated. However, other opportunities for harnessing the complementarity of some databases are forgone.

For example, many data sources focus on policies in the energy sector, thus often categorising and describing the same set of policies. The International Energy Agency's (IEA) *Addressing Climate Change* database overlaps significantly with the NewClimate Institute's *Climate Policy Database*. While the latter differs from the former in providing a more systematic approach in the form of a "good policy matrix", it is not clear whether all potential synergies (e.g. providing complementary information) between the two databases have been explored. This also holds true for other database examples in the analysis.

### **2.2.9 Interim findings**

Our analysis leads to a few interim findings. First, data on climate change mitigation policies is increasingly available. This is a positive development from the perspective of transparency of climate policy, and can potentially lead to more informed decision making, and at the same time can help strengthen the capacity of other stakeholders to act on climate change.

Second, available information is concentrated largely on the energy sector, with an emphasis on energy efficiency. Whether this is due to the greater number of energy policies compared to, for example, agricultural policies needs further investigation particularly given the importance of simultaneous climate action in multiple sectors. Therefore, a more comprehensive sectoral coverage of climate policy databases would be a welcome development.

Third, data availability is unevenly distributed. While the countries in the global North are well represented, information on policies in developing countries (particularly in Sub-Saharan Africa) is scarcer. Moreover, to the extent information is available, information in those regions tends to be less comprehensive when compared to industrialised countries. Again, further research can help to discern whether this is due to the fact that there are fewer climate change mitigation policies in these countries or due to the fact that information is not readily available (or available in accessible languages) because of transparency or capacity-related issues. In any case, more information about developing countries' policies would not only be beneficial to track their efforts to achieve their NDCs, but may also be useful for the countries themselves, with a view to sharing knowledge and best practices with each other, gaining access to climate finance, and learn about past successes and failures.

Fourth, the data sources analysed are insufficiently linked to each other, thus forgoing potential synergies, and potentially leading to an excess of information. However, some efforts towards integrating data sources are underway. Still, such efforts may be hampered



by inter-institutional political sensitivities, particularly when large international organisations are involved.

Lastly, data sources generally eschew comparisons of policies and provide little information about the costs of, and actual emissions savings attributed to, specific policies. While it may be challenging to provide such information both *ex ante* and *ex post*, comparable estimates of costs and/or emissions savings will become increasingly important after Paris. However, providing such information may be politically sensitive for international organisations, whose member governments may wish them to refrain from making “political” judgments in the form of comparisons.

## **2.3 Survey on climate change policy databases**

### **2.3.1 About the survey**

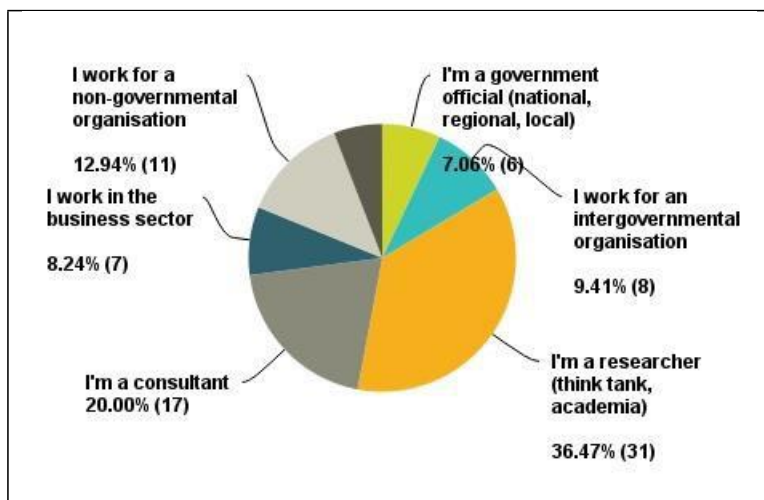
Following the analysis of databases presented in Section 1.2, we carried out an online survey in June-July 2016, containing 16 questions about the actual usage of such policy databases. Overall, three main objectives guided the survey. First, we wanted to understand what kind of databases were already used by respondents. Second, we wanted to uncover what kind of information is sought and who was deemed to be particularly trustworthy in providing this information. The third objective was to learn what information was sought but not provided and what kind of improvements managers of policy databases could make. The online tool *SurveyMonkey* was used to conduct the survey, allowing respondents approximately four weeks to reply. Survey invitations were sent out to large mailing lists (e.g. Climate-L), and to the database of CARISMA stakeholders. In total, 85 people took the survey.<sup>9</sup>

### **2.3.2 Overview of survey responses**

Of the 85 people who took the survey, 31 self-identified as researchers, 17 hailed from the consulting sector, while 11 identified as working in the non-governmental sector. Figure 2 gives an overview of the professional background of all respondents.

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<sup>9</sup> Note that not all respondents answered all questions, meaning that the number of respondents for each question varied.



**Figure 2. Professional backgrounds of survey respondents.**

In terms of professional experience, most people answering the survey had at least 6 years of experience of working in the area of climate change mitigation policy.

To a large extent, respondents either self-identified as working on renewable energy (58) or energy efficiency (54),<sup>10</sup> while the sectors of forestry (25) and agriculture (27) were less well covered.

### 2.3.3 The use of databases

The next series of questions addressed the usage of databases and inquired which kind of databases respondents consulted regularly, and why. When using databases, most respondents indicated that they do so to support their research (41 out of 50 respondents felt that this was "very important" or "important") or to back up their positions with credible facts and figures (39 answered "very important" or "important"). Knowledge of other countries' policies was also deemed "very important" (21) or "important" (20), while personal interest (24) or a commercial purpose (8) figured less prominently on the list of reasons why people use certain databases. The latter may be explained by the fact that there was a relatively small amount of respondents from the private sector.

To obtain a sample of databases used regularly – without reference to the databases surveyed by the project team – and to identify potential gaps in our database coverage, the next question asked respondents to provide concrete examples of databases they use regularly. However, many respondents indicated databases which did not fit the definition of a policy database as used in Section 2.2. For example, the UNFCCC website and related pages were mentioned 12 times as source of information, even though these were not included in our analysis presented above. However, some databases would possibly merit

<sup>10</sup> Multiple answers were possible.

an inclusion in our sample. Table 2 offers an overview of databases mentioned by participants and which might warrant an inclusion in our sample for further analysis.

**Table 2. Climate change mitigation policy databases mentioned by survey respondents.**

Database	Link
International Partnership on Mitigation and MRV	<a href="https://mitigationpartnership.net/gpa">https://mitigationpartnership.net/gpa</a>
REN 21 Status of RES	<a href="http://www.ren21.net/status-of-renewables/ren21-interactive-map/">http://www.ren21.net/status-of-renewables/ren21-interactive-map/</a>
REDD Desk Database	<a href="http://theredddesk.org/countries">http://theredddesk.org/countries</a>
Transport Policy Database	<a href="http://transportpolicy.net/index.php?title=Main_Page">http://transportpolicy.net/index.php?title=Main_Page</a>
ICAP	<a href="https://icapcarbonaction.com/en/ets-map">https://icapcarbonaction.com/en/ets-map</a>

Respondents were then invited to choose the one database they would use the most. Forty-one out of 85 respondents answered this question. Of those examples provided, five respondents mentioned IEA and OECD-managed databases while another five respondents indicated that they would use the UNFCCC website for policy information. Other databases mentioned and included in our initial database review were the *Odyssee-MURE* database (one mention), *Climate Action Tracker* (one mention), the *EEA Database on Policies and Measures* (two mentions), *New Climate Institute's Climate Policy Database* (two mentions), the *LSE Global Climate Legislation Database*, and the *Sabin Center Climate Change Laws Database* (one mention).

### 2.3.4 The quality of databases

Next, respondents were asked to elaborate on why they used the chosen database, with reference to several pre-defined quality criteria. Forty-five people responded to this question. The most important quality of those databases was the fact that they *provide the most reliable and trustworthy data*. Twenty respondents felt this was “very important”, while another 20 felt that it was “important”.<sup>11</sup> *Having a wide geographical or sectoral coverage* was rated 19 times as “very important” and 13 times as “important”, while *providing the most detailed information* was rated 16 times as “very important” and 22 times as “important”. These three qualities (wide coverage, detail of information, and reliability) were therefore the most important attributes sought after in a database. Perhaps surprisingly, the quality of allowing for an evaluation of countries’ policies was considered to be relatively less important to respondents: 12 respondents felt it was “very important”,

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<sup>11</sup> Note that each quality could only be assigned one answer ranging from “not important” to “very important”. It was therefore not possible that one respondent chose one quality, for example “it is user-friendly”, and rated it both “very important” and “important”.

13 felt it was “important”, 13 stated “somewhat important”, and five responded “not important”.

### 2.3.5 The kind of information sought

Respondents were then asked what kind of information they look for in policy databases, and were also given the opportunity to indicate whether a specific kind of information was sought “never”, “sometimes” or “often”. Forty-seven people responded. Top answers (often) were a *detailed description of countries’ mitigation policy instruments* (22), *information about the implementation of policies* (22), and *assessment or evaluation of policies in terms of their environmental or socio-economic impacts* (21). Information about policy interactions is sought “sometimes” in 27 of the cases, making it the top answer in that category. Information about the number of policies enacted in one jurisdiction is “never” sought in 12 cases, giving it the most responses in the “never” category. Here, we can already identify a gap between available information and knowledge needs. Because while a significant number of users often look for information on policy assessments (21), those assessments are rarely provided in the databases analysed in Section 2.2.

This knowledge gap might partly explain why half (22) of the respondents were only “moderately” satisfied with the data available on mitigation policies. A further 11 were “not satisfied” and only another 11 were “satisfied” with the information available online.

### 2.3.6 What is missing: Limitations of databases and options for improvement

When asked what was missing, the majority (29 out of 44) responded that they felt that *information on the economic impacts of policies* was absent from databases. A further 28 respondents were of the opinion that *information on environmental impacts* were missing, while 21 respondents indicated that *information on social impacts* was missing. This suggests that some sort of evaluation is sought after (but not often provided by the databases). When given the opportunity to add their own description of what was missing, respondents indicated that information about the cost-effectiveness was missing, while one respondent criticised missing information about the standards used in various policies.

To supplement these findings, respondents were asked what kind of information they ideally would like to see included in databases. There was a quite even distribution among the options respondents were able to choose and their importance. Twenty-five out of 45 wanted to see information on *expected/projected emission reductions from policies* and ranked this missing information as “very important”. Twenty-three out of 44 wanted to see information concerning the *evaluation of policies compared to their objectives* and ranked this answer as “very important”, while 22 wanted to have information about *cost-effectiveness* and ranked this as “very important”. The only answer which did not score over 20 was *overall costs of policies* which only 16 respondents (out of 43) ranked as “very important” with regard to the information they would like to see in a policy database. When given the opportunity to elaborate on “other” kinds of information they would like to see,

respondents added information needs on policies dealing with overseeing markets and information on the governance and compliance conditions of certain policies.

### 2.3.7 What makes a database authoritative?

As a next step, respondents were invited to indicate what attribute would make a database most authoritative. Thirty-two out of 44 suggested that *the sources of information are credible* make databases “very authoritative”, while 29 out of 43 chose *the methodology is explained well and sources are referenced* make databases “very authoritative”. Interestingly, that the database is kept up-to-date made a database “very authoritative” for 27 respondents. One respondent commented that it was important that the most recent and most “up-to-date” information was shared in a database and suggested some sort of Wikipedia-inspired page which would let stakeholders update information on different countries. Interestingly, all respondents who responded with *the organisation leading and managing the database is credible and authoritative* (22) when asked about the authority of databases, all mentioned IEA/OECD databases as the ones they would use. The same holds true for the category *the sources of information are credible*. One might infer from these findings that IEA/OECD databases are considered to be particularly authoritative.

### 2.3.8 The user-friendliness of databases

The last part of the survey dealt with the design and the user-friendliness of databases. The responses (21 in total) were relatively heterogeneous, with only the IEA/OECD databases receiving several (three) mentions. Other databases which were deemed user-friendly are the *Reegle* database (because of its easy, step-by-step process to find information), *RES-LEGAL* (because of the conciseness of its information), the *EEA Database on Policies and Measures* (no explanation given), *Climate Action Tracker* (quick and easy to navigate), *New Climate Institute’s Climate Policy Database* (easy overview, good search function, detail of information) and the *LSE Global Climate Legislation Database* (well organised).

However, when respondents were asked to point out particularly user “unfriendly” databases, the UNFCCC website came up four out of ten times. Although the website in itself does not necessarily qualify as a database (and was therefore not included in our sample), the sheer amount of information as well as its static character were the main reasons why the UNFCCC webpage was qualified as user “unfriendly”. This suggests that users might want relatively concise, up-to-date information instead of lengthy, detailed documents and descriptions. However, it should be remembered that the UNFCCC website for the most part serves as a repository for submissions from Parties and observers, which can explain the heterogeneity of the available information and how it is presented. Even though the UNFCCC offers at times detailed guidance to Parties for reporting on their actions (e.g. through National Communications or Biennial Reports), there is still significant leeway for Parties in what exactly they choose to report and what they leave out.

The last part, dealing with visualisation, revealed that while 21 out of 43 respondents wished to have some visual support, 22 replied that visual support was *welcome but not necessary*. *Static graphs and tables* were identified as the main desired visual support (“very important” for 18 out of 40 respondents), as were *infographics explaining complex information quickly and clearly* (13). Interestingly, only 11 out of 39 respondents thought that *interactive graphs and tables* were “very important” and *audio-visual support* like photos or videos was deemed “not important” by 10 out of 38 and therefore was the least important category.

### 2.3.9 Interim findings

As mentioned above, the survey had three main research objectives: To better understand how databases are used, to gain insights into the kind of information sought, and to survey suggestions on how to improve the availability of data. Several observations can be made on the basis of the survey.

Overall, respondents use databases mainly to back up their research and/or their professional positions with facts and figures. Mostly, users seek detailed information about countries’ mitigation policies, as well as information about the implementation and the ultimate effects of those policies. When using databases, respondents deemed the reliability and trustworthiness of a database as the main desirable feature. This feature is guaranteed either by a well-explained methodology or when the source is deemed credible. Well-established and well-known organisations such as the OECD or the IEA are thought of as the most credible in this regard.

However, the satisfaction with the quality of available data seems to be only moderate. One explanation might be that while the sectors respondents were active in by and large matched data availability (most respondents work in the energy sector, and most databases convey information about mitigation policies in the energy sector), other information sought is not readily available.

This is particularly the case when it comes to evaluation and impact assessments. While most of the respondents deem information about environmental effectiveness (emission reductions) and socio-economic impacts (including costs) as important, only a few databases actually convey this sort of information.

Concerning the user-friendliness of databases, easy-to-navigate content as well as concise and easily accessible information seem to be the defining criteria. While more visually appealing methods of conveying information, such as elaborated graphs and multimedia support might be welcomed, it was not deemed necessary by half of the respondents.

## **2.4 Follow-up interviews**

### **2.4.1 Summary of interviews**

To supplement these findings with additional, qualitative information, we conducted additional interviews with selected participants and members of the CARISMA Advisory Boards. Interviewees were selected to ensure a variety of viewpoints. In total, seven stakeholders agreed to a short (20-30 minutes) interview, which were carried out between August and October 2016. Four interviewees fell into the “research” category with one representative each from the “business”, “NGO” and the “consultancy” sector. Policy-makers were not available for an interview. All interview partners can be considered experts in their field and have had a strong track record in their specific areas of expertise. The main purpose of these follow-up interviews was to obtain some tentative explanations of observations made based on our initial analysis of policy databases and on the survey described above.

### **2.4.2 What kind of information is sought?**

The first set of questions sought to uncover what kind of databases the interview partners (and people in the same professional category) used and what kind of information they sought. By doing so, we wanted to corroborate the trends already observed in our initial analysis.

Answers varied according to professional backgrounds. While stakeholders from research often look for more details on specific policies and quantitative data such as costs, emission savings and other indicators, people closer to the policy making process (consulting and business representatives) seem to be additionally interested in barriers and obstacles to certain policies (and how to overcome them), as well as in a long-term perspective on future potential policies. These answers corroborated information gathered by the survey, in which evaluations and impact assessments of climate policies related to costs or actual emission reductions per policy were indicated as desirable information by many respondents. However, the interviewed stakeholders also pointed to other factors that would help gain a better understanding of what makes policies “effective”. For example, the interviewee from the consultancy sector opined that data, facts and figures would often not be enough to fully get the picture of what can be considered to be “effective” policies. Contextual factors should be taken into account when analysing policies and their effectiveness. For instance, effective energy efficiency policies in France might be very different from effective energy efficiency policies in Denmark as they operate in a different cultural and societal context. Here, the need for more qualitative information became apparent but also the need for concrete proposals on how to overcome certain barriers to effective policy making.

But despite the need for some sort of assessment, all interviewees were not fully convinced that they could find all the necessary information for their professional usage in existing climate change policy databases. Again, this is in line with survey findings where overall



satisfaction with availability of data was only moderate. Researchers were overall more satisfied with data availability while others seemed to be more sceptical. When asked about what other sources of information interviewees used, most mentioned either going directly to the source of policies such as reports by government agencies and legal texts, or indicated that they would use specialised journalistic and think tank sources. Moreover, making use of one's extended professional network was mentioned as an important source for climate policy information.

### **2.4.3 Exploring the lack of certain data**

Drawing on the interviewees' expertise, the next questions mainly sought to help explain the two main findings of the survey and the initial desk review of policy databases (see Section 1.2): first, the uneven sectoral and geographical coverage of policy databases; and second, the absence of evaluation and assessment of policies.

Concerning the uneven sectoral and geographical coverage, interviewees were asked whether they believed that this lack of information was due to the lack of policies enacted in these sectors and geographical areas or simply because there was an information gap in these sectors and geographical areas (i.e. policies are enacted, but there is simply no information available).

Three respondents argued for a mix of both, and three pointed to a perceived information gap. One respondent further emphasised that this information gap was clearly demand-driven in the sense that since there were less governmental or private sector obligations in low-income countries to report on climate policies, less information was available as a result. Another explanation given was the fact that in some sectors policies might be easier to evaluate than in others. For example, fuel consumption and ensuing emissions are relatively straightforward to calculate in the energy sector, whereas one participant pointed to the methodological difficulties to assess emissions in the agricultural or waste sector. This lack of knowledge was thought to be particularly pronounced in low-income countries which, according to one interviewee, might explain the lack of information identified in Section 1.2. Moreover, some sectors such as the energy sector would have the largest emissions savings potential, therefore being the target of policy makers and subsequently researchers. One participant suggested that to fill the knowledge gap in low-income countries, intensified South-South cooperation on climate policy information should be envisioned, since, from a structural perspective, methodologies and lessons learnt would be much more valuable if shared between "like" countries, rather than between industrialised and emerging countries.

Concerning the lack of policy evaluation and assessment in climate change policy databases, interview partners pointed to several possible reasons. Overall, the feeling among interviewees was that there was simply a lack of reliable data. Several barriers to obtaining this data were indicated. Two interviewees stressed the methodological difficulties, echoing one of the reasons given for the aforementioned sectoral and geographical information gap. On the one hand it was seen as challenging to link certain



emission or energy consumption reductions to specific policies. Also, a lack of harmonisation of how to report those reductions was mentioned. On the other hand, two interviewees opined that some of the evaluated and assessed data might prove to be very sensitive information, and some countries might eschew publishing this information. But the absence of “push factors” was also mentioned. One interviewee suggested that policy makers were usually not pushing for evaluation and assessment, thus offering no incentives to do so. Moreover, the lack of expertise and resources to carry out proper evaluations were indicated as barriers as well as the shortcomings of traditional assessment criteria such as costs and efficiency which often overlook other factors that might make for “good” policies such as social equity or co-benefits.

These arguments were largely echoed during a two-day workshop, organised independently from CARISMA research by the European Environment Information and Observation Network (EIONET) and the European Environment Agency (EEA), in Copenhagen on 6-7 September 2016 (see Box 1).

**Box 1. Workshop on reporting and assessment of climate policies and measures.**

During the EIONET workshop on the details of emissions reporting and the challenges of getting reliable data on climate change policies, Member State representatives, European Commission officials and research institutions discussed how to improve reporting on emissions and pondered the effectiveness of policies deemed to reduce them, offering important insights into the complex world of climate change mitigation data usage.

Participants confirmed, among other things, that getting the right information was challenging from a methodological point of view and several reasons were given, conforming some viewpoints of our interviewees.

For instance, there is the problem of overburdening national administrations. EU Member States have several reporting obligations, not only under EU rules, but also under the UNFCCC. The reporting requirements of the latter are embedded in the EU’s Monitoring Mechanism Regulation, while EU policies demand reports not only for issue-specific Directives (e.g. on energy efficiency and renewable energy), but also for overall strategies such as the EU Energy Union initiative. Here, it becomes apparent that streamlining and bringing different reporting strands together would be a welcome step to reduce the bureaucratic burden for Member States.

Smaller countries in particular struggle to find enough human and financial capacity to respond to all reporting requirements in a timely manner. But also within Member States, there may be room for improvement. Sometimes, sub-optimal communication between national institutions and a lack of national reporting provisions makes it difficult for countries to come up with the right data. European institutions, such as the EEA, which

hosted the workshop, already provide guidance for Member States on how to report on policies, but these could be improved by providing best practice examples of reporting.

But then there are also technical issues, such as the difficulties of linking estimated or even verified emission reductions to a specific policy. And while models and scenarios often exist *ex ante*, *ex post* evaluations after a certain period are often not carried out due to resource constraints and the complexity of disentangling empirical effects of a certain policy from other emission-reducing factors such as economic cycles or weather conditions.

Last but not least, one could add a political dimension to the challenges of data gathering. Information such as the costs of policies are often not reported simply because this sort of information proves to be a sensitive issue; power dynamics between governing institutions are often a hindering factor. Think for example about coalition governments, where different ministries are staffed by different parties and where opinions of objectives and priorities might diverge.

In a similar vein, the next interview question inquired whether databases were generally perceived as up to date. While four respondents were generally of the opinion that the information available was up-to-date, three respondents felt that this was not the case. Here, it is interesting to note the probable limitations of policy databases. The interviewees from the NGO, consultancy and business indicated that timely information was important. However, it was felt that this information cannot be provided by managers of databases because of lacking resources. Often, business sector clients would employ specialised advisors and analysts who would gather information already during the stage where policies are debated by decision makers, while policy databases normally contain only information on already enacted policies. However, it remains questionable whether policy databases can and even should provide for this close to real time information.

#### 2.4.4 Improving databases

The last set of questions asked interviewees to propose some measures to: 1) improve the basis of policy information; and 2) elaborate on what managers of databases could do to improve the relevance of policy information to its users. To improve the basis of policy information, interviewees pointed out the need for more tacit and more contextual knowledge. Even though one respondent argued for more quantitative data (and another pointed to the need of more comparable data), the need for qualitative data was clearly suggested as one way to improve the quality of information. One way to assure this would be to concentrate and pool research efforts as proposed by one interviewee, since research efforts were often carried out in parallel, which would leave room for improvement. Supporting these efforts with financial resources was another suggestion, as well as regrouping research efforts under the auspices of one organisation which would take the lead. However, then the reliability of available information would be heavily dependent on the credibility of such an organisation.

Regarding the strengthening of information provision to users (and increasing the relevance of this information), standardisation efforts were mentioned by one interviewee as a means to achieve this objective. Other respondents argued for an increased communication effort in the sense that policy database managers should increase awareness of existing knowledge in a continuous manner, for instance through a regular update service (e.g. a newsletter) or presentations to key stakeholders, making use of several forums such as workshops or expert conferences. Moreover, one respondent stressed the need to increase usability by using creative visualisation tools and easily searchable and downloadable information, which was very much in line with findings from the online survey.

### **2.4.5 Summary of interview findings**

The follow-up interviews corroborated initial research findings as well as survey results, and provided some additional insights into user needs of policy information databases.

Overall, interviewees argued that information about costs and environmental impacts of policies was a sought-after quality in policy databases. While some interviewees also stressed the need to go beyond simple facts and figures and to include more qualitative information about contextual factors when providing information about climate change mitigation policies, these were also arguments made by survey participants. However, and also similar to the survey respondents, interviewed stakeholders opined that the quality of the information on that matter leaves room for improvement. Interviews and survey both yielded only a moderate satisfaction with data availability on those matters but also in general. In addition to that, interview partners emphasised the importance of up-to-date and even prospective information. However, it is doubtful whether databases can provide for this timely and continuous flow of information.

Besides those opinions corroborating survey findings, the interviews also yielded some interesting insights on some of the main findings of both the survey and the initial analysis of policy databases: the uneven sectoral and geographical distribution of information and the absence of policy evaluation and assessment.

With respect to the geographical and sectoral distribution of policy information, the interviews further accentuated the picture, suggesting that sectoral and geographical information gaps could be due to methodological difficulties in those areas and sectors. For the agricultural sector for example, linking cause and effect, policies and actual emissions saved proves to be challenging, while lower policy reporting demands and technical know-how have been identified as potential barriers for low income countries but also in the industrialised North.

These methodological difficulties, the lack of appropriate human and financial resources as well as the perceived sensitivity of the information gathered were suggested as the main reasons for why policies are seldom evaluated and assessed even on the national level. Given that databases often rely on information provided by national governments, they

subsequently also lack this kind of information. This has been confirmed by interviewees, but also during the EEA workshop. However, besides those difficulties to get “hard” data, there also seems to be a need to broaden the analytical assessment spectrum and go beyond indicators such as costs or emission reductions, and include more social indicators such as co-benefits into the calculations.

## **2.5 Conclusions and the way forward**

The work on climate change mitigation policy databases described here yielded some interesting insights and observations. First, the initial analysis of existing databases allowed for some gauging and categorisation of existing knowledge on climate change mitigation policies. Second, the survey gave us a better understanding of what kind of databases are already used by a variety of stakeholders, what kind of information is sought and where the gaps between this desired information and the actual information available are to be found. The third step, consisting of interviews with climate change mitigation experts, corroborated some of the findings from the first two steps, and offered interesting explanations to some of the questions that had arisen.

Overall, information about climate change mitigation policies is increasingly available and stakeholders seem to have a good awareness of what information is available. Several databases managed by well-known organisations such as the OECD seem to be able to provide information that is deemed trustworthy.

However, the information available does not seem to fully match user needs. Satisfaction with the information provided by databases was deemed mostly “moderate” by people surveyed and an initial analysis indeed suggests that there are some gaps in the information provided. While some sectors and some countries like the energy sector and European countries are well represented, information about sectors such as agriculture and/or countries in sub-Saharan Africa is seldom found. Moreover, evaluation and assessment of climate change mitigation actions is mostly missing but a sought-after feature by users according to our survey.

However, meeting some of those user needs is challenging. Particularly the issue of timing, evaluation and assessment are difficult to tackle. Evaluation and assessment of policies is less straightforward than it seems. Policies are enacted to achieve objectives that are the product of heavily contested political decision-making processes, and the ultimate objectives of policies are not always easy to uncover (e.g. to some, the overarching of an emissions trading system would always be environmental – i.e. emission reductions; to others, it would be about cost-effectiveness).

Moreover, from a practical perspective, evaluation is already fraught with difficulties at the primary source: national governments. Resource limitations (both human and financial), as well as methodological difficulties, can be important barriers for governmental stakeholders. Also, information provided almost in real time as desired some interviewed experts desired largely surpasses the capacities of database managers, with the potential

exception of larger databases managed by organisations with sufficient capacity. Besides these major problems, there also seems to be room for improvement when it comes to avoiding the duplication of information. Although some duplication may in fact be desirable – as a pluralism of sources and methodologies may yield more insights about the performance of policies than just one source or method – it may also lead to inefficiencies, and confusion for the user. Finally, information could be made more appealing to users, either through better visualisation methods or via searchable and downloadable data.

But despite those difficulties, there are several possible ways forward. First, the use and usefulness of databases might be enhanced by strengthening their visual potential and providing users with expressive and convincing graphs or more creative visualisation tools. Survey respondents and interviewees felt that this might be a useful way to not only strengthen the interaction with users but also to increase the use of available data.

Second, further efforts could be made to link users to databases. An initial interface indicating what type of information can be found in which database would already be a first step. Related to this, better communication by the managers of policy databases about the information in their databases will be helpful. Users are often not aware of what kind of information is available in online databases, and a continuous flow of information (regular updates) was deemed necessary by several interviewees and stakeholders. Moreover, increased communication effort by managers of databases could provide an opportunity not only to present what databases can do, but also clearly communicate the limitations of databases especially when it comes to assessment, evaluation and real-time information.

Third, collaboration across databases offers an opportunity to explore the complementarities of the available data sources, and to reduce overlaps and exploit synergies. The collaboration between the IEA and IRENA on renewable energy policies is a step in this direction, as is the recently announced integration of the LSE Global Climate Legislation Database and the Sabin Center Climate Change Laws Database.

Finally, given that many data are based on national reporting by countries (e.g. in the EU or UNFCCC context), improved reporting should improve the quality of information in databases. This may also, over time, allow for the generation of further information to assess the environmental, economic and social effects of policies.

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## 3 Effects of interactions between EU climate and energy policies

### 3.1 Introduction

This part of the report analyses case studies of environmental and climate change policies with a specific focus on how the results of chosen policies have been influenced by other policies. Policy making usually takes place within complex systems, where multiple policies and policy instruments are identified to achieve different policy goals (Tinbergen, 1952). The reason for focusing on policy interactions is that co-existence of policies could also result in one policy influencing another policy, for example, when they target similar stakeholders who may respond differently to multiple policies than to an individual policy. Such interactions could, for example, lead to policies reinforcing each other, but could also lead to reduced policy effectiveness if one policy has a negative impact on another policy.

Policy interactions can be discussed from at least two perspectives. From the first perspective, the design features of policies in a policy mix are analysed to identify (positive or negative) overlaps. For example, as is explained elsewhere in this report, policy makers for climate change mitigation, energy efficiency improvement and renewable energy support often realise that their goals and targets may overlap. For greenhouse gas (GHG) emission reductions, among others, low- or zero-emission energy technologies are needed, which are also the focus of energy efficiency and renewable energy policies. These overlaps can be justified if policies reinforce each other or when they focus on different aspects, such as one policy focussing on current climate goals and another policy focussing on developing energy technologies that will be needed for future climate and energy goals. Such discussions also form the basis for environmental policy and economics literature on, among others, policy instrument choice and justifications for directed technological change (e.g. Acemoglu, Aghion, Bursztyn and Hemous (2012)).

The INTERACT project<sup>12</sup> with its focus on potential interactions between the EU Emissions Trading Scheme (ETS) and other climate and energy policy instruments in the EU and its Member States was among the first studies to analyse how policies could interact within a policy mix, and how policies could influence each other's effectiveness through such interactions (Sorrell, et al., 2003). Other studies have analysed policies individually in terms of their targets and policy instruments and then compared them to see whether their target setting and instrument choices were consistent (IEA, 2011a; IEA, 2011b; Oikonomou, et al., 2011; Oikonomou, Flamos, & Grafakos, Is blending of energy and climate policy instruments always desirable?, 2010; Spyridaki & Flamos, 2014; Duval, 2008; Jensen & Skytte, Interactions between the power and green certificate markets, 2002; 2003).

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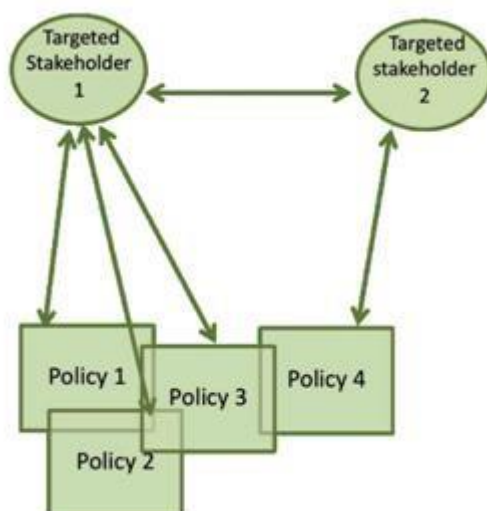
<sup>12</sup> Interaction in EU Climate Policy 2001-2003, an EU funded project in the 5th Framework Programme.



The second perspective complements this analysis by considering aspects that are typically related to the contexts for the policies, such as economic development, technology development, people's awareness and preferences and policy implementation aspects. Understanding policy contexts is important because consistent policies "on paper" could in practice have negative interactions if, for example, the policy implementation is different from what was anticipated, if the response of stakeholders to a set of policy instruments is different from the assumed response to each individual policy instrument, or if public acceptance of a policy is lower than anticipated. Consequently, while policy makers may know and understand policy interactions based on theory and experience with similar policy mixes in the past, this knowledge of policy instruments and how they are likely to interact under a range of observed conditions is of limited use if the present context (the current timeframe a policy instrument operates in) is different from the past context. It is noted though that this perspective is not so much about policy interactions as it is about different responses to the same policies given varying (temporal, spatial, social and regulatory) contexts.

When analysing interactions between energy, environmental and climate policies (and their policy instruments), the EU-funded project APRAISE (7<sup>th</sup> Framework programme) particularly focused, using extensive case study analyses, on the behaviour of stakeholders and their direct and indirect responses to multiple policy instruments, to explain why actual policy results differed from expected results (APRAISE, 2012). Figure 3 illustrates the approach taken by APRAISE, thereby assuming four policies which target two stakeholders. Stakeholder 1 is targeted by policies 1, 2 and 3, while policy 4 targets stakeholder 2. The behaviour of targeted stakeholder 1 is thus determined by three policies at the same time, instead of just one policy. Thus, the stakeholder's behaviour may differ from what the policy makers of the individual policies had expected. Moreover, APRAISE (2012) also explained situations where a stakeholder who is targeted by just one policy, may still behave differently than expected, because of interactions (e.g., collaboration or competition) with other stakeholders whose behaviour is affected by other policies. In terms of Figure 3, there could be interaction between policy 4 and policies 1, 2 and 3 through the interaction between both stakeholders.





**Figure 3. Policy interaction through the behaviour of directly and indirectly targeted stakeholders.**

The example also shows that policy interactions can take place in different ways. Policies can focus on separate policy areas but interact as they target the same stakeholders. This can result in a negative interaction between the policies (strong or moderate), positive interactions (strong or moderate policy synergies between policies) or neutral (despite the interactions, stakeholder behaviour is in line with what policy makers expected for their individual policies).

Understanding policy interactions is important as these could have positive or negative impacts on the eventual effectiveness of a policy. Moreover, policy interaction could increase or decrease efficiency of a policy or a policy mix, when co-existing policies lead to higher costs for targeted stakeholders or for society. At the same time, as is illustrated elsewhere in this report for a case study in Austria, situations could occur where a loss in efficiency is accepted as the policy instruments chosen are politically the most acceptable. These three criteria – effectiveness, efficiency and political feasibility – have been identified by, among others, Del Rio (2014), Edenhofer et al. (2014) and Fischer (2010). They explain how, in practice, the most efficient policy instrument may be politically unfeasible.

In CARISMA, policy interaction is analysed through four case studies which have been selected with the objective to explore potential interactions of climate policies with energy efficiency and renewable energy support policies. Interactions between these three policy areas are particularly interesting because they form the three pillars of the EU Climate and Energy Package (European Parliament and the Council (2009), renewed in 2014). During the design of the package, possible interactions were considered by European policy makers, but it remained to be seen how these interactions would work in practice. For example, policy makers realised that accelerated introduction of renewable energy technologies and energy efficiency support would lead to lower GHG emissions for EU ETS-covered installations in the electricity sector and possibly surplus allowances in this sector,

but it was assumed that these surpluses would be absorbed by installations in other ETS sectors (Fischer, 2015).

However, the example of ETS and RED policy interaction also demonstrates the importance of policy context. In their design of a policy mix with the ETS and the German feed-in tariff system, policy makers in Germany had not anticipated the economic crisis after 2008 and its consequences for the performance of both policy instruments. Because of the economic crisis, industrial production dropped so that industrial sector installations covered by the ETS required fewer allowances to cover their actual emissions and therefore did not absorb the allowance surpluses in the German power sector. In other word, as Fischer (2015) and Mulder (2016) conclude, while the interaction between RED and ETS was foreseen and considered manageable, the ETS and RED-policy design has often not been ready for handling an external shock such as the economic crisis.

The relationship between the German feed-in tariff for stimulation of renewable energy technologies and the response of German electricity sector stakeholders to that has also been topic of a PhD research at the University of Groningen (Mulder, 2016). The study concludes that the performance of the EU ETS has been seriously undermined by the interaction with “parallel instruments”, *i.e.* other energy and climate instruments that operate in parallel to the EU ETS and affect the carbon dioxide (CO<sub>2</sub>) emission levels of ETS installation. Mulder (2016) finds that these interactions has lowered the ETS allowance price by €5 by 2030 (a 14% lower price) compared to a scenario without both parallel instruments. For the EU as a whole, a similar, though stylised, simulation was performed, leading to the conclusion that all parallel instruments currently in place in Europe are expected to lead to a 50% reduction of the allowance price by 2030 (€20; compared to €40 in a scenario without parallel instruments). Furthermore, in case of stagnating economic growth, a carbon price below €10 would remain probable even in 2030.

Like Fischer (2015), Mulder (2016) does not proclaim that renewable energy and emissions trading policies should not co-exist or should not interact. Co-existence of policies can be justified if a feed-in tariff for developing technologies would help develop technologies that will be needed for future climate targets. However, to avoid adverse interactions, Mulder (2016), for example, proposes the introduction of a price floor and ceiling in the ETS and/or limiting the use of parallel instruments (even though this would lead to reduced certainty about the quantity of allowances in the ETS).

The CARISMA case study analysis on energy and climate policy interactions aims to complement existing literature on policy interactions by addressing a set of aspects of policy interactions related to: the policy levels at which interactions may occur (e.g. interactions between policies at the national levels for achieving national goals and those formulated at provincial levels aimed at sub-national goals), inter-temporal interactions (e.g. interactions between policies aimed at short term versus those aimed at longer-term policy goals), and interactions that occur if stakeholders are indirectly affected by a policy instrument (even if they are explicitly excluded from the policy). For that, the following four case studies have been analysed:

- **France:** Impact of the implementation of the RED and energy efficiency measures on GHG emissions in the electricity sector under the EU ETS.
- **Austria:** Interaction between energy efficiency policy measures at the levels of the federal and regional governments.
- **Greece:** Impact of the planned Energy Efficiency Obligation scheme in Greece on the GHG emissions in the Greek power sector covered by the EU ETS.
- **EU-level:** Implications of interaction between the EU ETS and the Renewable Energy Directive.

Together, the case studies provide an illustrative pallet of policy interaction examples, while it is acknowledged that the overview should not be considered fully representative for all types of policy interactions that may occur because of implementation of the Energy and Climate Package in the EU and the Member States (European Parliament and the Council, 2009). For example, no case study was conducted on the above-described situation in Germany as it has already been widely discussed in several literature sources (including Fischer (2015) and Mulder (2016)). The EU-level case performs a similar analysis on ETS and renewable energy interaction, but its geographical focus is broader. As policy context aspects and analysis is covered by other tasks in the CARISMA project, the case study analysis in this report does not systematically explore contextual factors in relation to policy results, but where case study analysis touches upon specific local circumstances determining policy interactions, these will be discussed.

### 3.2 Case study analysis approach

The case studies have been analysed as follows:

- **Introduction:** What are the policies for which interaction is analysed?
- **Short background:** What are interactions between the policies addressed by the case study and how can these influence the results of the policies (impact on policy effectiveness)?
- **Analysis of policy interactions:** What has been/will be the impact of the policy interactions on the policy outcomes?
- **Lessons and recommendations**

Stakeholders in the case study contexts have been invited to share their knowledge for the analysis, via personal communication, interview and requesting reviews of draft texts. Table 3 presents an overview of the case studies, with indications of the policy areas covered per case study and analysed for interaction.

**Table 3. Overview of CARISMA case studies for policy interaction analysis.**

<b>Case study country</b>	<b>Interaction level</b>	<b>EU ETS</b>	<b>Renewable energy</b>	<b>Energy efficiency</b>
<b>France</b>	National-regional level interaction ( <i>ex post</i> analysis)	X	X	X
<b>Austria</b>	National-regional ( <i>ex post</i> analysis)			X
<b>Greece</b>	National level interaction ( <i>ex ante</i> analysis)	X	X	X
<b>EU as a whole</b>	EU-level interaction ( <i>ex post</i> analysis)	X	X	

### 3.3 Introduction to the EU Directives covered by the case studies

#### 3.3.1 The Energy Efficiency Directive (EED)

In October 2012, the European Commission adopted the Energy Efficiency Directive (EED) with a goal to reduce consumption of primary energy by 20% by 2020 and enhance energy efficiency beyond 2020. Member States must adopt national targets and notify these to European Commission, which will undertake progress assessments and recommend further measures, when needed (Article 24 of the Directive). The European Commission will particularly monitor the impact of the EED on the EU ETS.

#### 3.3.2 The EU Emissions Trading System

The EU ETS was established in 2005 to regulate GHG emissions of all major industrial and power plants in the 28 EU Member States, Norway, Liechtenstein and Iceland. In total, it covers about 11,000 installations, which account for half of total CO<sub>2</sub> emissions in Europe. The ETS is a “cap and trade” system, which allows installations to emit a certain amount of CO<sub>2</sub> per year. These allowances can be traded in the ETS market. Since 1 January 2013, allowances have been largely auctioned, instead of freely distributed, as was the case during the first two ETS phases.

#### 3.3.3 The Renewable Energy Directive

The Renewable Energy Directive (RED) (2009/28/EC) focuses on the promotion of using energy from renewable sources (e.g. biomass, geothermal, hydrothermal, hydropower, ocean energy, landfill gas, sewage treatment plant gas, biogases, biofuels, solar and wind). For that, the directive contains a mandatory target of a 20% share of renewable energy sources in the EU by 2020. The scope of this directive includes renewable energy sources

in several sectors, such as built environment<sup>13</sup> (both including new and renovated buildings) and transport (using biofuels, boosting the use energy efficiency technologies, etc.), and is focussed on heating and cooling installations<sup>14</sup> (Official Journal of the European Union, 2009, pp. 11, Art.1) as well as production of electricity from renewable energy sources.

### **3.4 Case study 1: Interactions between climate and energy policies in the French electricity sector**

#### **3.4.1 Introduction**

In France, interactions between climate and energy policies can potentially occur through the National Low-Carbon Strategy (NLCS), which aims at supporting the country's transition towards a sustainable, low-carbon economy. This new policy framework was released in November 2015 by the French ministry for Ecology, Sustainable Development and Energy. The strategy aims at reducing national GHG emissions by 75% in 2050 compared to 1990 levels. For the energy production sector, with an emission reduction goal of 96%, an almost complete decarbonisation is targeted.

The NLCS interacts with climate and environmental policy making at different levels. On the one hand, the strategy is designed within the context of EU climate policies, while on the other hand, it may have an impact on policy making at regional and local levels in France. Therefore, the case study analyses three types of policy interactions of the National Low-Carbon Strategy with:

1. Energy efficiency and renewable energy objectives in France;
2. The EU ETS; and
3. Governance at local levels.

Interactions between EU and French policies are analysed for electricity generation in France.

#### **3.4.2 Background and policy context**

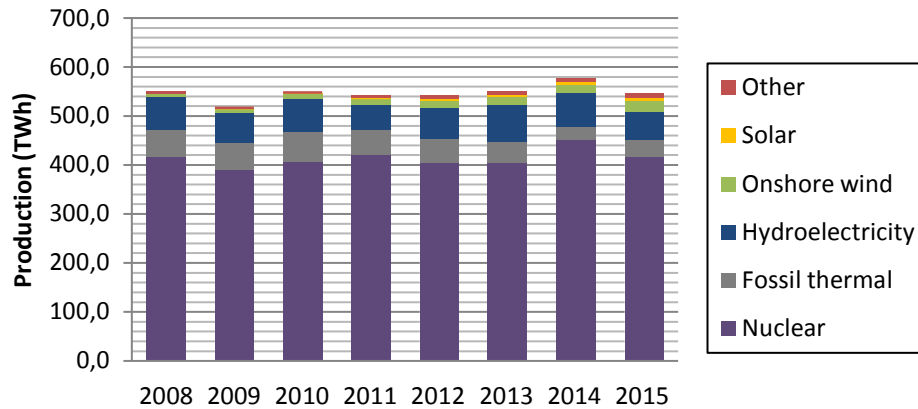
Historically, GHG emissions from electricity generation in France have been relatively low: 42 gCO<sub>2</sub>eq per kWhel in comparison with the European average of 352 gCO<sub>2</sub>eq per kWhel (CITEPA, 2015). Emissions are relatively low in France because of the large share of nuclear power in electricity production. In 2015, around three-quarters of electricity supply in France (546 TWhel) was generated from nuclear power, followed by hydroelectricity

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<sup>13</sup> Many countries have already included a renewable energy quota for use in buildings. <http://www.rehva.eu/eu-regulations/renewable-energy-sources-directive-res.html>.

<sup>14</sup> New infrastructures and more effective installations should be built for heating (also district heating) and cooling services based on RES to achieve the 2020 target.

(11%), fossil fuels (6%), wind power (4%), solar power (1.5%) and bioenergy (1.5%) (RTE, 2016) (see Figure 4).

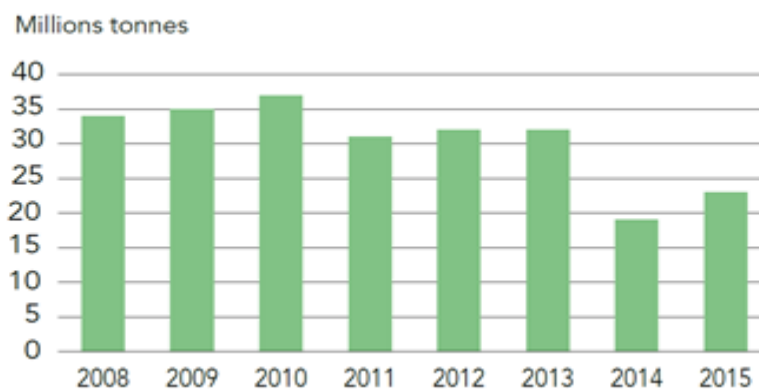


**Figure 4. Electricity production in France.**

Source: I4CE based on data from RTE (2016).

Overall, GHG emissions from electricity generation amounted to 23 MtCO<sub>2</sub>eq in 2015 (Figure 5), which means that France has the lowest emission intensity in the world (calculated as tCO<sub>2</sub>/GDP, Next 10, 2015).

Over the past 25 years, the French electricity sector has decommissioned coal power plants and invested in development of renewable sources of electricity, which resulted in a GHG emission reduction in the power sector of 27% (Figure 5). The relatively low emission level in 2014 was caused by the mild winter during that year.



**Figure 5. Evolution of emissions from the electricity sector in France.**

Source: RTE (2016).

The EU-level context for the French National Low-Carbon Strategy consists of the objectives in terms of renewable energy sources, energy efficiency and GHG emissions reduction. The main policy instrument for meeting emission reduction goals is the EU ETS.

In France, 119 aircraft operators and 1,183 industrial and energy production plants are covered by the scheme, which together represented around 100 MtCO<sub>2</sub>eq emissions in 2015 (EEA GHG data viewer). 40 installations from the French power sector were covered by the EU ETS in 2015, which together emitted 16 MtCO<sub>2</sub> (European Union Transaction Log, 2016).

The 2020 European objectives for both the deployment of renewable energy sources and climate change mitigation efforts (see Section 3) were translated in France in the “Grenelle” Laws (2009-2010). In 2015, following the updated EU goals for climate and energy (covering the period 2020-2030) (European Commission, 2014), the French government released the Energy Transition for Green Growth Act with five main objectives:

- 40% reduction of GHG emissions in 2030 compared to 1990 levels, in line with the strategy of the EU;
- 30% reduction of fossil fuel consumption in 2030 compared to 2012;
- Share of nuclear power in the electricity mix brought down to 50% by 2025;
- Share of renewable sources of energy brought up to 32% in the total final energy consumption by 2030;
- Decrease by half of the final energy consumption in 2050 compared to 2012.

For achieving these objectives, the above-mentioned NLCS has been launched, which aims, among others, at a GHG emission reduction from 552 MtCO<sub>2</sub> in 1990 to 358 MtCO<sub>2</sub> per year during 2024-2028 (amounting to a 35% reduction). To realise this, the NLCS will create nation-wide carbon budgets, both for ETS and non-ETS sectors. NLCS aims at an almost full decarbonisation of energy production and consumption (96% emission reduction compared to 1990 levels) in 2050, which will be supported by a planned halving of final energy consumption (in 2050 compared to 2012) and further deployment of renewable sources of energy.

While ETS-covered installations acquire emission allowances under the EU ETS, for non-ETS sector installations a carbon tax has been introduced in France in 2014. In 2016, the carbon tax amounts to €22 per ton of CO<sub>2</sub> to be increased over time to €56 by 2020 and €100 by 2050. For energy efficiency, France targets a 30% reduction in final energy consumption in 2030 compared to 1990. In terms of renewable energy, the national target is to achieve a 23% share in final energy consumption, which corresponds to a 27% share of renewable energy in electricity by 2020, to comply with EU’s renewable energy goal. In 2014, 17% of electricity in France was generated from renewable sources, which was mainly based on hydroelectricity. For reaching future targets, wind and solar are the two

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<sup>15</sup> This figure does not consider the fact that combined heat and power (CHP) plants have GHG emissions not related to electricity production. The emissions from electricity generation only are therefore lower.



most promising technologies with a potential increase from 15 GW in 2014 to 40 GW in 2023<sup>16</sup>.

### **3.4.3 Analysis of policy interactions between French policies and EU ETS**

#### **3.4.3.1 Impact of French energy efficiency and renewable energy policies on EU ETS**

Berghmans (2012) concludes that national renewable energy deployment policies contributed around 40% of total emission reductions within EU sectors during Phases II and III of the EU ETS (2008-2020). In addition, national energy efficiency policies have led to an emissions reduction of 500 MtCO<sub>2</sub> within the ETS. Though the impact of national energy efficiency and renewable energy policies can be significant at the European level (see examples in Section 1), given the relatively low level of GHG emissions from electricity generation in France (23 MtCO<sub>2</sub> in 2015) compared to the total amount of allowances in the EU (about 2 GtCO<sub>2</sub> per year), French-level policies implemented in the national electricity sector are likely to have a minor impact on the EU ETS.

#### **3.4.3.2 The EU ETS impact on French energy efficiency policies through earmarking auctioning revenues**

Based on allowance auctioning, the EU ETS generates a public revenue stream for all EU Member States which can be invested into cost-effective mitigation opportunities and the development of low carbon technologies. In France, the government decided in 2013 that 90% of auction revenues were used to finance energy efficiency in the residential sector, through the French National Housing Agency (*Agence Nationale de l'Habitat*) (Chevaleyre & Berghman, 2013). It is noted that since using EU ETS revenues for energy efficiency is not a necessary/mandatory element of the EU ETS, strictly speaking there is no direct policy instrument interaction. Indirectly, though, given the political choice to invest part of the revenues into energy efficiency measures, there is an effect.

#### **3.4.3.3 Impact EU ETS allowance price on French deployment of renewable energy in France**

An intended impact of the EU ETS is to make fossil-fuel-based technologies relatively more expensive and low-emission technologies more competitive (European Commission, 2012). However, it has been demonstrated that even if CO<sub>2</sub> emissions are duly priced in the power sector, specific incentives for supporting the deployment of renewable energy technologies are justified (Philibert, 2011). To further support deployment of renewable energy sources at the national level, the French government has invested €100 billion in renewable energy between 2005 and 2011 (ADEME - French Environment and Energy Agency, 2016).<sup>17</sup> In

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<sup>16</sup> Arrêté relatif aux objectifs de développement des énergies renouvelables, Journal Officiel, April 2016.

<sup>17</sup> Through feed-in tariffs, feed-in premiums and revenue complements.



addition to these public expenditures, private sector investments have also contributed to an increased share of electricity produced from solar and wind power from 1% in 2008 to over 5% in 2015 (I4CE based on data from RTE (2016)). This was *a priori* driven by the national renewable energy support measures rather than the EU ETS, but in France, the EU carbon price was considered a policy signal to create a credible national framework for promoting renewable energy.

During the annual Environmental Conference in April 2016 in France, the French government announced that it would unilaterally set a carbon price floor of around €30/tCO<sub>2</sub> on electricity generation activities, including ETS installations in the power sector, in 2017 (see also Reuters (2016)). With a carbon floor price a minimum price for CO<sub>2</sub> emission allowances is introduced in the market: “polluters must pay a minimum amount of money for the right to pollute” (Sandbag, 2016). Should the market price drop to a level below the floor price, companies with CO<sub>2</sub> emissions pay a “tax” for the difference between the market and the floor price. As such, a situation is created that the costs of emitting CO<sub>2</sub> remain relatively high, so that it becomes easier for installations with low- or zero-emission technologies to compete in the market. Consequently, a carbon price floor could increase certainty for potential investors in renewable energy and energy efficiency technologies (Hood, 2011) (Trotignon, 2016). However, it remains to be seen whether a carbon price floor is sufficiently high to tip the scale to the advantage of clean energy producers in France, as it will barely be enough to encourage fuel switch from coal to gas. In an analysis for the UK carbon floor proposal, Sandbag (2016) concludes that due to the current oversupply of EU allowances in the market, a carbon floor price is not enough to support the use of clean energy technologies; without measures to tighten the caps on emissions, a floor price will not be effective. Therefore, the impacts of an EU carbon floor at the level of €30 as proposed by France on renewable energy stimulation policies in France, in terms of size, remain uncertain.<sup>18</sup>

The impacts of interactions of energy support and ETS policies in France are summarised in Table 4.

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<sup>18</sup> Nevertheless, despite the uncertainty, it could be argued that an increase in the carbon price will, *ceteris paribus*, *always* have an effect. For example, a higher price will unlock several other measures that would have otherwise not have been incentivised.

**Table 4. Summary of case study results France.**

Key variables	ETS, energy efficiency and renewable energy interaction impacts	
<b>CO<sub>2</sub> emission reduction in French electricity sector under ETS</b>	minor	Due to low level of GHG emissions from electricity generation in France, French-level policies implemented in the national electricity sector are likely to have a minor impact on the EU ETS
<b>National fossil-fuel based electricity generation</b>	minor	
<b>Energy and electricity demand/households</b>	Decrease	Energy efficiency measures lead to a reduced consumption of electricity
<b>Energy efficiency improvement</b>	Increased, but slowing down	<ul style="list-style-type: none"> <li>90% of auction revenues of EU allowances (EUAs) is used for energy efficiency improvement.</li> <li>Due to lower EUA prices, renewable energy support funds become lower.</li> </ul>
<b>Renewable energy deployment</b>	Increase	EU ETS was seen in France as a policy signal for creating a national investment framework for renewable energy promotion. A carbon floor price can add more certainty to renewable energy investors, but interaction between carbon floor and renewable energy stimulation remain uncertain

### 3.4.4 Findings

In this case study on policy interactions in the French power sector, the following conclusions can be drawn:

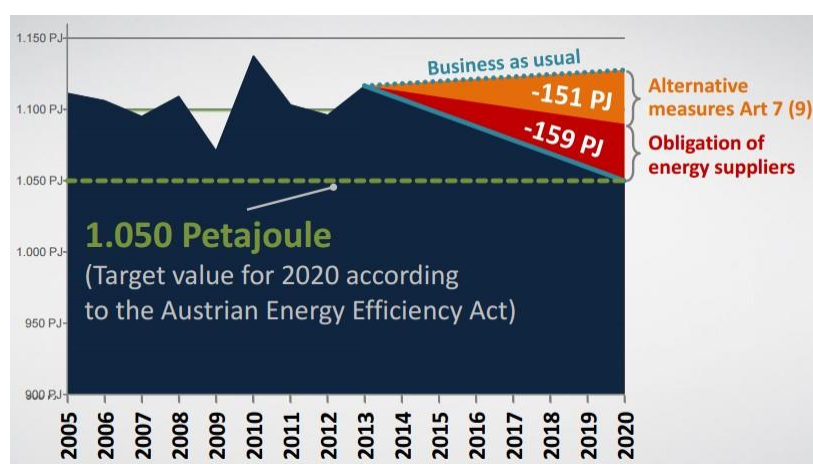
- Energy efficiency and renewable energy stimulation policies implemented by the French government in the electricity sector are unlikely to have a significant impact on the EU ETS.* This moderate policy interaction is mainly due to the relatively low GHG emissions of the French electricity companies covered by the ETS. Thus, French-level policies implemented in the national electricity sector are likely to have a minor impact on the EU ETS.
- The EU ETS impacts energy efficiency improvements in France using through earmarking auctioning revenues.* This policy effect (which, as explained above, may not be considered a direct policy interaction, but more an indirect policy effect) can be relatively strong in France, as the French government uses 90% of ETS auction revenues to finance energy efficiency in the residential sector through the French National Housing Agency.

- *The EU ETS allowance price can be a complementary policy instrument but is not enough for large deployment of renewable energy in France.* The French government invested in renewable energy technology deployment through a subsidy scheme amounting to €100 billion between 2005 and 2011, which has increased the share of solar and wind energy in total energy production from 1 to 5% (between 2008 and 2015). To further support renewable energy deployment, the French government has announced a carbon floor price for on electricity generation. However, the effect of the latter policy interaction remains uncertain.

### 3.5 Case study 2: Interactions between energy efficiency policies in the household sector in Austria

#### 3.5.1 Introduction

In Austria, overall final energy consumption has increased again after the sharp decline in 2009, which was due to the financial crisis and corresponding economic recession. To address this trend, Austria's Energy Strategy, the National Renewable Energy Action Plan (NREAP) and the Energy Efficiency Law have set a target value for primary energy consumption of 1050 Petajoule in 2020 (compared to 1120 PJ in 2013, see Figure 6). Nevertheless, despite a range of measures in place, without additional efforts it will be difficult to reach the target (Austrian Environment Agency, 2016). Therefore, Austria has implemented the EED in 2015 via its Energy Efficiency Law, which will add additional financial means to the existing policy framework.



**Figure 6. Final energy consumption in Austria (2005-2020).**

Source: (Austrian Energy Agency, 2015).

However, these additional policy measures for reducing energy demand come on top of already existing policy measures, which increases the risk of possible overlaps with already existing policy instruments.

### 3.5.2 Background and policy context

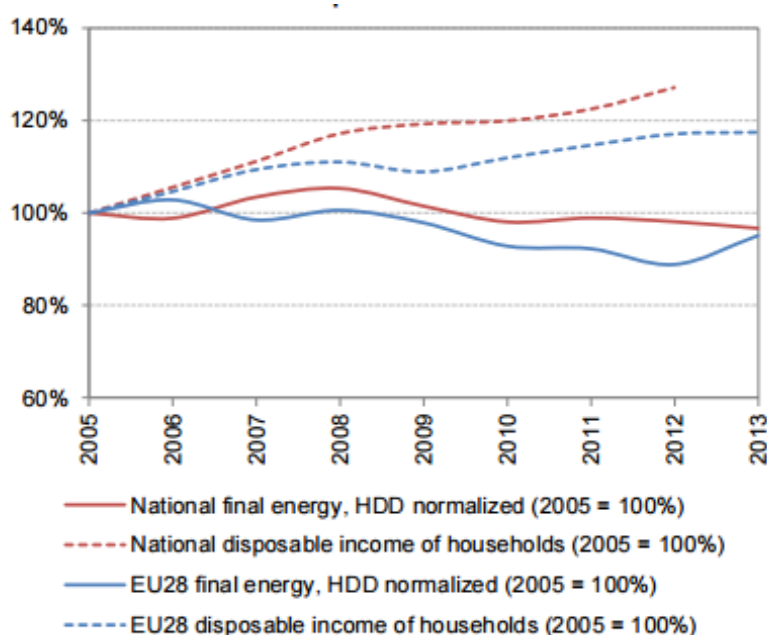
The relevant policy framework at the EU level for the Austrian policy instruments for energy efficiency improvement consists of the EU RED, the Energy Performance of Buildings Directive (EPBD) and the EED. The transposition of the RED in Austria has taken place via the National Renewable Energy Action Plan, per which Austria must increase its share of renewable energy in gross final energy consumption to 34% by 2020. This target is not very ambitious, as the share of renewables in Austria had already reached a level of 29% in 2008. Under the EPBD, all new buildings in Austria must fulfil a near zero-energy standard by the end of 2020 (for public buildings this deadline needs to be reached already by the end of 2018). Finally, the EED requires Austria to use energy more efficiently at all stages of the energy chain from its production to its final consumption. Following the transposition of the above EU directives into domestic legislation, the following policy instruments have been formulated in Austria for energy efficiency in the household sector, which are, except for the Federal law on energy efficiency, mainly subsidy schemes:

- **Renovation check ("Sanierungsscheck")**, which is a subsidy, provided at the *federal government* level, in the form of a unique and non-repayable grant, which private households obtain for the refurbishment of dwellings older than 20 years, such as through insulation of outer walls and ceilings, replacement of windows and doors and change of conventional heating systems to renewable systems.
- **The Federal Housing Subsidy Law ("Wohnbauförderungsgesetz")**, which includes general conditions for the *provincial* governments for energy efficiency improvement measures in the built environment, such as thermal insulation and space and water heating measures (MURE, 2015). Allocation of the subsidies is regulated by provincial law and each province has a scope of freedom to decide on subsidy amounts and set their own subsidy conditions and limitations, given the general federal conditions. Subsidies in the scheme are provided mainly in form of soft loans. Potential applicants are private persons, non-profit making housing associations, municipalities and other legal entities.
- **Subsidies of the Austrian Energy and Climate Fund**, which can both be focused on energy conservation and GHG emission reduction measures, such as investments in energy efficient stoves in households.
- **Federal law on energy efficiency ("Energieeffizienzgesetz")**, adopted in 2016, which obliges energy suppliers to initiate and annually implement energy efficiency measures corresponding to at least a 0.6% reduction of their total energy supply to energy end users in Austria in the preceding year aiming at a reduction of 159 PJ on aggregate by 2020 (Government of Austria, 2016). At least 40% of these required efficiency measures must be implemented by energy suppliers at the household level. Based on reported plans, 40% of the intended measures relate to lighting, 30% to kitchen devices and 20% to heating and warm water. As part of the energy efficiency law a monitoring institution was created to support companies in complying with the law and to evaluate proposed measures.

As can be concluded from this overview of energy efficiency enhancement plans, Austrian energy and climate policy is characterised by a dense landscape of subsidies, including investment incentives and subsidised loans for the adoption of energy-efficient technologies. The subsidies are provided both at the federal and provincial government levels.

### 3.5.3 Analysis of energy efficiency policies at different government levels

The effectiveness of the schemes is difficult to determine precisely. For example, the total electricity consumption of Austrian households has increased, but this was largely due to an increase in the number of households in Austria (E-Sieben, n.d.), which offset the decrease in average household electricity consumption (by 230 kWh per year during 2008 to 2012). Moreover, as shown in Figure 7, Austria's energy consumption in the household sector over the past ten years has been above the EU average, but in terms of energy per unit of GDP, it has been around or below the EU average. Austria has also managed to continue the trend of decreasing energy consumption in households during the past few years, while the EU average trend has shown an increase in energy consumption since 2012. Stakeholders consulted for this case study (from government, business and research) have indicated that the overall decrease in energy demand in households cannot be clearly attributed to the existing energy efficiency policy instruments, as the influence of the mild winters in the past few years in Austria may also have been an important explanation for lower household-level energy consumption.



**Figure 7. Energy consumption in households in Austria and the EU as well as disposable income.**

Source: (Austrian Energy Agency, 2015).

In terms of policy interactions, the case study has analysed whether energy efficiency improvement policies at the federal government level could lead to overlaps with policies at the level of provincial governments and what this could mean for the effectiveness and efficiency of the policies. At the federal government level, several ministries have specific energy-related responsibilities, while at the regional level, the governments of the nine federal provinces have responsibility for policy making, including setting subsidy levels and implementing regulatory control of energy companies.

The case study analysis concludes that overlaps between federal and regional subsidies for energy efficiency are unavoidable as the scope, instruments and target groups of different subsidy scheme are too often similar. As such, this does not have to be a problem if in the design and implementation stages, a detailed fine-tuning of measures takes place. However, in actual practice fine-tuning of federal government energy efficiency policies with all nine provinces is complicated as the provinces differ from each other in terms of their regional policies and subsidies, based on different priorities, political coalitions and technological as well as socioeconomic boundaries. Level and implementation of housing subsidies vary in all federal states. Although the national government assigns federal states with a specific funding volume, federal states are not obliged to report on the use of the funding. This can result in cash flows to purposes that are different from the initial purposes, which could lead to inefficiencies regarding the intended policy achievement (Fruhmann, Tuerk, Kulmer, & Seeabauer, 2017 forthcoming).

An example of such fine-tuning can be found in the implementation of the Energy Efficiency Law. As the law prescribes that 40% of the required energy efficiency measures should be implemented by energy suppliers at the household level, there is a potential overlap with existing policies, especially governmental subsidies for stimulating household-level energy efficiency improvements. The Energy Efficiency Law tries to avoid such overlaps by an “additionality check”: measures under the Renovation check and Housing Subsidy Law cannot be accounted for under the new Energy Efficiency Law. For other measures that energy suppliers want to have accounted for under the law, a combination with existing subsidies is possible, and the accounted savings can be shared among the two funders (the regional or national government and the companies under the energy efficiency law). This requires an agreement between the two funders how the savings are shared before the measure can be accounted for under the new energy efficiency law. So far, there has been little experience with these provisions. Some NGOs complained that the legal basis to share the accountable savings is too vaguely defined, especially with those measures that already received federal subsidies in 2014 and 2015.

The federal government has made steps to avoid policy overlaps by limiting in some cases combinations of its subsidy system with other regional subsidies. Moreover, a possible way forward is to design a new target-oriented policy mix that is not entirely based on subsidies. For example, energy saving investments in households that require complex financing models (due to high transaction costs and long payback periods) cannot be induced by subsidies alone. Some of the stakeholders interviewed for this case study mentioned that for some measures, standards or a combination of standards with subsidies would be a



better way forward (it is noted that these views do not necessarily imply that there is consensus on this topic in Austria). This would require terminating or changing some of the subsidies. The latter may not be easy though as subsidies have the largest political acceptance among policy instruments in Austria. Subsidies have been in place for long and have been agreed on in a political process with a range of different interests that needed to be satisfied. Such a “subsidy lock-in” of a policy system is not easy to change in the short term.

A possible step forward in avoiding policy overlaps is the new monitoring institution in Austria, which:

- Systematically assesses the measures proposed by entities under the new Law on Energy Efficiency. In case overlaps are expected or known, the other funding institutions in Austria are contacted, and the share of funding and corresponding energy savings can be split.
- Increases the knowledge of the effectiveness and efficiency of energy efficiency measures in Austria. The methods to assess effectiveness and efficiency are being steadily further developed by the monitoring institution.
- Develops national energy efficiency action plans that are submitted to the European Commission. So far, the entire policy mix is not systematically considered but stakeholders expect that the integrated climate and energy plans recently proposed by the European Commission, if adopted, will require EU Member States investigate and consider policy interactions much more strongly.

A better understanding of inefficiencies may serve as a suitable basis for improving and fine-tuning the policy mix at a later stage.

### **3.5.4 Findings**

Based on the case study on interactions between energy efficiency policies at different policy levels in Austria, the following key findings can be formulated:

- *Overlaps between federal and regional subsidies for energy efficiency are unavoidable.* The scope, instruments and target groups of different subsidy schemes are often similar. This could be avoided through a detailed fine-tuning in the policy design and implementation stages, but in actual practice fine-tuning of federal government energy efficiency policies with all nine provinces is complicated.
- *Overlaps in subsidies, over-subsidisation or insufficiently targeted use of funds imply the risk that government funds are used inefficiently.* Thus, the observed energy savings in households are achieved at relatively high public costs. Moreover, in terms of policy effectiveness, it is not entirely clear whether the observed reduction in household-level energy demand during the past few years can be fully attributed to the subsidy schemes. On the one hand, in terms of energy demand reduction Austria



performs better than the EU-average, but this performance may also have been caused by the relatively mild winters in recent years.

- A possible way forward is to design a new target-oriented policy mix that is not entirely based on subsidies, but, for instance, enables a combination of energy or environmental standards with subsidies.

The impacts of interactions of energy support policies at different policy levels in Austria are summarised in Table 5.

**Table 5. Summary of case study results Austria.**

Key-Variables	Impact of policy interactions on policy effectiveness	
<b>Electricity demand/households</b>	Increase	Caused by increase in the number of households
<b>Energy demand /households</b>	Decrease	Caused by energy efficiency measures and weather conditions. Energy demand reduction is however achieved in an inefficient way due to overlapping support schemes
<b>National fossil-fuel based generation</b>	Decrease	Decrease consequence of lower energy demand
<b>National CO<sub>2</sub> emissions</b>	Decrease	Decrease consequence of lower energy demand

### 3.6 Case study: Interactions between the energy efficiency obligation and the EU ETS in Greece

#### 3.6.1 Introduction

Currently, the Greek government is formulating an Energy Efficiency Obligation scheme (EEO, under the EU Energy Efficiency Directive). It targets energy distributors and retail energy sales companies that are responsible for the installation, operation and maintenance of smart-meters for electricity, gas, heating, cooling and hot water for domestic consumption. Their obligation is to provide incentives to final energy consumers to either adapt their energy consumption behaviour, or purchase energy-efficient technologies.

This case study analyses potential interactions between the EEO and the EU ETS. Such interactions could work in both directions. On the one hand, energy efficiency measures may lead to lower electricity demand and thus reduce the demand of ETS power sector installations for allowances. On the other hand, the ETS market price can lead to a higher

wholesale price for electricity which electricity distributors can pass on to consumers, so that they have an incentive to save energy. In order to understand potential interaction effects between the schemes in Greece and whether their parallel operation contradicts their intended outcomes or causes potential unintended effects (e.g. environmental side-effects or distributional effects), this case study analyses possible interactions between an EEO scheme for retail energy sales companies in Greece and the obligations for energy-producing installations in Greece that are covered by the ETS.

### 3.6.2 Background and policy context

Most electricity production in Greece is still carried out by the Public Power Corporation (PPC), which owns transmission and distribution networks and is the major supplier for customers. The Greek electricity market, despite its deregulation, remains concentrated with PPC holding a share of 71.5% in the electricity market and only two other utilities having a share of more than 5%. Since 2013, electricity producers in Greece are required to purchase their ETS emissions allowances through auctions. Although this development was expected for years, PPC did little to upgrade its energy portfolio for lower-emissions electricity production and reduce compliance costs (Moris., 2013), as the company, given its market share, usually follows the practice of passing on emission allowance purchase costs to customers via the electricity bills. In fact, PPC has already proposed to the Regulatory Authority of Energy (RAE) to increase charges for all customer categories (low, medium and high voltage).<sup>19</sup>

In other words, higher wholesale prices are translated into higher retail prices for consumers also for the Greek energy market. The economic recession and the consequent reduction for electricity demand (PPC emissions in 2011 recorded a decrease of 10% from 2008) eventually softened this effect of passing on additional costs to retail prices.

The use of energy from *renewable energy sources* was promoted both in electricity production and heat supply and transportation. In 2014, a Feed-in Tariff (FiT) scheme was introduced to support that (under the so-called “New Deal”) (MStR Law Firm, 2014). Moreover, the use of renewable energy technologies in heating and cooling has been supported by the provision of subsidies granted by the government. Finally, in the transport sector obligations have been introduced for use of fuel types, as well as taxes for different kinds of polluting vehicles.

In many cases these implemented measures overlap, since a strict categorisation of measures is not always possible. For instance, some measures mainly refer to renewable-based electricity generation projects, but also cover renewable-based heat generation

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<sup>19</sup> Announcement from RAE 11/12/2012: [http://www.rae.gr/site/categories\\_new/about\\_rae/factsheets/general/11122012\\_2.csp](http://www.rae.gr/site/categories_new/about_rae/factsheets/general/11122012_2.csp).

projects (e.g. via the FiT), such as renewable energy-based co-generation installations and other thermal energy generation projects.

The EU EED was only recently transposed into Greek law (in 2015). In view of the requirements of the EED, the energy savings target for the period 2014-2020 amounts to 3.33 Mtoe, which is almost equal to 19.3% of the total final consumption in 2012. By 2020, annual energy saving is targeted at 902.1 ktoe. Energy conservation measures in the building sector are scheduled to contribute almost 58% of the national energy efficiency target. The EEO scheme has been implemented since 1 January 2017 for contributing to the national energy savings target (in the context of Article 7 of the EED). The policy instrument for operating the EEO scheme in Greece is currently in its early formation phase. Based on conversations held with Greek stakeholders (for this case study), it seems likely that emphasis under the EEO will be placed on energy savings in the built environment (residential dwellings and public buildings). Importantly, Greece has opted (in line with the provisions of Article 7 of the EED) for excluding industrial sectors from the calculation of the final energy savings target.

Table 6 summarises the key features of the two schemes for which the interaction analysis is undertaken. Please note that for the EEO scheme, the description provided is a proposal of its design, which is yet to be decided.

**Table 6. Summary of the key features of the policy instruments.**

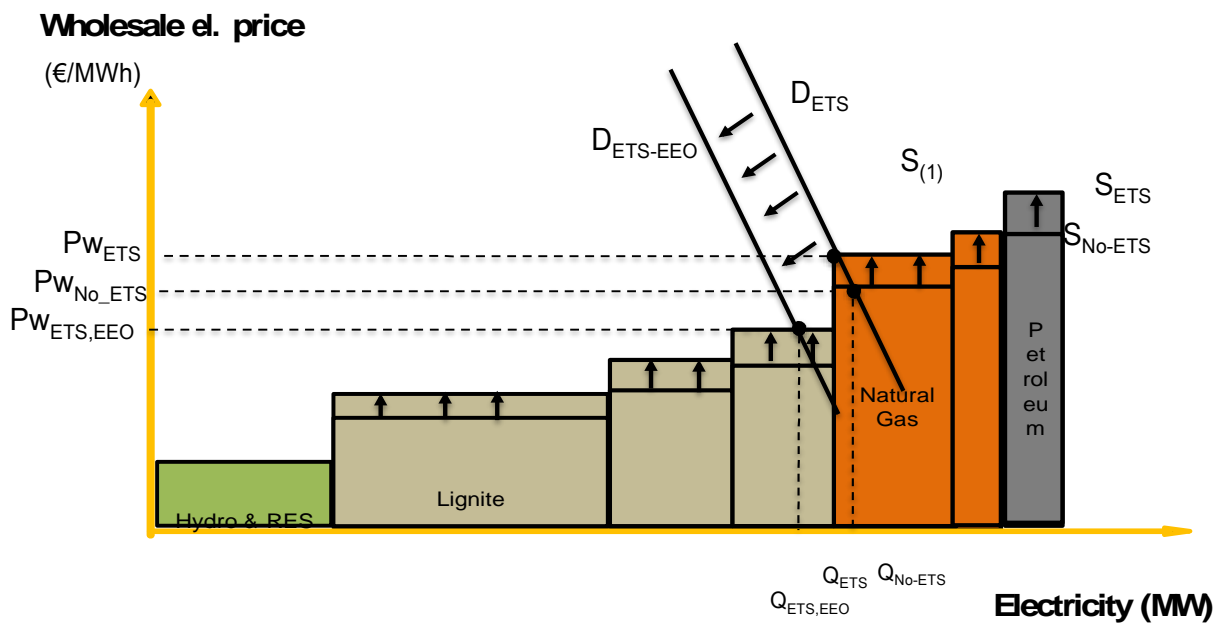
	<b>Policy instrument 1: EU ETS</b>	<b>Policy instrument 2: EEO scheme (proposed)</b>
<b>Level of governance</b>	European	National
<b>Timeframe</b>	2013-2020 (3 <sup>rd</sup> phase of implementation)	2017-2020 (1 <sup>st</sup> phase of implementation)
<b>Type of intervention</b>	Quota, market-based	Command & control/ market-based subsidies
<b>Policy target/outcome</b>	To reduce <b>emissions of CO<sub>2</sub></b> by setting a quantity limit. To achieve <b>national emissions reduction target</b>	No targets so far. Achieve <b>final energy savings</b> targets in frame of EED
<b>Policy scope /sector covered</b>	Energy-intensive installations (i.e. industry) and energy production utilities	All end-use sectors with a focus on buildings.
<b>Targeted stakeholders</b>	<u>Obligated parties:</u> Energy-intensive industry, aviation, energy-producing installations	<u>Obligated parties:</u> retail energy sales companies in gas & electricity, <u>Eligible parties:</u> third parties (e.g. ESCOs, companies). <u>Beneficiaries:</u> households, public buildings, vehicle drivers
<b>Allocation of costs</b>	Increase of the wholesale electricity price, which is passed on to the retail electricity price.	Full cost-recovery is envisaged to be allowed (additional costs to be passed on to electricity consumers through the retail electricity price)
<b>Flexibility</b>	Trading of emission allowances	Not described so far. Financial assistance and advice/audits to consumers is foreseen to be provided.
<b>Related market (price &amp; quantity) variables<sup>20</sup></b>	i) Wholesale electricity price ii) Retail electricity price iii) Electricity supply and demand iv) CO <sub>2</sub> Emissions allowances v) Price of emissions allowances	i) Retail electricity price ii) Electricity supply and demand iii) CO <sub>2</sub> Emissions allowances iv) Price of emissions allowances

Source: Authors' own elaboration.

<sup>20</sup> These variables are listed here as they enable an analysis of how consumers' and producers' surpluses change due to concomitant implementation of the two schemes (compared to their surplus when the schemes are in effect standalone).

### 3.6.3 Analysis of policy interactions between the EEO, EU ETS and RED

When introducing an EEO scheme in an electricity market that is covered by the ETS, the expectation is that demand for electricity will be reduced. In Figure 8 this is illustrated by a shift from the electricity curve to the left, leading to a new equilibrium with a lower wholesale price for and a lower quantity of wholesale electricity in the market. In terms of quantity of electricity supplied to the market, the EEO enhances the impact of the ETS. As shown in Figure 8, the ETS already leads to a quantity reduction (from  $Q_{No-ETS}$  to  $Q_{ETS}$ , following a move along the demand curve) and due to the impact of the EEO, traded electricity is further reduced to  $Q_{ETS, EEO}$  (following a shift from the demand curve). In terms of price development, the EEO is expected to reverse the wholesale electricity price increase caused by the ETS (from  $P_{W_{No-ETS}}$  to  $P_{W_{ETS}}$  following the move along the demand curve) by stimulating a price reduction (from  $P_{W_{ETS}}$  to  $P_{W_{ETS, EEO}}$  due to the shift from the demand curve). This implies that the more expensive producing units stay out of the market and do not generate electricity for the specified period.



**Figure 8. The impact of an EEO scheme on the Greek wholesale electricity market regulated by the EU ETS.**

The introduction of an EEO scheme may amplify the impact on energy retailers in comparison with a situation in which they are only targeted by the ETS. Although the obligation scheme will have no direct effect on the wholesale electricity price, a reduction in final energy demand (which is the main intended outcome of the EEO) can cause the power production units with the highest marginal costs, based on the merit order, to reduce

their power output, which could consequently lead to an electricity price reduction<sup>21</sup>. In the longer run, energy efficiency gains will affect the power plant mix, changing the merit order curve (Altmann, et al., 2013). Peak generators in the Greek power mix, which have the highest variable (i.e. fuel) operating costs, are mainly diesel generators and natural gas combustion turbines. Therefore, in periods with low electricity demand, it is highly likely that gas-fired plants will reduce their power output. In this case, the imposition of the EEO on the Greek electricity market can potentially make it more difficult or expensive to increase renewable energy in the long term due to the reduction in fast-ramping gas turbines that might be needed to balance variable/ intermittent RES. Operating units are also faced with a profit reduction (i.e. lower producers' surplus) as the difference between their marginal costs and lower wholesale price becomes smaller (due to decrease in demand for electricity).

The reduction of CO<sub>2</sub> emissions caused by electricity savings depends on the type of power plant that reduces its output, which may also vary depending on the time of day. In Greece, the main fuels used for electricity production are lignite, natural gas and petroleum products, and the impact of saving a kWhel in terms of CO<sub>2</sub> emission reduction depends on the power plant and time of the day. For the Greek fuel mix it can range from 550 gCO<sub>2</sub>/kWhel if natural gas is saved to almost 1,200 gCO<sub>2</sub>/kWhel if a lignite fired power plant reduces its output.

When it comes to meeting climate policy commitments, the EEO scheme can pose implications as it does not account for the CO<sub>2</sub> intensity of different generating sources. The imposition of the obligation scheme along with the structure of the Greek power generation market may thus lead to a lock-in problem as this implicitly promotes cheaper, but more carbon-intensive lignite generation at the expense of less carbon intensive sources (e.g. natural gas). If the EEO scheme were revised to aim at CO<sub>2</sub> reduction rather than energy demand, in combination with a stricter EU ETS cap, it could become an efficient climate policy tool.

With respect to impact on diffusion of low emission technologies at the end-user level in Greece, the EEO scheme is expected to act as a strong driver for energy efficiency as it helps to provide a stable source of funding and stimulates the development of the ESCO (energy services company) market (European Commission, 2014). In that sense, the EEO is expected to drive additional investments in energy efficiency measures, which will lead to additional energy savings, compared to the situation with only the EU ETS, thus reflecting a positive interaction between the two policy instruments.

At the same time, the EEO scheme is not aimed at accounting for switching from fossil fuel-based to renewables-based energy consumption if the total energy consumption remains the same. After all, in that case, one cannot speak of final energy saving. Instead,

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<sup>21</sup> When an emissions cap is in place, lower electricity demand compared to a reference case will lead to lower emission allowance prices and thus lower electricity prices, as long as there is no policy intervention (Thema, Suerkemper, Grave, & Amelung, 2013).

the energy end-use saving measures are considered eligible provided that they are more energy efficient (than the baseline technology) and result in final energy savings. This may, however, include the replacement of inefficient oil boilers with more efficient natural gas boilers, which risks locking in technologies that are not compatible with the long-term decarbonisation objective (and that do not significantly improve security of supply). In that respect, the EEO could have a negative impact on investments in a low-emission climate future.

On the other hand, Greek energy policy makers point out that arguably the biggest rival of energy efficiency in the energy market is RES diffusion and subsequent state support. There is a wide mix of policy measures for the promotion of RES systems for heating and cooling in buildings as well as in the transport sector, while the new EEO scheme should focus on energy end-use efficiency, thereby fostering savings at the demand side.

Last but not least, electricity consumers are expected to be directly influenced in a number of ways by the combination of the EEO and ETS impacts on energy-intensive industries. On the one hand, electricity retail prices may increase as power producers pass on the costs of purchasing ETS allowances to consumers. Consumers may also be confronted with an add-on to electricity prices in order cover deficits in the *Special RES Account* in Greece.<sup>22</sup> On the other hand, further reductions in energy demand (due to both the carbon and EEO charges on electricity bills, as well as due to energy efficient investments) may lower the wholesale and subsequently the retail electricity price. Increases in energy costs can also be offset for beneficiaries of the EEO scheme who receive financial aid for energy efficiency investments. Overall, the reduction in the retail electricity price (due to reduction in demand) is most likely to be offset by the expected increases in both GHG emission charges and cost-recovery charges.<sup>23</sup> Such surcharges in prices may in turn have substantial distributional and political implications. For instance, a surcharge based on electricity generation does not differentiate by carbon-intensity of the technologies used, so that, for example, the surcharge, when expressed in €/tCO<sub>2</sub>-eq., is much higher for natural gas-based electricity production than for, e.g., lignite-based power production.<sup>24</sup>

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<sup>22</sup> The Market Operator (LAGIE) is authorised to operate the support and funding mechanism for the remuneration of the generated energy from RES power plants, through a dedicated account (Special Account for RES). Although the revenues of this account come from different sources, there are two primary revenue sources: 1. A charge calculated upon the consumed energy that all consumers pay through their electricity bills; 2. the amount resulting from the day-ahead electricity market dispatch (Anagnostopoulos, 2016).

<sup>23</sup> Experience from European EEO schemes has shown that allowing for full cost-recovery of costs results in annual consumer charges ranging from 0.02 to 0.06 €/kWh<sub>el</sub> for consumers in the household sector (ENSPOL, 2015).

<sup>24</sup> A volumetric charge on every kWh sold is comparable to an energy or carbon tax, and at the level of 5-6 cents such a charge is quite significant if expressed in terms of tCO<sub>2</sub>-eq. For example, assuming that producing 1 kWh<sub>el</sub> using natural gas technology leads to emissions of 0.55 kgCO<sub>2</sub>, then generating 1.818 kWh<sub>el</sub> causes an emission of 1 tCO<sub>2</sub>. At the upper range of a surcharge of 6 eurocents per kWh<sub>el</sub>, this would lead to an effective carbon price for producing electricity with natural gas of nearly €110/tCO<sub>2</sub>. For lignite, with a carbon intensity of over 1 kg/kWh<sub>el</sub> this could amount to up to €50 per tCO<sub>2</sub>.



Finally, the use of revenues from auctioning emissions allowances in the power sector can be used to support energy savings at the end use level. Hence the impact of the EU ETS on the EEO scheme and energy efficiency stimulation could become more positive. However, until the end of 2015, the total revenues from auctions of CO<sub>2</sub> allowances in Greece were channelled to the Special RES Account. As of 1 January 2016, this was stopped and an upcoming Ministerial Decision will determine the new allocation of the revenues. It requires that at least 50% of these revenues are directed to "green actions", which may also include the strengthening of RES support. The Ministry of Energy has reportedly decided to allocate a 70% share of these revenues on supporting renewable energy technology diffusion by contributing to the Special RES account. This offers an opportunity to dedicate these funds to renewable energy technologies, which could go at the expense of investments in energy savings technologies and may risk the successful implementation of the EEO scheme, especially during the first critical years of its operation.

### 3.6.4 Findings

This case study discusses potential implications of introducing and EEO scheme in the EU ETS regulated energy market in Greece, in terms of changes in the distribution of costs and benefits for relevant market players. These effects are likely to occur due to interactions (overlaps) between the two policy instruments and are exacerbated by the operation of the Greek energy market, its nature (i.e. relatively concentrated) and several market failures. Below, the implications of policy co-existence, likely to be observed due to the expected Greek EEO design, are summarised, which may act as a trigger for recommendations to Greek policy makers.

- *The increasing compliance costs of the combined EEO and ETS scheme for energy producers are most likely to be passed on to Greek electricity consumers, lowering their consumer surplus significantly especially in the short-term. Alternative financing approaches to counterbalance the increase in compliance costs are highlighted as a priority action for Greek policy makers. For that, the Greek Government envisages the creation of a National Energy Efficiency Fund to support the obligation scheme with revenues coming from alternative sources although its scope remains relative ambiguous.*
- *The Greek EEO scheme and its short-term targets may jeopardise the attainment of long-term GHG emission targets due to a lower price for allowances, which may implicitly put off R&D efforts in more efficient low emission technologies. Lower emission prices due to less scarcity of allowances in the market can be mitigated by temporarily withholding emission allowances to tackle the current and future oversupply in the ETS.<sup>25</sup>*

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<sup>25</sup> This argument is elaborated on in more detail in a Working Document on this case study, which can be downloaded from <http://carisma-project.eu>

- Most importantly, *the combination of EEO and RES policies can fundamentally alter the merit order in Greek (and European) wholesale electricity markets*, pushing natural gas out down the merit order and reducing EUA prices, thereby weakening the fuel-switch effect of a reversal in the clean dark and spark spread.
- *Investments in RES technology in end-use sectors (e.g. buildings or transport) are discouraged within the implementation of the obligation scheme.* To avoid lock-in phenomena in fossil-fuel technologies at the demand-side, it is advisable to Greek policy makers to consider putting in place energy efficiency measures under Article 7 (of the Energy Efficiency Directive). This would lead to changes in terms of final energy savings, but also in terms of energy sources and therefore CO<sub>2</sub> emissions.
- *The use of revenues from auctioning emission allowances in the power sector can be used to support energy savings at the end use level.* Hence the impact of the EU ETS on the EEO scheme and energy efficiency improvements could become more positive.

The possible impacts of interactions of ETS, EEO and renewable energy support policies are summarised in Table 7.

**Table 7. Summary of case study results for ETS and EEO scheme interaction impacts.**

<b>Key Variables</b>	<b>EU ETS &amp; Greek EEO scheme</b>	
<b>Electricity demand</b>	Decrease	Reduction in demand due to energy efficiency investments and higher retail electricity prices
<b>Wholesale electricity price</b>	Decrease	The shift in the demand curve to the left results in lowering the wholesale price, since less electricity is needed to cover lower demand levels than with the ETS stand-alone.
<b>Retail electricity price</b>	Ambiguous/ Increase	Reduction in the retail electricity price (due to reduction in demand and subsequent reduction in the wholesale price) is likely to be offset by the expected increases in both GHG emissions chargers and cost-recovery charges.
<b>National fossil-fuel based electricity generation and CO<sub>2</sub> emissions</b>	Decrease	Decrease due to lower demand than with the ETS alone; lower emissions from the power sector due to reduction in demand in non-ETS sectors (e.g. buildings).
<b>Non-RES Producers' surplus</b>	Ambiguous	Lower surplus than with the ETS alone due to decrease in demand may be offset by the benefits from the ETS (reduction in emission due to reduction in energy demand leading to lower compliance costs).
<b>Consumers Surplus</b>	Decrease	Surplus is likely to be lower than with EU ETS alone especially for non-EEO beneficiaries of energy efficient investments.
<b>EE technology investments</b>	Increase	Investments in energy efficiency technologies will be increased more than with the ETS alone
<b>RES technology investments</b>	Decrease	Investments in RES technology are likely to be reduced in the long term than with the ETS alone due to lower emission prices and non-eligibility of measures resulting in primary energy savings.

## **3.7 Case Study 4: Interaction between the EU ETS and the Renewable Energy Directive at the EU level**

### **3.7.1 Introduction**

When the original ETS Directive was drafted and later revised (European Union, 2003; 2009), the effects of the RED on the EU ETS were considered, but it is unlikely that the effects of ETS Phase I (2005-07) and its transition to Phase II (2008-12) were anticipated. The latest ETS reform proposal (European Commission, 2015) for Phase IV (2021-2030) provides an opportunity to review in a systematic way the impacts of the co-existence of the ETS and policies based on RED. A priori, this co-existence could be justified for several reasons: to correct for market and policy failures and to meet multiple targets and objectives (Rey, L., et al., 2013; Löschel & Schenker, 2015; Lehmann & Gawel, 2011; OECD, 2011), but could also lead to lower policy effectiveness and efficiency.

This case study examines primarily the effects of the EU RED on the implementation of EU ETS, with a focus on two main sources of literature: one from the research community (both scientific and policy research) and the other based on consultation of market participants (the power and trading sectors). At the same time, this analysis not only looks at policies and policy instruments but also at policy targets (i.e. renewable energy targets, GHG emission reductions).

### **3.7.2 Background and policy context**

The adoption in 2008 of the EU's Climate and Energy Package for 2020 (European Parliament and the Council, 2009) was a strategic policy choice to support the UNFCCC climate negotiations in Copenhagen (2009). As such, the package was mainly a climate package with EU energy policies, especially those relying on renewable energy and energy efficiency, contributing to the EU's climate policy and the EU's position in international climate negotiations. This policy landscape has significantly changed since the start in 2015 of the European Energy Union, which has a stronger focus on the supply side of the energy market, including security of energy supply and the internal energy market. Thus, EU climate policy nowadays is also aimed at contributing to the Energy Union. Nevertheless, the role of the ETS as the main European instrument to meet its 2030 climate target in the most cost-effective manner was not only confirmed in the European Council Conclusions in October 2014 (Council of the European Union, 2014) but also reaffirmed in the EU's post-Paris strategy published in March 2016 (European Commission, 2016).

A majority of European stakeholders perceive the ETS as the main policy instrument for inducing GHG emission reductions (e.g. Nordeng et al. (2014) (2015), Fujiwara (2015)). On the other hand, there are interesting changes in stakeholders' perceptions as well as Member States' preferences. First, there is an increasing view that in contrast to the conventional wisdom (Sartor & Mathieu, 2015), the ETS will remain the best but not the only instrument for EU climate policy, and can be combined with other policy instruments such as subsidies for renewable energy (for variance in preference across member states,

see Nordeng et al. (2015)). Second, there is a shift in preference for choice of policy instruments, such as a shift from Feed-in-Tariffs (FiTs) to Feed-in-Premiums (FiPs) for supporting renewable energy technology development (e.g. Ragwitz (2015). In a survey, to which about 75 ETS-covered installations responded, 19% answered that the EU ETS had induced their companies to reduce emissions in the early phase but has little impact now. By comparison, 32% suggested that the ETS had and would continue to cause reductions, while 29% were of the view that it had not and would not likely cause any reductions (Nordeng, A. et al., 2015).

A survey commissioned by the European Commission found that carbon abatement and prices for emission allowances were not the primary drivers for most companies and sectors to invest in carbon-efficient solutions. Nevertheless, the survey concluded on a positive note that the ETS played a supportive role in many decisions, especially in the early years of the second ETS phase when the price was higher (around 2008-2009). This has induced installations to minimise energy costs, improve financial viability and profitability, raise awareness for climate issues at the management level and among employees, and build capacity for more accurate monitoring and reporting of emissions (European Commission, 2015). A ZEW survey among German installations revealed that in ETS Phase I and Phase II the main drivers for these installations were the need for them to reduce energy and raw material costs and improvements in the general efficiency of the production process (European Commission (DG Climate Action), 2015).

### **3.7.3 Analysis of policy interactions RED and ETS at EU-level**

The European Commission's impact assessment for the 2020 Climate and Energy Package (European Commission, 2008) assessed impacts of various design choices to implement both renewable energy and GHG emission reduction targets. Nevertheless, actual effects of the RED were realised by market participants such as power companies and traders, then later verified by researchers when data for the ETS Phase I became available for ex-post evaluation. By 2010, emission reductions triggered by the RED were estimated at around 50 MtCO<sub>2</sub> across the EU ETS sectors (IETA, 2015). Another assessment found that over the last six years, renewable energy capacity has led to a reduction of GHG emissions in the ETS-covered power sector of around 15 Mt every year (Energy Aspects, 2015). Similar conclusions were found in an ex-post assessment based on the data from 12 Member States in Western and Southern Europe between 2007 and 2010: deployment of renewable electricity technologies displaced CO<sub>2</sub> emissions within the ETS sectors, thereby reducing demand for ETS allowances resulting in a lower allowance prices (Van den Bergh, Delarue, & D'haeseleer, 2012).

A case study of Germany showed that approximately 10 to 16% of the reduction in CO<sub>2</sub> emissions from the electricity sector between 2005 and 2011 could be attributed to the increase in the share of renewable energy technologies the energy mix (Weigt, Delarue, & Ellerman, 2012). More recently, Berghmans et al. (2014) conducted an ex-post assessment for CO<sub>2</sub> emissions from the electricity sector in the EU during Phases I and II (2005-12) and concluded that supporting policies for renewable energy generation enhanced

reductions of CO<sub>2</sub> emissions in the power sector. Most of the new renewable energy generation capacity was set in place by Member States in the form of FiTs or green certificates without a link to EU allowance (EUA) prices. Berghmans et al. (2014) conclude that CO<sub>2</sub> emission reductions within the ETS-covered sectors have been mainly induced by stimulation measures for renewable energy technologies. This has also been due to the low ETS market prices because of the economic crisis, as with low allowance prices fewer incentives exist for ETS installations to invest in low emission technologies. Koch et al. (2014), using a data set which includes a full period of ETS Phase II (2008-12) and the first year of Phase III (2013), also concluded that growth in renewable energy deployment, especially that of wind and solar, contributed to (further) lowering EUA prices, although they found that the effects of renewable energy growth on EU allowance prices are smaller than what ex-ante simulation-based assessments predicted.

With a view to the future, IETA (2015) expects that interacting EU policies, including the energy efficiency, renewable energy and Ecodesign Directives, will reduce demand for EUA by 1.1 billion tonnes by 2020. Based on a calculation of the impact on emission reductions from renewable energy sources in 2020, renewable energy generation in the EU-28 between 2008 and 2020 would amount to a reduction in demand for EUAs of approximately 210 MtCO<sub>2</sub> (IETA, 2015). Similarly, other reports assume continuation of renewable energy uptake but on a smaller scale, due to a fall in the levels of subsidies<sup>26</sup> with annual emission reductions from renewable energy in the range of approximately 10-15 Mt (Carbon Weekly, 2016).

Because of perceived low EUA prices over the long term, most ETS-compliant companies in the power sector have stalled investments in newer and low-emission gas-fired plants while having kept running existing coal and lignite-fired plants which have lower operating costs (e.g. installation CEZ, see European Commission (2015)). An energy market research group, AG Energiebilanzen (2015) (also quoted in an analysis by Carbon Pulse (2016)), estimated that energy-related CO<sub>2</sub> emissions in Germany increased by 0.9% in 2015 due to increased energy demand (primarily due to the weather, which was slightly cooler than the very mild previous year, and the associated higher demand for heating energy) and more burning of lignite and natural gas. This figure would have been higher without a 10.5% increase in renewables-based power (Carbon Pulse, 2016).<sup>27</sup>

Several stakeholders in the energy sector are concerned about the overlap of multiple instruments and multiple objectives. For example, RWE suggests the use of the ETS for climate policy and to move away from FiTs and towards FiPs and tendering schemes for renewable energy support.<sup>28</sup> In addition to the ETS, Repsol views that multiple targets for renewable energy, fuel quality, and energy efficiency create a complex regulatory

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<sup>26</sup> For the case of Germany, see Nordeng et al. (2015).

<sup>27</sup> Among other renewable technology types, wind power on land and off shore showed a plus of 50% compared to the previous year. The share of solar energy (photovoltaics and solar-thermal energy) increased by 6% and that of biomass by 2% (AG Energiebilanzen, 2015).

<sup>28</sup> RWE, presentation at the 3<sup>rd</sup> POLIMP stakeholder workshop, Brussels, 11 February 2015.

framework with additional risks for competitiveness and uncertainties (European Commission (DG Climate Action), 2015). CEZ even sees “a threat that the increased deployment of renewables, based on a non-market approach and relying on national support schemes, conflicts with the EU ETS as it creates emission buffers in the ETS with absolute targets” (CEZ in European Commission (DG Climate Action) (2015)). Such adverse effects have been also acknowledged by the research community (e.g. (Sartor & Mathieu, 2015; Berghmans, Cheze, Alberola, & Chevallier, 2014; Van den Bergh, Delarue, & D'haeseleer, 2012)).

On the other hand, based on the concerns about the potential of the ETS to drive low-emission technologies and innovation, most studies reviewed for this case study recommend the continuation of combining different approaches, which they view as complementary, instead of relying on the ETS as the only instrument of EU climate policy. Based on the literature review and stakeholder consultation, there are three main suggestions to avoid and/or mitigate possible detrimental effects of renewable energy support on the ETS:

1. *The ex-ante assessment of the ETS cap at the start of each Phase, i.e. no ex-post adjustment to the cap during the Phase*

Possible policy interaction effects need to be fully accounted before setting the ETS cap for each phase through the review of the Linear Reduction Factor. At the start of a phase there is a possibility for adjustments, depending on the need for making progress towards the 2050 goal (80-95% GHG emission reductions from 1990 levels) and in international negotiations (IETA, 2015). Aligning complementary policies with the ETS means that the ETS cap should be reduced by an equivalent amount of abatement expected from complementary investment support policies in the context of National Energy and Climate Plans (NECP) (Sartor & Mathieu, 2015) (for NECP see European Commission (2015)).

2. *Transparency in information*

Greater transparency in information is needed to assess the adequacy of the ETS cap and to monitor impacts of abatement delivered through complementary policies such as renewable energy support. Essential data include GHG emission reductions and sub-sectoral allocation at an installation level, as well as costs and impacts of complementary policies (IETA, 2015). For example, this requires differentiation of technology types, as the evidence for effects of renewable energy support measures on the ETS was robust in wind and solar, but not necessarily in hydro (Koch, Fuss, Grosjean, & Edenhofer, 2014). In addition, energy traders argue that Member States and the European Commission do not provide detailed fundamental assumptions at a local or aggregated level, particularly on economic growth (GDP growth) and carbon intensity (emission per unit GDP), and that Member States fail to inform about the impacts that National Energy and Climate Plans would have on the ETS (European Federation of Energy Traders, 2016).

3. *The Market Stability Reserve*



It was the *over-achievement* of the renewable energy target which caused high uncertainty about the level of demand for EUAs (Jalard, Dahan, Alberola, Cail, & Keramidas, The EU ETS emissions reduction target and interactions with energy and climate policies, 2015a).<sup>29</sup> While the Market Stability Reserve (MSR) primarily aims to restore the balance between supply and demand and enhance the ETS resilience against external shocks, it can be regarded as the only and most effective instrument in place to mitigate the impacts of complementary policies, which were unpredictable or/and unavoidable, during the phase. It may not avoid the problem at its origin but could repair the negative effect of those policies by withdrawing allowances from auctioning (IETA, 2015; Jalard, Dahan, Alberola, Cail, & Cassisa, 2015b). The amount of withdrawal may be determined based on assessment of different scenarios assuming different rates of increase in abatement resulting from complementary policies such as on renewable energy (Sartor & Mathieu, 2015).

These three suggestions are not mutually exclusive but related to each other. Long-term scarcity should be ensured by the ex-ante assessment of the ETS cap, which requires comprehensive data collection and periodic and systematic monitoring of impacts of abatement from complementary policies. Unavoidable effects of the latter could be mitigated to some extent using the MSR.

The EU-level impacts of renewable energy support schemes on the ETS are summarised in Table 8.

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<sup>29</sup> Unlike energy efficiency or offsets, the renewable energy target itself was accounted for in the ETS cap-setting at the start of Phase 3. What was unaccounted for was the overachievement of the target. Renewable energy policies accounted for a large share of CO<sub>2</sub> emission reductions but their contribution to allowance surpluses did not contribute significantly to the increasing surplus in contrast to the impacts of energy efficiency policies and offsets (Jalard, Dahan, Alberola, Cail, & Keramidas, The EU ETS emissions reduction target and interactions with energy and climate policies, 2015a).

**Table 8. Summary of case study results on interaction renewable energy schemes and ETS (at EU level).**

Key variables	Impact of ETS and RED interaction	
<b>CO<sub>2</sub> emissions in ETS power sector</b>	Decreased	Renewable energy (through RED) has led to additional emission reductions in ETS sectors (e.g. 15 Mt per year during 2010-2015). However, due to lower EUA prices, ETS-compliant companies kept coal and lignite-fired plans operational, which counter-weighted the RE-induced emission reduction
<b>EUA price</b>	Decreased	Renewable energy development support has reduced demand for EUAs in ETS sectors, resulting in EUA price reduction.
<b>Renewable electricity technology deployment</b>	Increased	Instruments such as FIT and FIP have resulted in stronger deployment of renewable energy technologies, which had not yet reached the stage of commercial application.
<b>Low emission energy investments in ETS power sector</b>	Decreased	Most ETS-compliant companies in the power sector have stalled investing in newer and low-carbon gas-fired plants due to lower EUA prices

### 3.7.4 Findings

From this EU level case study on interactions between renewable energy support policies and the EU ETS, the following key findings can be presented:

- *The combination of policy instrument for energy efficiency improvement, renewable energy support and the EU ETS can be justified because each of them has its own target under the EU Climate and Energy Package.*
- *Nevertheless, detrimental effects of renewable energy support measures on the EU ETS have been among the major concerns of EU stakeholders in the power and energy trading sectors.* The overachievement of the renewable energy target meant that in the power production sector demand for ETS allowances decreased, resulting in a lower ETS market price. In terms of efficiency, this resulted in a loss as emission reductions delivered by renewable energy support measures such as FiTs have higher abatement costs than those through cap-and-trade systems such as the EU ETS.
- *While interactions between the policy instruments were foreseen, the overachievement of the renewable energy target was not anticipated.* This success has been driven by

policy objectives other than GHG emission reductions, e.g., energy security and air pollution reductions. The current EU policy framework in this field, the Energy Union, aims at an increase in renewable energy share for multiple reasons.

- *It is important to understand how RED affects the ETS, and to identify the conditions under which this effect will become detrimental to undermining the purpose of the latter, and how this can be prevented.* For that the case study analysis concludes on three key measures:
  - The effects of policies such as renewable energy support need to be fully accounted for when the ETS cap is set at the start of each ETS Phase through the review of the Linear Reduction Factor, for which greater certainty about future RES deployment would be needed, or more frequent reviews and updates of the linear reduction factor under the EU ETS,<sup>30</sup>
  - Greater transparency in information is needed to assess the adequacy of the ETS cap and to monitor impacts of abatement delivered through complementary policies such as RE,
  - The Market Stability Reserve is the only and most effective instrument currently available at the EU level to mitigate the impacts of complementary policies, which are unpredictable or/and unavoidable.

### 3.8 Key findings from the case study analysis

In this part of the report, interactions between EU climate and energy policies have been analysed based on four case studies. The case studies, while acknowledging that they cannot cover the full landscape of potential energy and climate interactions, nor cover the full policy landscape of all EU Member States, illustrate how simultaneous implementation of policies can lead to interactions. Policies covered by the case studies are in the areas of energy efficiency improvement, renewable energy support and the EU ETS. In three of the case study the analysis has focused on national policies which are the result of transposing the EU Directives for Renewable Energy, Energy Efficiency and the ETS into national law.

Findings from the four individual case studies were formulated in the preceding sections. This section contains a few key findings which have been generated from the case study analysis and which are assumed to have a wider applicability to cases of other energy and climate policy interactions.

- *Consistency between policies during policy design stages:* Policy interaction can take place at the level of policies' overarching objectives, policy instruments (to achieve policy objectives) and their design characteristics (target, scope, technologies, and target groups). Policy co-existence can be justified if the policies are aimed at different

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<sup>30</sup> Both of them may have tradeoffs: RES auctions and quota systems, for instance, tend to exclude smaller RES investors, such as households, farmers etc., while frequent updates to the linear reduction factor introduces new uncertainty and risk into the EUA market.

targets, such as one policy to achieve short-term environmental targets and another policy for longer-term targets. Policies can be considered consistent when individual policy instruments do not contradict each other, but instead, result in synergies within the policy mix. To avoid negative interactions, it is therefore important that ex ante impact assessments of policies consider potential interactions and ensure that they all work in the same “direction”.

- *Have provisions in place in case the effects of policy interactions are not anticipated or stronger than anticipated:* There can be cases in practice where a specific policy interaction is assumed to lead to synergistic effects (e.g. policies all contribute to CO<sub>2</sub> emission reduction), but that actual practice shows that the policy results are undesirable. For example, the EU-level and Greek case studies on interaction between ETS and renewable energy support and ETS and the energy efficiency obligation scheme, respectively, has shown that accelerated deployment of renewable energy technologies has resulted in extra CO<sub>2</sub> emission reductions, larger EUA surpluses and a lower EUA price. While beforehand, these effects were expected (although not to the full extent as experienced, due to uncertainty about RES growth and target overachievement), the impacts of the economic crisis after 2008 on the ETS market were not anticipated. Consequently, market imbalances could not be repaired. Quantity management solutions, such as the ETS Market Stability Reserve (EU case study) or price floors (French case study) can serve as a solution for that.
- *Streamline and fine tune policy making at different policy making levels within countries:* While most of the case studies focus on interactions between different policy instruments covering different policy areas (i.e. energy efficiency, renewable energy and climate), the case study in Austria has shown an example of policy interactions taking place within one policy area but between federal and provincial levels of government, which both, quite independently from each other, operate subsidy schemes for energy efficiency improvements in households. The case study has shown that Austria’s energy consumption in households decreased over the last years, which is likely to be attributable to energy efficiency measures at different government levels. However, it also raises the question of how efficient the current policy mix has been and whether there is a need to reform the current system towards a policy mix that is not entirely based on subsidies. One potential issue, which has been mentioned in the Austrian case study, is that more efficient federal and provincial mixes of energy efficiency policies may require termination or changing some of the subsidies. At the same time, subsidies have the largest political acceptance among policy instruments in the country, which may require a trade-off between policy efficiency and acceptance.
- *Renewable energy targets formulated as percentages can “automatically” be achieved because of energy efficiency policies:* The French case study shows how renewable energy targets were “automatically” met because of achieving energy efficiency goals. Due to energy efficiency measures, energy consumption reduced, so that renewable energy goals, formulated as a percentage of energy consumption, were automatically met (assuming that renewable energy generation does not drop with reduced energy

demand<sup>31</sup>). While this is no problem for short-term policy goals, this interaction reduces the pressure to increase investments in renewable energy technologies, which may be detrimental for development of technologies needed for future energy and climate goals. To mitigate this, renewable energy targets can be set as absolute amounts of renewable energy to be produced/consumed.

- *Impact of policy interactions partly depends on (energy) market characteristics:* The case study in Greece has shown how a monopoly situation in the electricity market can lead to a passing on to consumers of increasing compliance costs due to the combined effect of the energy efficiency obligation and ETS schemes for energy producers. The case study in France has demonstrated that interaction between national renewable energy support policies and the EU ETS is much weaker than in other Member States, especially compared to Germany, as the French power sector has a relatively small CO<sub>2</sub>-intensity so that national policies are likely to have a negligible impact on the EU ETS (in terms of surpluses and prices).
- Short-term interactions between EU ETS and renewable energy policies may result in negative impacts on the fuel-switching between coal and natural gas. Additional RES policies were aimed incentivising RES investments, but in co-existence with the EU ETS, and against the backdrop of the economic recession, these incentives contributed to lower EU ETS allowance prices, which has been primarily favourable for coal-based technologies and detrimental to natural gas-based technologies.

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<sup>31</sup> For example, if wind turbines are not replaced once they reach the end of their useful lifetime.

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