This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727470

Ref. Ares(2018)2474982 - 11/05/2018

Report No ECHOES 6.1 – D6.1 Policy Recommendation papers

Report

Policy Recommendations:
An analysis on collective and energy related decision-making processes of three formal social units

Picture under creative common licence. © Sabine Schwoaze at pixabay.com

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727470

Report

POLICY RECOMMENDATIONS

KEYWORDS:
Energy behaviour, formal social units, policy recommendations, electric mobility, smart technology, buildings.

VERSION
03

DATE
11.05.2018

AUTHOR(S)
Simen Rostad Sæther[1], Xinlu Qiu[1], Marianne Skaar[1], Jens Dalseth Røyrvik[2], Marie Nilsen[2], Asle Gauteplass[2], Jens Petter Johansen[2], Christian A. Klöckner[1], Espen Moe[1], Gitte Koksvik[1], Luitzen de Boer[1]

NTNU[1], NTNU Social Research[2]

Quality Check:
Andrea Kollmann

PROJECT NO.
727470 (H2020)

NUMBER of PAGES/APPENDICES:
130/0

ABSTRACT
By conducting 67 semi-structured in-depth interviews and 15 focus group studies that have taken place in Austria, Bulgaria, Finland, Norway, Spain, and Turkey, the aim of this report is to provide comprehensive policy recommendations addressing the three levels of formal social units defined as stakeholders in the ECHOES project: Formal social units, collective decision-making units and individuals engaging in joint contracts. The primary policy recommendations are centered around three technological foci: Smart energy technologies, electric mobility and buildings based on the insights from the thorough analysis of the in-depth interviews and focus groups.

REPORT NO.
D6.1

ISBN
NA

CLASSIFICATION
public

CLASSIFICATION THIS PAGE
public

Document history

VERSION	DATE	VERSION DESCRIPTION
1	24.03.2018	First version for quality check
2	31.03.2018	Final version sent to European Commission
3	11.05.2018	Revision of delivered version

The following ECHOES partners have contributed to conducting the interviews and focus groups, which form the basis of the report. In addition, they conducted an initial screening of the data and provided the author team with country-specific summaries of policy implications.

Country	Consortium partner	Name
Austria	Joanneum Research	Gudrun Lettmayer, Stephan Schwarzinger
Bulgaria	University of Architecture, Civil Engineering, and Geodesy	Elena Dimitrova, Milena Tasheva-Petrova, Irina Mutafchiiska, Angel Burov, Mila Yolova, Stela Kaloyanova, Ioana Petrova
Bulgaria	Eneffect	Dragomir Tzanev
Finland	VTT Technical Research Centre of Finland	Heidi Auvinen, Tiina Koljonen, Marja Liinasuo, Anton Sigfrids, Lassi Similä, Laura Sokka, Maria Åkerman
Norway	Norwegian University of Science and Technology	Marianne Skaar, Simen Rostad Sæther, Xinlu Qiu, Jo-Kristian Stræte Røttereng, Jens Olgard Dalseth Røyrvik, Luitzen de Boer
Spain	Tecnalia	Lucía Polo, Daniela Velte, Xabier Uriarte, Izaskun Jimenez
Turkey	Izmir University of Economics	Mehmet Efe Biresselioglu, Muhittin Hakan Demir, Melike Demirbag Kaplan

EXECUTIVE SUMMARY

In the ECHOES project, we have conducted 67 semi-structured in-depth interviews and 15 focus group studies in Austria, Bulgaria, Finland, Norway, Spain, and Turkey. The purpose of the interviews has been to produce data enabling us to provide solid science-based policy recommendations to the European Commission on how to achieve a stronger Energy Union and the successful implementation of the Strategic Energy Technology (SET)-Plan. Social Science and Humanities (SSH) research on the energy transition is in high demand both nationally and internationally. Among the strengths of this research within the field of energy is its ability to provide insights to policymakers on how stakeholders make energy-related decisions, yielding recommendations towards the goals of providing clean, affordable and reliable energy, and facilitating a shift towards electric mobility and sustainable buildings. The SSH also have a firm focus on the innovation that secures the European Union's position in the world markets of the future.

The overall aim of this report is to provide comprehensive policy recommendations addressing three levels of formal social units – stakeholders defined in the ECHOES project as *formal social units which act as policy makers and/or energy providers*, *collective decision-making units which are more formally structured and with relative lower information and power asymmetries* and *individual consumers engaging in joint contracts to increase their power of negotiation*. Formal social units we define as decision-making units that act as policymakers and/or energy providers with a wider reach of influencing energy choice decisions. Collective decision-making units are formally structured groups with lower power asymmetries as compared with formal social units. Individual consumers engaging in joint contracts are individuals that engage in group decision-making processes around energy choices, so that they can increase their negotiation power with other more formal bodies. Moreover, this report also aims to provide policy recommendations relating to three technological foci addressed in the ECHOES project, namely smart energy technology, electric mobility, and buildings.

For the formal social units, comprehensive policy recommendations address several key impact areas for improving and facilitating energy-related decision-making. The main purpose of the report is to provide overarching policy recommendations. It is however important to note that the differences between the different countries are great enough that one-size-fits-all policies may not always work well, as the interview material sometimes reveals quite different problems, needs and requirements between the different countries. General recommendations will not always fully capture these differences. However, based on the data material we suggest recommendations can be centered on three basic themes: regulations and support schemes, cities and local governance, and public procurement. The data strongly indicates that solely relying on regulations and support schemes is insufficient. There is a perceived gap between the various policy directives provided on the one hand, and the way individual Member States implement them on the other, and our respondents report that the impact of regulations and schemes is often unpredictable due to the complexity of non-linear phenomena. Thus, expected results, according to the respondents, are not always realized when regulatory differences, diverse sectoral goals and roles, incoherent industry standards, conflict with other international agreements and diverging technical criteria. Still, regulations and support schemes are a vital part of the solution, especially with respect to technology adoption. Support schemes must however be phased out as soon as efficient markets are in place, and it is also problem that existing support schemes (e.g. fossil fuel subsidies) sometimes counteract the intended results of a new support scheme. Cities and the local level of governance is where national and supranational policy is very often implemented. But the local level often lacks in terms of autonomy, budget constraints and competence. There is often a serious mismatch between what the local level is asked to do, and what it has the capacity to do. Capacity-building for instance through the creation of guidelines for local officials and dissemination of best practices could be extremely useful for successful local policy implementation. On public procurement, among other things we suggest eligibility requirements for bidders to comply with, using competitive tendering to “nudge” suppliers in the right direction, while emphasizing the danger that public procurement processes can lead to unnecessary bureaucracy and complicated regulations.

Addressing the collective decision-making units level, the report provides insights and policy recommendations on how collective energy-related decision-making can be facilitated and incentivized, and how policymakers might implement policies that trigger more decisions for a European low-carbon economy. The observations gathered in this report indicate, however, that existing policies have major deficiencies. Some of the main problems brought up by the respondents was that inconsistent and complex regulatory regimes change at unforeseen points in time and that the regulatory complexity is so great that it requires specialized competence among the firms and the need for external juridical competence to handle application processes, auctions, tax adjustments and liability hazards. These add to the already considerable risks of investing in green technologies. Thus, one of the problems with existing policies identified by the respondents is the transference of risk from the public to individual firms. Another is the prevalence of policies that create perverse incentives, for instance through different forms of subsidizing energy prices, energy consumption and fossil energy providers, and thus impeding energy efficiency improvements. Thus, this is a complex field and our conclusions point to the fact that only ambitious and consistent, while at the same time flexible, energy and climate policies will facilitate collective energy-related decision-making. Our findings suggest that policymakers can facilitate the shift towards low-carbon solutions by providing prioritized and tailored support schemes, increased R&D expenditure, and the facilitation of joint networks such as industrial zones and chambers, as well as support for small and medium-sized enterprises (SMEs). For smaller firms, policies aimed at reducing risk are very important to induce them to implement novel green technologies. We also suggest that policymakers to a greater degree should engage in dialogue with industrial experts, social partners and visionary pioneers to increase the awareness and knowledge about innovations and the technological frontier.

For individual consumers engaging in joint contracts, there is significantly less data, as this is a phenomenon that is still somewhat in its infancy, although one that will presumably be growing fast and be a highly interesting area for present and future policy-making. Consumers may become fundamental drivers in technological transition processes as they frequently have idealistic motives rather than mere financial ones. In cases where financial and environmental objectives pull in the same direction, consumers are fast to change behaviour and adopting new, sustainable technologies. Present examples of this are in the areas of energy efficiency in buildings and electric cars, where consumers can both save on costs and save the environment. One problem is however that consumers may have a shorter investment horizon than firms, since green investments often represent an up-front payment that for an individual household is often quite high. Thus, financial obstacles may often deter consumers from making idealistic choices. Another problem is that joint decision-making processes are often slow in nature and sometimes hampered by the need for majority voting or even unanimity. The prime example is housing co-operatives, where single individuals have sometimes been able to block spending on infrastructure for electric car charging. Thus, this part of the report focuses on providing policymakers comprehensive, evidence-based insights for successful policy implementation and factors that need to be taken into account to maximize the potential for citizen engagement in energy-related decision-making, aiming to coordinate and harmonize regulations and policy instructions, and other support systems to support energy-related decision-making for individual consumers and individuals engaging in joint contracts. Our suggested conclusions surrounds policy choices policymakers can pursue to facilitate energy-related decision-making. Our findings suggest that policymakers have several ways of influencing individuals through means such as providing the right incentives for individuals to choose low-carbon solutions, supporting infrastructure establishment, tailored support schemes that directly mitigate some of the large upfront costs of several large investments in cases of large-scale retrofitting and charging infrastructure, for instance in condominiums and housing co-operatives. Finally, we suggest that regulations and market design have to be adopted to address an increasing level of small-scale distributed renewable energy distribution and other smart energy-related technologies. It is also worth emphasizing that a side-benefit to increasing citizen engagement might be increased participation and involvement in local democracy, with both potential social benefits and economic and environmental effects.

For a full list of policy recommendations for industries, see section 5.2. Here we emphasize the following: Support schemes should support technology adoption, but must be phased out when efficient market forces are in place. Policy regulations need to be more precise, so as to target the policy goal without distorting behaviour. Infrastructure investments are necessary, but difficult to undertake and participate in for individual firms and need to be

undertaken by national authorities directly. Overregulating can be counterproductive. Thus, markets need to be regulated in a way that promotes fair competition and efficient solutions. Open trade within Europe in environmental goods and services must not be impeded by other trade political concerns. And environmental taxes need to make sustainable behaviour profitable for the individual.

The following table summarizes the main conclusions from all three levels and technology foci (a fuller version of this table can be found in the conclusions chapter, section 5.5.).

Decision-making units	Buildings	Electric mobility	Smart energy technology
Formal	• Provide guidelines for building inspections and requirements • Increase competence for public purchasers and inspectors • Manage and reduce in energy usage in public buildings during peak demand • Energy performance certificates • Energy planners in construction projects	• Funding transport decarbonisation projects • Setting strict vehicle standards • Electric mobility specific support schemes • Predictable support scheme phase-out • Requiring low-carbon technology in PP (buses, ferries, municipal vehicle-fleets) • Incentives for charging infrastructure (especially in rural areas) • Integrated regulations (across sectors)	• Resilient grids and flexibility • Effect pricing and effect control • Incentives for smart energy technologies and green behaviour • Investment in smart grid projects • Improve market design and regulations for consumers selling excess energy to the grid.
Collective	• Mediators/ influencers – to supply chain contractors and housing entities • Provide information • Adopting green construction standards	• Influencing national, regional and local stakeholders in adopting electric mobility and building charging stations • Association guidelines (charging, range, user experiences) • Communicate to car industry on consumer demands, needs and experiences	• Cost reduction in renewable energy and smart energy technologies for small-scale and distributed energy generation • Provide revenue stream from new business models • Industrial clusters as hubs for knowledge transfer • Engaging in pilot projects and R&D
Individual	• Influence building technology focus, attitudes, and perceptions • Provide information on energy expenditure and possible savings	• Building trust and acceptance • Car sharing initiatives • Joint decision making for charging infrastructure to motivate shift to EVs • Increase consumer awareness and knowledge	• Increase consumer trust and acceptance • Highlight economic benefits • Encourage participation and community collaboration

Table of contents

EXECUTIVE SUMMARY **4**

1. GENERAL INTRODUCTION AND OVERVIEW **9**

1.1. Aim of the report *9*

1.2. Overview of the ECHOES project *9*

1.3. Summary of the main findings *10*

1.4. Methodology, organization of the report and introduction to the analysis perspectives *16*

1.4.1. Methodology 16

2. IDENTIFICATION OF STAKEHOLDERS **22**

2.1. Definition of stakeholders *22*

2.1.1. Formal social units 22

2.1.2. Collective decision-making units 24

2.1.3. Individual consumers engaging in joint contracts 26

2.1.4. Summary: Identification of stakeholders for each technological focus 27

3. CURRENT POLICIES **29**

3.1. A general overview of EU climate and energy policies *29*

3.2. Policy for the three technological foci *32*

3.2.1. Buildings 32

3.2.2. Electric mobility 33

3.2.3. Smart energy technologies 34

4. POLICY RECOMMENDATIONS **37**

4.1. Formal social units *37*

4.1.1. Policy context 37

4.1.2. Policy objectives and policy choices 38

4.1.3. Addressing the technological foci for formal social units 64

4.2. Collective decision-making units *79*

4.2.1. Policy context 79

4.2.2. Policy objectives 83

4.2.3. Policy choice 85

4.2.4. Policy design 91

4.2.5. Policy implementation and monitoring 97

4.3. Individual consumers engaging in joint contracts *99*

4.3.1. Policy context 100

4.3.2. Policy objectives 106

4.3.3. Policy choice 112

4.3.4. Policy design 115

4.3.5. Policy implementation and monitoring 118

5. CONCLUSIONS AND GENERAL RECOMMENDATIONS **123**

5.1. Overview of the report *123*

5.1.1. Formal social units 123

5.1.2. Collective decision-making units 124

5.1.3. Individuals engaging in joint contracts 125

5.2. Policy recommendations for industries 126
5.3. Stakeholders central to the three technological foci 127
5.4. Challenges according to decision-making units 128
5.5. Recommendations for the three technological foci at different decision-making levels 129

1. GENERAL INTRODUCTION AND OVERVIEW

1.1. Aim of the report

Over the past few years Social Science and Humanities (SSH) research on the energy transition has been encouraged and requested both nationally and internationally. Social science research is uniquely positioned to give insights to policymakers on how relevant stakeholders make energy-related decisions and can provide recommendations towards the goals of providing clean, affordable and reliable energy, facilitating a shift towards electric mobility and sustainable buildings as well as innovation that secures the European Union's position in the world markets of the future. By conducting 67 semi-structured in-depth interviews and 15 focus group studies that have taken place in Austria, Bulgaria, Finland, Norway, Spain, and Turkey, the aim of this report is to provide comprehensive policy recommendations addressing the three levels of formal social units defined as stakeholder in the ECHOES project: Formal social units which act as policy makers and/or energy providers (in the following just referred to as formal social units), collective decision-making units which are more formally structured and with relative lower information and power asymmetries (in the following just referred to as collective decision-making units) and individual consumers engaging in joint contracts to increase their power of negotiation (in the following just referred to as individuals engaging in joint contracts). The primary policy recommendations are centered around three technological foci: Smart energy technologies, electric mobility and buildings based on the insights from the thorough analysis of the in-depth interviews and focus groups.

The report aims to provide a systematic analysis of the relevant stakeholders at each level, how these interact and communicate and potential motivators and barriers for energy-related decision-making. Following this, we present the insights from the in-depth interviews and focus groups, with policy recommendations addressing each level and technologic focus. For the formal social units, comprehensive policy recommendations will address several key impact areas for improving and enhancing energy-related decision-making, while acknowledging the differences in energy transition progress across Europe, as general recommendations would not fully capture these differences. Yet, the main aim has been to provide policy recommendations of a general character. Addressing the collective decision-making units, the report yields insights and policy recommendations on how collective energy-related decision-making can be facilitated and incentivized, and in what way policymakers might implement policies that trigger further decisions towards a low-carbon economy. For individuals engaging in joint contracts, the report focuses on giving policymakers comprehensive, evidence-based insights for successful policy implementation as well as highlighting factors that need to be taken into account to maximize the potential for citizen engagement in energy-related decision-making. This may yield a range of desirable effects, such as increased participation and involvement in local democracy, which might have social benefits as well as economic and environmental effects. The insights from this part of the report focuses on coordinating and harmonizing regulation and policy instructions, and other support systems to support energy-related decision-making for individual consumers and individuals engaging in joint contracts.

1.2. Overview of the ECHOES project

This report has been written as a deliverable in the H2020 project ECHOES[1] based on previous deliverable D3.1 (Social Science Perspectives on Electric Mobility, Smart Energy Technologies, and Energy Use in Buildings – A comprehensive Literature Review)[2], D3.3 (An Analysis of the Potential of Advanced Social Science Knowledge in Policymaking) and in-depth interviews conducted in six partner countries. The interviews consist of both focus group interviews and individual interviews, and cover formal social units, collective decision-making units, and

[1] https://www.echoes-project.eu

[2] https://www.echoes-project.eu/sites/echoes.drupal.pulsartecnalia.com/files/ECHOES_D3.1_literature_report_1.pdf

individuals in joint contracts. The next section will provide a comprehensive overview of the most important findings from the interviews. The overarching objective of ECHOES is to unlock the policy potential of an integrated social science perspective of socio-cultural, socio-economic, socio-political, and gender issues that influence individual and collective energy choices and social acceptance of the energy transition in Europe (see Figure 1.1). Hereby, ECHOES aim to foster the implementation of the SET-Plan actions and support the Energy Transition, as well as the decarbonizing of Europe's future energy system. ECHOES employ the innovative theoretical concept of "energy collectives" that covers determinants of energy choices from the individual level to formal social units.

This report is one of the deliverables of WP6. The focus of WP6 is formal social units acting as policymakers and/or energy providers, collective decision-making units, which are more formally structured and with relatively smaller information and power asymmetries, and individuals engaging in joint contracts:

Formal Social Units: decision-making units which act as policy-makers and/or energy providers, with a wider reach of influencing energy choice decisions

Collective Decision-Making Units: formally structured groups with relatively lower power asymmetries as compared with formal social units

Individual Consumers Engaging in Joint Contracts: individuals that engage in-group decision-making processes in energy choice behavior in order to increase their power of negotiation with other more formal bodies.

ECHOES analyses the impact of energy collectives in three technological foci: (a) smart energy technologies, (b) electric mobility, and (c) buildings. The three-fold technology focus is also reflected in the structure of the policy document analysis presented in this document.

The ECHOES consortium consists of 14 partners, comprising academic departments, research institutes and end-users. All types of partners were involved in the analyses presented in this report. The consortium also represents a wide geographical diversity, allowing us to tap into different dynamics of collective and individual energy choices, which is again reflected in the selection of policy documents analyzed.

1.3. Summary of the main findings

There are definitely overlaps between the three levels mentioned above in 1.2. At the same time, the differences between them are clear enough that for analytical purposes it is wise to distinguish them.

Formal social units consist of international, national and local policymakers and –implementers, such as the European Union, the various national authorities, local municipalities, and providers of energy and energy-related services. On this level, based on the data that we have accumulated from interviews and focus groups, we have chosen to highlight three areas that require greater effort, but also three areas that hold much promise in terms of policy recommendations. These are regulations and support schemes, cities and local governance, and public procurement. These areas all affect the three overarching technological foci mentioned above in 1.2. With respect to regulations and support schemes, there is no doubt that this is important, but that there however also are a number of problems. There is a gap between the various policy directives provided by the EU on the one hand, and

on the other the way in which individual member states implement them. Regulations are also often unpredictable because of their complexity, something which is a problem in a world that is rapidly changing, in particular within the field of energy. Thus, it is important that regulations are not unduly restrictive regarding how firms choose to reduce their carbon footprints. Subsidies may assist new technology in becoming profitable. However, it is also important that support schemes (for instance for electric cars), are kept in place only for as long as a technology is still young and immature, and phased out when market forces have developed to such an extent that the support schemes are no longer substantively needed.

Implementation is very often local. One encouraging development is the extent to which cities and local communities have forged ahead in terms of energy and climate initiatives. They are however often bound by a lack of autonomy, budget constraints, and a lack of necessary competence (especially in small communities). Many cities have voluntarily initiated programs that for instance encourage energy efficiency at the local level. Ensuring that cities and local communities have the ability and the capacity to lead is crucial. Thus, creating guidelines for local officials and providing information on best practices and courses for building local competence stand out as essential for cities and local communities to be successful in their work on energy and climate.

Another promising area with room for improvement is public procurement, as of 2016 accounting for 14 percent of EU GDP[3]. Here, the potential for improvement is potentially huge. In formulating procuring requirements, price should not be the single deciding factor. Instead, competitive tendering may be used to underline demand for low carbon or zero emission solutions in public procurements, "nudging" suppliers into providing such solutions. Procurement policies also provide an opportunity for new, green business to emerge. The material however also makes it clear that procurement policies is no magic wand. There is often a trade-off between extensively employed public procurement solutions on the one hand and the concern for reducing bureaucracy and simplifying regulations on the other.

Collective decision-making units comprise various business-related associations such as energy producer associations, consumer associations, commerce chambers, industrial chambers and organized industrial zones. These are often perceived as main drivers for innovative and forward-looking technological change. Our respondents suggest that sustainability measures are readily implemented when sustainability and business targets work in the same direction also on the firm level. However, when faced with direct regulations, individual firms will often comply only with the minimum standard to which they are obliged, and voluntary measures to increase sustainability are difficult to realize without losing competitiveness. However, corporate reputation is often a concern, particularly among larger companies, and may well lead larger firms to take stronger environmental measures than what is desirable from a purely financial perspective. In addition to this, and interestingly, industries and other collective decision-making units often advise politicians to impose strong regulations on industries as a whole, in a way that ensures fair and transparent competition between firms.

What we do however also find, is that there are major deficiencies to existing policies. Inconsistent and complex regulatory regimes prone to changing at unpredictable points in time, as well as regulatory complexity means that firms require specialized competence on the regulatory regime in which they operate, and very often for external legal competence. This is wasteful. Regulatory uncertainty, or political risk, with abruptly and erratically changing regulations add to the already substantial risk of investing in new clean technology. Thus, risk is transferred from the public to the individual firms, which is highly suboptimal. Perverse incentives are to a major extent hampering this transition. Removing these, such as subsidized energy or subsidized coal is crucial to a sustainable energy transition. From some of the countries involved in this study, a bias in the direction of large-scale producers was also emphasized, making it hard for smaller actors to enter the market and to challenge the incumbent firms. Thus,

[3] European Commission - Single Market Scoreboard - Public procurements 2016: http://ec.europa.eu/internal_market/scoreboard/_docs/2017/public-procurement/2017-scoreboard-public-procurement_en.pdf

policies directed toward risk reduction are very important to induce smaller firms to implement novel technologies. We did however also talk to respondents who advocated focusing the efforts on already existing clusters and industrial and technological ecosystems. To this train of thought, subsidies to start-ups and smaller firms might not reap the scale benefits of research. Thus, this is a complex area where it is easier to point out deficiencies in existing policies than to advocate a one-size-fits-all solution that resolves all problems. Our findings do however suggest that policymakers can facilitate the shift towards low-carbon solutions by providing prioritized and tailored support schemes, increased R&D expenditure, and the facilitation of joint networks such as industrial zones and chambers, as well as support for small and medium-sized enterprises (SMEs). We also suggest that policymakers to a greater degree should engage in dialogue with industrial experts, social partners and visionary pioneers to increase the awareness and knowledge about new innovations and the technological frontier.

When it comes to the third level, **individuals engaging in joint contracts** we clearly do not have as much data as we do for the two other levels. Individuals engaging in joint contracts is still a quite recent phenomenon, and one that is limited mainly to a couple of the countries included in this report. However, it is our belief that this is an area that will become ever more important in the future, and that individuals engaging in joint contracts is a very interesting area for present and future policy-making.

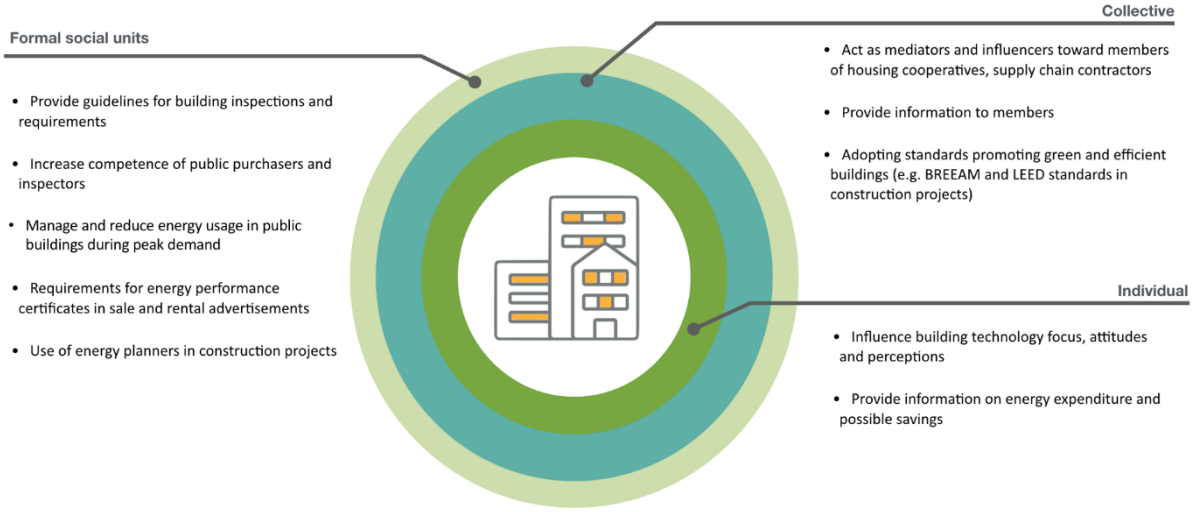
Consumers may be fundamental drivers in technological transition processes as they frequently have idealistic motives for their behaviour rather than mere financial ones. In cases where financial and environmental objectives pull in the same direction, consumers are fast to change behaviour and adopting new, sustainable technologies. This is especially so when incentives align with the personal values of the consumers. Examples that were mentioned in this respect were in particular electric cars and energy efficiency in buildings, allowing the consumer to both save costs and save the environment. Consumers are however in general more short-sighted than firms, and are discouraged from investing when up-front payments are too high. Thus, to a larger extent than for the other two levels, financial obstacles may prevent idealistic choices from being made. Still, as individuals' attitudes towards green technologies are often motivated by moral and normative judgements beyond pure self-interest, collective decision-making processes can sometimes enforce and benefit from altruistic motives to speed up costly transitions toward new technologies. Joint decision-making processes are, on the other hand often slow in nature. When individuals engaging in collective decision-making processes consider adopting new technologies, majority voting, or sometimes even unanimity, may impede the transition process, and they may be overruled by small minorities that find the new technology in question too risky. Most of the evidence for this comes from housing cooperatives, where there have been many examples of cooperatives very reluctantly spending money on necessary infrastructure for electric car charging.

For more detail on all of the levels, we refer the reader to chapters 4, where the three levels are described in detail and 5, which provides the conclusions to this deliverable.

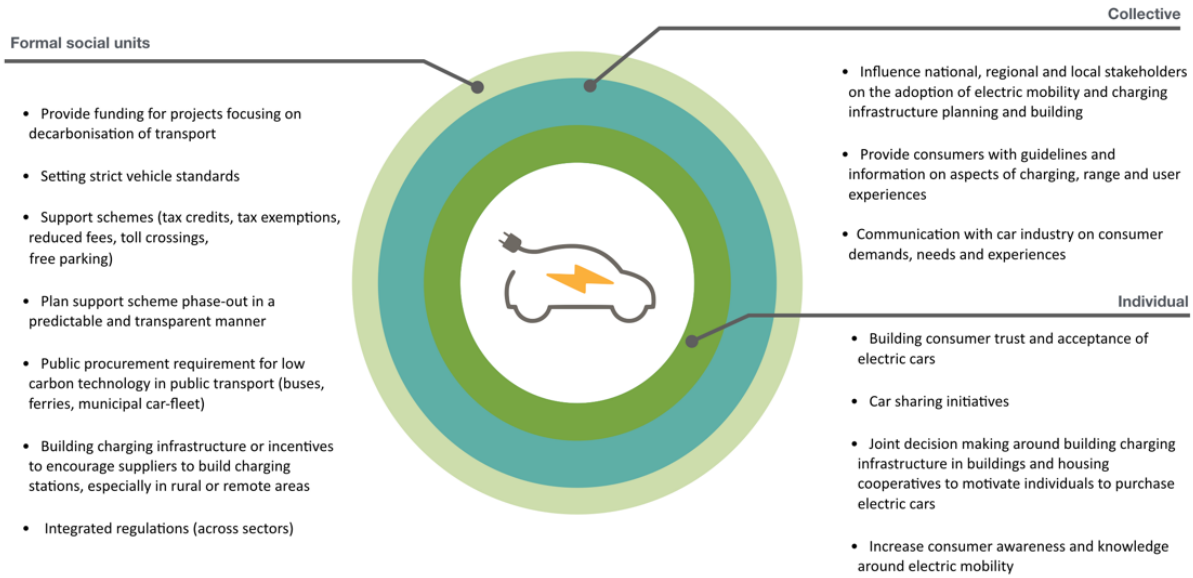
The following table summarizes the main conclusions from all three levels and technology foci (a fuller version of this table can be found in the conclusions chapter, section 5.5.):

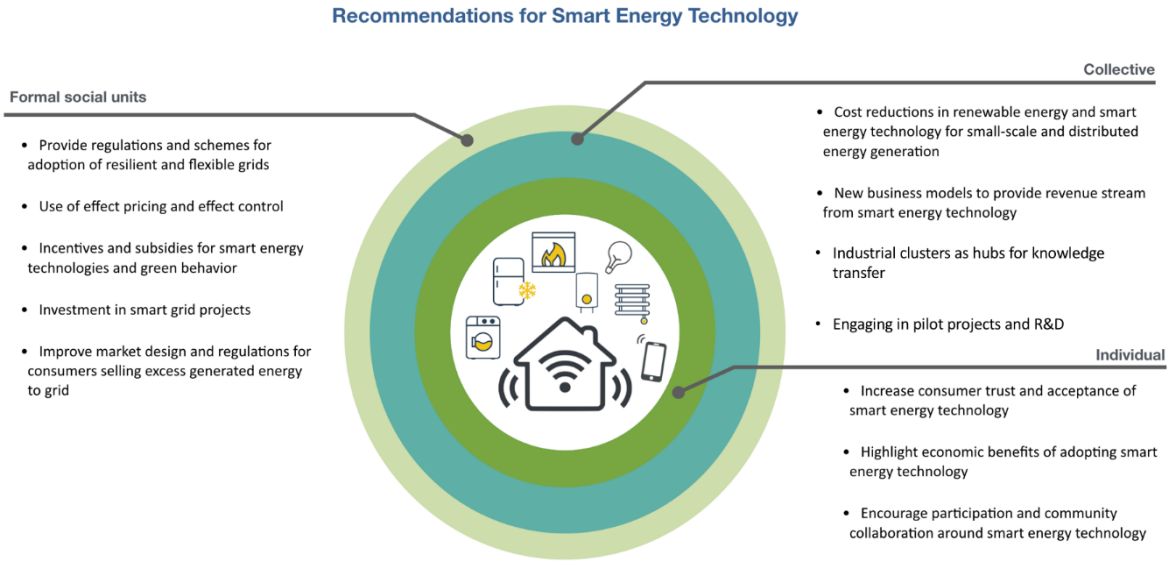
Decision-making units	Buildings	Electric mobility	Smart energy technology
Formal	• Provide guidelines for building inspections and requirements • Increase competence for public purchasers and inspectors • Manage and reduce in energy usage in public buildings during peak demand • Energy performance certificates • Energy planners in construction projects	• Funding transport decarbonisation projects • Setting strict vehicle standards • Electric mobility specific support schemes • Predictable support scheme phase-out • Requiring low-carbon technology in PP (buses, ferries, municipal vehicle-fleets) • Incentives for charging infrastructure (especially in rural areas) • Integrated regulations (across sectors)	• Resilient grids and flexibility • Effect pricing and effect control • Incentives for smart energy technologies and green behaviour • Investment in smart grid projects • Improve market design and regulations for consumers selling excess energy to the grid.
Collective	• Mediators/ influencers – to supply chain contractors and housing entities • Provide information • Adopting green construction standards	• Influencing national, regional and local stakeholders in adopting electric mobility and building charging stations • Association guidelines (charging, range, user experiences) • Communicate to car industry on consumer demands, needs and experiences	• Cost reduction in renewable energy and smart energy technologies for small-scale and distributed energy generation • Provide revenue stream from new business models • Industrial clusters as hubs for knowledge transfer • Engaging in pilot projects and R&D
Individual	• Influence building technology focus, attitudes, and perceptions • Provide information on energy expenditure and possible savings	• Building trust and acceptance • Car sharing initiatives • Joint decision making for charging infrastructure to motivate shift to EVs • Increase consumer awareness and knowledge	• Increase consumer trust and acceptance • Highlight economic benefits • Encourage participation and community collaboration

Recommendations for Buildings



Recommendations for Electric Mobility




Recommendations for Smart Energy Technology
Formal social units
• Provide regulations and schemes for adoption of resilient and flexible grids
• Use of effect pricing and effect control
• Incentives and subsidies for smart energy technologies and green behavior
• Investment in smart grid projects
• Improve market design and regulations for consumers selling excess generated energy to grid
Collective
• Cost reductions in renewable energy and smart energy technology for small-scale and distributed energy generation
• New business models to provide revenue stream from smart energy technology
• Industrial clusters as hubs for knowledge transfer
• Engaging in pilot projects and R&D
Individual
• Increase consumer trust and acceptance of smart energy technology
• Highlight economic benefits of adopting smart energy technology
• Encourage participation and community collaboration around smart energy technology

1.4. Methodology, organization of the report and introduction to the analysis perspectives

Below we present the methodology of the report. This concludes chapter 1. Following this, in chapter 2 we identify and discuss the relationships between the various stakeholders at the three levels. Chapter 3 is a review of EU policies on climate and energy in general and on the three technological foci more specifically. Chapter 4 is the main part of the report, analysing the three levels of formal social units: Part 4.1 looks at the formal social units, 4.2 collective decision-making units and 4.3 individuals engaging in joint contracts. Chapter 5 presents the conclusions.

1.4.1. Methodology[4]

WP6 of ECHOES aims to identify the drivers of energy choices and energy related behaviour within different forms and levels of formal social units including policy makers, energy providers, industrial consumers, and individual consumers engaging in joint contracts. In doing so, the package also intends to pinpoint the differences and similarities across regional, national and local entities in their energy choices and behaviour, as well as providing policy recommendations for each decision-making level. In this context, primary research methodology of WP6 proposed a combination of qualitative and quantitative inquiries to elaborate on the insights provided by the available literature. This manuscript is based on the qualitative part of the research in WP6, which uses focus groups and in-depth interviews, following a comprehensive and state-of-the-art literature review.

The use of qualitative techniques has been highlighted for the objectives of WP6, as these allow for deeper insights into human experience that pertains to energy related decisions and decision-making processes, particularly in regard to the low carbon energy transition. The reason for using a qualitative approach was to discover common and emerging themes, distinctive aspects, patterns, sequences and causal relationships, possible hierarchies and the general context of decision making processes in collective units, which could prove to be more difficult with quantitative means of assessment.[5] Moreover, because the study examined a sample from six different countries (and hence different socio-cultural contexts), "exploratory, fluid and flexible, data-driven and context-sensitive" nature of qualitative methodology enabled us to utilize a nonmathematical process of interpretation that was more advantageous in gaining a deeper understanding into our research questions.[6] Such an understanding of the drivers behind collective energy choices also helped develop deeper grounds for subsequent quantitative data collection stages.

In order to ensure a consistent interpretation and inclusion of the factors regarding energy decision-making processes, initial focus groups were conducted in six countries. The number of focus group studies totalled 15, which involved gathering selected individuals together in order to participate in a planned discussion that is intended to elicit perceptions and behaviours about a particular topic. Focus groups were deemed appropriate for collecting initial information about how decision making on low carbon energy consumption is realized in collective settings. To this end, each focus group accommodated members from a particular decision-making level.

Prior to the focus group meetings, Work Package Leader, Izmir University of Economics, developed a guideline to assist the project partners in conducting focus group studies, including the basics of focus groups, the roles of moderators, a general framework with sample questions, and other useful tips. The general framework of the focus group topics included the role of participants in low carbon energy transition projects and decision-making

[4] This chapter of the report is derived from the methodology chapter of Echoes Report 6.2 which was authored by the team at IUE. The qualitative data material generated for WP6 is the foundation for both Report 6.1 and 6.2, and the researchers have taken a similar approach in the analysis of the data.

[5] Strauss, A. and Corbin, J. (1990) Basics of Qualitative Research Techniques and Procedures for Developing Grounded Theory. Sage Publications: London.

[6] Mason, J. (2002) Qualitative researching. 2. edition. Sage Publications: London.

processes, as well as understanding the collective patterns that influence the perception of motivating factors and barriers in making these decisions.

Focus groups were conducted in Turkey, Bulgaria, Spain, Austria, Finland, and Norway, and were completed before the end of 2017. A summary of focus group characteristics is presented in Table 1.1. All focus groups were tape recorded upon written consent of the participants, and then transcribed. Focus groups were held in the language native to participants, while transcriptions were later translated into English for analysis.[7]

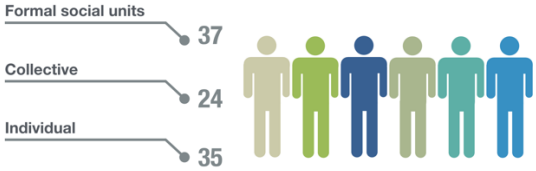


Table 1.1: A summary of focus group characteristics

Focus Group Code	Country	Decision Making Level	# of participants
FOGR1TRA	Turkey	Collective decision-making unit	6
FOGR2TRB	Turkey	Individuals engaging in joint contracts	7
FOGR3TRC	Turkey	Formal social units	10
FOGR4BGA	Bulgaria	Formal social units	6
FOGR5BGB	Bulgaria	Individuals engaging in joint contracts	6
FOGR6BGC	Bulgaria	Collective decision-making unit	6
FOGR7ESA	Spain	Collective decision-making unit	9
FOGR8ESB	Spain	Individuals engaging in joint contracts	10
FOGR9NOA	Norway	Individuals engaging in joint contracts	6
FOGR10NOB	Norway	Collective decision-making unit	3
FOGR11NOC	Norway	Formal social units	4
FOGR12FIA	Finland	Individuals engaging in joint contracts	6
FOGR13FIB	Finland	Collective decision-making unit	7
FOGR14ATA	Austria	Formal social units	4
FOGR15ATB	Austria	Collective decision-making unit	6

In order to further elaborate on the findings of the literature reviews and focus groups, we initiated the in-depth interview stage in the Spring of 2017. Similar to the focus groups, Izmir University of Economics, as the leader of the Work Package 6, first developed a semi-structured interview protocol with the general framework and sample questions for each technological foci, namely smart energy technologies, electric mobility, and buildings, and for each of the decision-making levels, namely, formal social units, collective decision-making units, and individuals engaging joint contracts, and circulated this among partners conducting in-depth interviews in their respective countries and settings. The protocol aimed to collect personal, demographic and professional data from the interviewees, their role in energy transition projects and decision-making processes, as well as understanding the collective processes that influence the perception of motivating factors and barriers in making these decisions. Similar to focus groups, the interviewees were first provided with brief information about the objective of the study and general framework, while their written consent was obtained for tape recording. Interviewees were assured of anonymity, through the use of pseudonyms, and an assurance that no other identifying information would be used

[7] All quotes presented in this report have been carefully transcribed and translated to English by members of the ECHOES research team or professional translators. The respondents have not quality checked the final result of this process, so any ambiguities and misunderstandings connected to the quotes from the respondents are under the responsibility of the research team.

in any publications or reports based on the interviews. In order to facilitate referencing, a labelling system of informants' pseudonyms, gender, country and decision-making level was used, as indicated in Tables 1.1 and 1.2.

Most interviews lasted between 45 minutes and 90 minutes, which was appropriate for collecting in depth information from participants. Interviewees came from a variety of backgrounds and were selected on the basis that they are experienced members and/or ultimate decision makers in energy transition projects in collective settings. Where appropriate, snowball sampling was also utilized.

By the end of 2017, a total of 67 in-depth interviews was completed in six countries identical to the focus groups. A summary of interview characteristics is presented in Table 2. Interviews were carried out in a language native to the interviewee, and a semi-structured interview guide was used with predetermined questions and script, by which improvisation was allowed for through follow-up questions to explore emerging topics. In case the respondents faced difficulty in expressing themselves, they were provided with examples from previous interviews in a manner that would not result in biased replies. Before finalizing the interviews, the participants were asked about the most notable topic discussed, and to think if there were additional points, they would like to add. After this stage, the interview was finalized.

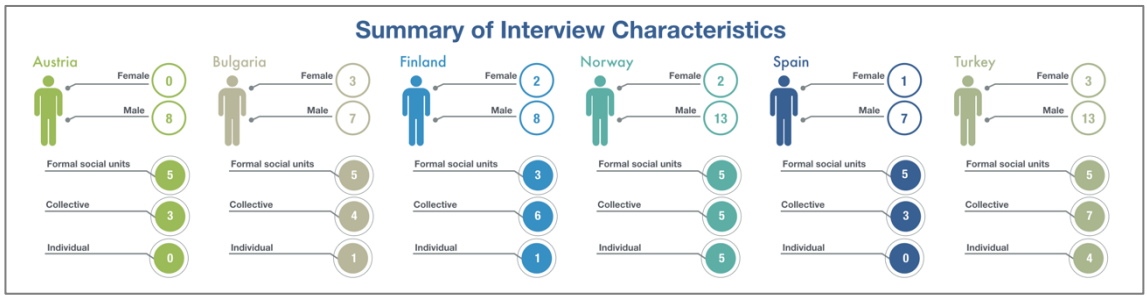


Table 1.2: A summary of interview characteristics

Interview Code	Country	Decision Making Unit	Role	Gender
IDIN1TRA	Turkey	Collective decision-making unit	Logistics Supervisor	Male
IDIN2TRB	Turkey	Formal social unit	Director of Social Studies and Projects	Female
IDIN3TRC	Turkey	Collective decision-making unit	Chairman of an Association in oil and natural gas industry	Male
IDIN4TRD	Turkey	Formal social unit	Representative from Metropolitan Municipality	Male
IDIN5TRE	Turkey	Individuals engaging in joint contracts	Head of Solar Energy Cooperative	Male
IDIN6TRF	Turkey	Collective decision-making unit	Industrial Engineer	Male
IDIN7TRG	Turkey	Collective decision-making unit	Portfolio Optimization Manager	Male
IDIN8TRH	Turkey	Individuals engaging in joint contracts	President of Dairy Cooperative	Male
IDIN9TRI	Turkey	Formal social unit	CEO of Transportation Company of Metropolitan Municipality	Female
IDIN10TRJ	Turkey	Collective decision-making unit	CEO of Energy Company	Male
IDIN11TRK	Turkey	Collective decision-making unit	President of an Association in wind energy sector	Male
IDIN12TRL	Turkey	Collective decision-making unit	Vice Chairman of Industrial Association	Female
IDIN13TRM	Turkey	Individuals engaging in joint contracts	Director of Housing Society	Male
IDIN14TRN	Turkey	Collective decision-making unit/ Individuals engaging in joint contract	Executive Board Member of Organized Industrial Zone	Male
IDIN15TRO	Turkey	Formal social unit	Mayor	Male

IDIN16TRP	Turkey	Formal social unit	Representative from Turkish Ministry of Energy	Male
IDIN17BGA	Bulgaria	Formal social unit	Chairman of Energy Agency	Female
IDIN18BGB	Bulgaria	Collective decision-making unit	Project Coordinator in environmental NGO	Male
IDIN19BGC	Bulgaria	Formal social unit	Director of R&D Construction company	Female
IDIN20BGD	Bulgaria	Individuals engaging in joint contracts	Entrepreneur in RES and farming	Male
IDIN21BGE	Bulgaria	Collective decision-making unit	Expert in consultancy services	Male
IDIN22BGF	Bulgaria	Collective decision-making unit	Partner in sustainable development advisory	Male
IDIN23BGG	Bulgaria	Collective decision-making unit	Member of executive board EV association	Male
IDIN24BGH	Bulgaria	Formal social unit	Major Administrator of State Agency	Female
IDIN25BGI	Bulgaria	Formal social unit	Director of Ministry's Directorate	Male
IDIN26BGJ	Bulgaria	Formal social unit	Political Decision Maker in Municipality	Male
IDIN27ESA	Spain	Collective decision-making unit	High-level representative of large carmaker	Male
IDIN28ESB	Spain	Collective decision-making unit	Head of Energy Efficiency	Male
IDIN29ESC	Spain	Formal social unit	Representative from Renewable Energy Technology Provider	Female
IDIN30ESD	Spain	Formal social unit	Director of Regional Energy Agency	Male
IDIN31ESE	Spain	Collective decision-making unit	CEO of Renewable Energy Company	Male
IDIN32ESF	Spain	Formal social unit	Director of a Spanish Utility	Male
IDIN33ESG	Spain	Formal social unit	Representative of a Regional Energy Agency	Male
IDIN34ESH	Spain	Formal social unit	Representative of a Regional Government	Male
IDIN35NOA	Norway	Collective decision-making unit	Representative of an Interest Organization	Male
IDIN36NOB	Norway	Collective decision-making unit	Energy and Industry Economist	Male
IDIN37NOC	Norway	Collective decision-making unit	Communication Manager and Advisor	Males
IDIN38NOD	Norway	Formal social unit	High-level official in Energy Ministry	Male
IDIN39NOE	Norway	Formal social unit	Architect/Planning officer in energy saving	Female
IDIN40NOF	Norway	Formal social unit	Director of Energy Department in Energy Agency	Male
IDIN41NOG	Norway	Collective decision-making unit	Representative from an energy association	Male
IDIN42NOH	Norway	Collective decision-making unit	Senior Advisor in electric car association	Male
IDIN43NOI	Norway	Formal social unit	Director of a company in the energy sector	Male
IDIN44NOJ	Norway	Formal social unit	Project Manager in county	Male
IDIN45NOK	Norway	Individuals engaging in joint contracts	Head of Housing Society	Male
IDIN46NOL	Norway	Individuals engaging in joint contracts	Head and Board Member of Housing Society	Males

IDIN47NOM	Norway	Individuals engaging in joint contracts	Head of Board of Housing Society	Male
IDIN48NON	Norway	Individuals engaging in joint contracts	Head of Housing Society	Female
IDIN49NOO	Norway	Individuals engaging in joint contracts	Head of Housing Society	Male
IDIN50FIA	Finland	Formal social unit	Director of Energy Organization	Male
IDIN51FIB	Finland	Collective decision-making unit	Representative from construction sector	Male
IDIN52FIC	Finland	Collective decision-making unit	Consultant in a building company	Male
IDIN53FID	Finland	Formal social unit	Director of an energy company	Female
IDIN54FIE	Finland	Collective decision-making unit	Director of a company in research and innovation sector	Male
IDIN55FIF	Finland	Collective decision-making unit	Representative from a company in energy sector	Male
IDIN56FIG	Finland	Individuals engaging in joint contracts	Representative from electric vehicle association	Male
IDIN57FIH	Finland	Formal social unit	Representative from Municipality	Male
IDIN58FII	Finland	Collective decision-making unit	Director of a foundation	Female
IDIN59FIJ	Finland	Collective decision-making unit	Policy maker	Male
IDIN60ATA	Austria	Formal social unit	Representative from municipality	Male
IDIN61ATB	Austria	Formal social unit	Representative from municipality	Male
IDIN62ATC	Austria	Formal social unit	Representative from municipality	Male
IDIN63ATD	Austria	Formal social unit	Representative from the department in Provincial Government	Male
IDIN64ATE	Austria	Formal social unit	Representative from Provincial Energy Agency	Male
IDIN65ATF	Austria	Collective decision-making unit	Representative from car sharing association	Male
IDIN66ATG	Austria	Collective decision-making unit	Energy manager in car sharing association	Male
IDIN67ATH	Austria	Collective decision-making unit	Owner of a renewable energy provider company	Male

Upon completion of the interviews, all voice data was transcribed and translated into English. Data analysis started with the compilation of more than a 1000-page corpus of text, consisting of 15 focus group and 67 in-depth interview transcriptions. During the analysis, we followed the guidelines by Strauss and Corbin (1990)[8] and Kvale (1996).[9] In this context, three researchers, to avoid any possible bias, carefully read all transcriptions, and they were systematically coded to discover key emergent themes relating to their experiences in the low carbon energy transition.

Following this, the first stage of the analysis included open coding, which was used to break down, conceptualize and code the data. The researchers in each country also provided a country insights paper based on the interviews they had conducted in their respective countries, following a template made by the WP6 leader at Izmir University of Economics. These insights were used as a supplement in the first stage of coding to assure that the in-depth knowledge from the researcher conducting the interviews was included to enhance the quality of our analysis. Each separate idea in the corpus was labelled and similar phenomena were grouped at this step, using freely assigned words or phrases, such as “the role of networks”, “the role of municipalities”, “market structures”, and “distribution

[8] Strauss, A. and Corbin, J. (1990) Basics of Qualitative Research Techniques and Procedures for Developing Grounded Theory. Sage Publications: London.

[9] Kvale, S. (1996) Interviews: An Introduction to Qualitative Research Interviewing. Thousand Oaks: Sage.

of costs". Once open coding was completed by each of three researchers, these codes were brought together to be processed for the second stage, which is called "axial coding". Here we categorized the codes into a set of main themes such as "Impact of multi-level governance", and "Technology and the energy transition", and here we also sorted sub-codes relating to the main emerging themes. Following this, the themes and codes were then cross-checked with the WP6 leader to make sure no significant theme was missing. Finally, we applied selective coding, where the core themes of data are identified and the whole corpus was re-read to extract quotations for the report.[10]

Due to the interpretivist nature of the research approach, triangulation was applied to ensure the validity and trustworthiness of the findings.[11] Triangulation may be achieved through a variety of means, such as merging primary data with secondary sources and field notes, including multiple researchers, or utilizing multiple methods for interpretation. Our triangulation approach included all these techniques, as we compared our interview findings with the available literature, focus group findings and interview notes, as well as having three researchers studying the same corpus of text individually.

[10] Braun, V. and Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative research in psychology*, 1, 77-101.

[11] Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for information*, 22(2), 63-75.

2. IDENTIFICATION OF STAKEHOLDERS

2.1. Definition of stakeholders

This section elaborates on the definition of stakeholders based on the established categories of decision-making units on the formal level in the ECHOES project. The mapping and description of stakeholders is based on previous document studies and work in ECHOES. It is verified as relevant and enriched by the empirical analysis conducted for this report. The section is organized across the three levels of decision-making units and three technological foci with a summary table of all stakeholder groups in the end.

2.1.1. Formal social units

Formal social units refer to decision-making units, which act as policy-makers and/or energy providers, with a wider reach of influencing energy choice decisions[12]. Examples of formal social units in this project are the EU, national authorities, counties, municipalities, energy providers, national regulatory authorities (NRAs), transmission system operators (TSOs) and power exchanges (PXs). As such, these stakeholders are important for the facilitation of a successful transition within all technological foci of the ECHOES project: smart energy technology, electric mobility, and buildings.

The EU is an important stakeholder that provides strategy documents and EU-directives that Member States and EEA countries implement into their national legislation. Counties and municipalities are first and foremost the levels of implementation for many of the energy-related policies and strategies. This means that they are in many cases the stakeholders that in practice determine the success or failure of any given policy initiative based on their ability to implement. The EU is perceived as a driver for the energy transition, with the possibility to impose external pressure other formal units such as national states.

Austria

The issue hasn't really gotten a boost because people are thinking "I have to solve a problem now and that is problem-solving solution for it", but simply because of the pressure that has come from outside Austria, for example, the EU accession and so on, and that has also arisen due to the legislation. The input, in terms of legislation at the EU level, has been received mainly due to the excellent networking of experts working in the area of energy. Interview Code (IDIN63ATD, M, Austria, Formal social unit)

Finland

Finland is specifically good at implementing but not so good at in committing themselves, and specifically not good at pushing new initiatives. I mean, we nicely implement international and EU level policies as they are, but we are not pushing more ambitious climate policy or new climate policy openings - this practically does not happen at all. In that sense, Finland is different from other Nordic countries. Interview Code (IDIN59FIJ, M, Finland, Collective Decision-Making Unit)

[12] ECHOES 2017 Report Social Science Perspectives on Electric Mobility, Smart Energy Technologies, and Energy Use in Buildings – A comprehensive Literature Review

Also for non-Member States such as Turkey, the EU can act as a motivational factor for energy transitions:

Turkey

One of the major motivating factors is the effort of adjustment to EU laws and legislations. Namely, the EU membership process has positive effects on attempts regarding energy implementations in Turkey. No matter Turkey is accepted to the EU or not, these procedures provide specific opportunities for Turkey. (…) The EU membership process and the relations with Western countries directly have positive impacts on steps taken for energy efficiency. For instance, Turkey's Natural Gas Market Law No.4646 is a well-prepared and EU-harmonized law. (...) The European Union countries attach importance to choosing conscious suppliers. As a neighbour country of EU, Turkey also has to act concertedly with EU laws, and it has to pay attention to choosing suppliers that prioritize environmental health and protection. Interview Code (IDIN3TRC, M, Turkey, Collective Decision-Making Unit)

Similarly, EEA countries such as Norway are affected by EU policies through implementation of directives. The EU acts as a driver towards energy transitions, although some respondents argue that EU policies and national policies are yet to be harmonized:

Norway

All those directives that comes from them [the EU], well we have to follow them and, they have helped us going in that direction, as a driving force. At least in getting some things on the agenda. Also, we have several challenges with the EEA agreement that our support schemes have to be ESA approved. So, there is a little barrier there, and it can actually be a though process to get the green light on some of it. Focus Group Code (FOGR11NOC, M, Norway, Social formal unit)

Other respondents report on the benefits of two-way policy processes and the importance of communication between the formal social units:

Norway

And it's not like that the whole EU customize its policy to Norwegian needs, but they listen to our experience with the energy market. It's inspiring and exciting, for then we are allowed to join in, to stake out a course, on the same basis with most of the other EU countries. Interview Code (IDIN38NOD, M, Norway, Formal social unit)

Other formal social units such as energy providers can be in the form of publicly owned power producers and district heating system operators that provide buildings with renewable power and heating, as well as private companies providing energy and energy services for customers and public actors. Transmission system operators are responsible for the transmission of energy within their given area, and for keeping a stable and secure electrical grid. For example, in the Nordic region, the TSOs are responsible for both security of supply and the high-voltage transmission grid. Power exchanges (PX) are exchanges where power is purchased on the spot market. PXs can also be linked up to several national and regional power markets, such as the Nordic power exchange Nord Pool or the European Power Exchange (EPEX SPOT SE). As such, all these formal social units are stakeholders that are heavily involved in the technological foci defined by ECHOES.

Buildings

The EU provides strategic documents and is actively influencing actors in the sector through several key directives, which will be elaborated on in chapter 3 of this report. On the national level, national authorities such as the departments of planning- and building, local- and regional development, housing and energy, serve as stakeholders, which are essential for facilitating the transition towards a low-carbon publicly owned building-mass, building- and construction supply chain and residential sector. Many of the aforementioned formal social units also play an important role towards realizing the potential for a lower overall carbon footprint in building and construction processes, such as the use of low carbon materials, through the implementation of strict technical construction and public procurement requirements.

Electric mobility

National, county and municipal authorities are involved in decisions around electric mobility in several ways. National policies and support schemes, such as tax credits, tax exemptions, reduced fees and trade tariffs are all examples of economic incentives intended to speed up the shift from internal combustion engine (ICE) cars to electric or hybrid vehicles. For public transport, counties and municipalities can use their public procurement power to set requirements for low carbon technology such as electric buses and ferries. National and regional authorities also need strategies and effective policies to roll out charging infrastructure in places where the market fails to build it, and at the very least assist suppliers with incentives to cover rural and remote areas for adequate charging infrastructure for electric mobility.

Smart energy technology

New technology provides a range of possibilities and new challenges for the operation and maintenance of the power grid for national regulatory authorities, TSOs and energy providers. As consumers and other power consuming entities create increasing demand for electricity, the grid needs to be ever more resilient and be able to handle increased loads and effect peaks. Furthermore, managing a grid with gradually more intermittent distributed energy sources (DER), such as solar and wind power, will likely see an increase in the use and need for demand flexibility. Regulatory authorities are also starting to engage and prepare measures to ensure that effect peaks are handled appropriately using effect control and effect pricing. Smart energy technology will thus play a major role in monitoring and facilitating an ever more intelligent and connected grid. Many of the formal social units are also essential stakeholders in the expansion of renewable energy sources, as in most countries renewable energy technology such as solar PV and wind still rely on public subsidies schemes.

2.1.2. Collective decision-making units

Collective decision-making units refer to more formally structured groups with relatively low formal authority and power as compared to formal social units. Examples of collective decision-making units in this project include energy producer associations, consumer associations, commerce chambers, industrial chambers, and organized industrial zones. However, they can act as important intermediaries between formal units and the individual level:

Turkey

X Association creates a connection between the public and private sectors with respect to the fact that private sector's practices are reflected to the public sector. In this sense, the public sector creates a draft to prepare a regulation on renewable energy resources, in particular for wind energy. While creating such a draft, X Association contributes to the public sector in receiving opinions from the private sector by organizing several workshops. As a non-governmental organization, we reflect our own opinions to the public sector in a similar manner to stakeholder involvement in Europe. Even though we have an interactive working structure with the public sector, the decision makers are the public institutions in determining regulations. We have cooperation with many other ministries including the Ministry of Energy and Natural Resources, the Ministry of Forestry and Water Affairs, the Ministry of Environment and Urbanization, the Ministry of Cultural Affairs, the Ministry of Economy, and the Ministry of Science, Industry and Technology. The major purpose of our association is to benefit from the wind energy potential in Turkey as much as possible owing to the fact that Turkey has a great potential for wind energy. Interview Code (IDIN19TRK, M, Turkey, Collective Decision-Making Unit)

Norway

We are a resource organization for climate solutions. So that means that we work for the approval of various climate solutions, first and foremost zero emission solutions or solutions that take us to zero emissions within all the sectors you mentioned. And renewable energy, we have been working a lot with that. (…) So on the general level we are working with all these fields [green certificates, buildings, electric mobility…] and we are working to bring up solutions, connecting actors that can realize them. That is, get business actors to order electric lorries/trucks, be part of an increased demand and build early markets in that way, these types of solutions. So, there is a lot of contact with politicians, decision makers in politics and the public administration, but also the business world. These are our main target groups. (...) We are trying to steer our work where we can have the greatest impact with respect to climate, that's our

intention. More towards technology shifts and the possibility for such than for instance pushing for the internal combustion engine to become marginally more effective (...) what we are experts at is the proposing policy instruments proposal that are politically feasible. And that's where we're trying to be. That is, we try to come up with proposals for instruments that are within the opportunity space of various parties. So, that's maybe how we have the largest impact. Interview Code (IDIN37NOC, M, Norway, Collective Decision-Making Unit)

For collective decision makers, several key factors can play a role in energy related decision-making for stakeholders. As will be elaborated on in the empirical analysis in chapter 4, these can be effective incentives, environmental concerns, confidence in business, local participation, and overall changes in the energy industry. Also, changes in policy targets and ambition, changes in public procurement requirements, new or changed support schemes, and effective pricing of negative externalities such as carbon emissions and other environmental hazards can all lead to changes in behaviour and decision-making among relevant actors.

Buildings

Building related interest groups play an important role as collective decision facilitators. They do this by working as mediators and influencers towards their members (e.g., housing co-operatives or supply-chain contractors) and the local, regional and national governments. Such groups produce important information and guidelines to members, other relevant stakeholders and policymakers, while at the same time enhancing environmental awareness for all actors involved.

There are several collective decision-making units involved in various parts of the value chain for buildings. These include stakeholders in the production of materials, construction and planning. Current technical construction regulations have to be followed by all projects. However, technology development is often far ahead of these regulations, and it is up to the various stakeholders to utilize such innovations in their projects. One example on technology that exceeds government regulations are building standards for green and more efficient buildings, with the most known standards BREEAM and LEED. Such standards enable buyers to select actors from the industry that provide stricter environmental and energy efficiency standards in their construction projects, e.g., when a municipality decides to build a new school.

Electric mobility

Electric car associations and related interest groups work closely with national and regional stakeholders to influence their commitments and support for electric mobility and charging infrastructure. At the same time, they are providing consumers and collectives with information, guidelines, data on key topics such as charging and range, and user experiences. These associations and interest groups also work and communicate with the car industry to relay consumer demands, needs and experiences.

Smart energy technology

Industrial chambers and clusters are constantly looking for new opportunities and provide innovative products and services in the new green economy. Thus, they can be essential stakeholders in promoting smart energy technology or infrastructure development for the smart grid. Some of the organized companies are also pursuing their own energy production. Cost reduction of renewable energy and smart energy technology (i.e.) can be important pre-requisites for off-grid solutions or micro-power production that is connected to the grid and can serve as a revenue stream from the excess power production. Industrial clusters can serve as hubs for knowledge transfer and joint engagement in pilot projects and other R&D endeavours, as well as regional positioning in an ever more competitive business world.

2.1.3. Individual consumers engaging in joint contracts

In this project, individual consumers engaging in joint contracts are defined as individuals that engage in group decision-making processes regarding energy choice behaviour, in order to increase their power of negotiation with other more formal bodies. Examples include associations of households and small company cooperatives. One examples of individual consumers engaging in joint contracts are housing cooperatives where 'the residents are shareholders, and each share gives the resident the right to live in the cooperative (apartment or house)[13].

Individual consumers engaging in joint contracts have the characteristics of both individual consumers and organizations. Joint decisions are usually made through a majority voting system, so the individual consumers' information, awareness, and attitudes towards energy efficiency play an important role in the joint decision-making process. At the same time, by engaging in joint contracts those consumers generally have better access to knowledge, are guided by board leaders, and benefit from better negotiation power with other formal bodies, such as energy and service providers. Some key variables influencing the energy transition of individual consumers engaging in joint contracts can be environmental awareness, economic incentives, social acceptance and other individual and demographic factors[14]. There are also a number of contextual factors that play an important role in those consumers' energy related decision making, such as market design, policy regulations and other social factors[15]. Those contextual factors influence decision-making through two mechanisms: first, through cost of, and access to environmentally friendly products; second, through affecting the attitudes, feelings, and personal norms of individual consumers. Therefore, to coordinate and harmonize policy regulation other support systems are critical for facilitating energy-related decision making for individual consumers in joint contracts[16].

Individual consumers engaging in joint contracts are related to all three technology foci of ECHOES. For example, housing cooperatives are among the main customers for sustainable building renovation and smart energy technology, and the individual house owners are the main customers for electric vehicles.

Buildings

Housing cooperatives, housing associations, condominiums, and small company cooperatives are highly relevant to the building technology focus, and their attitudes, perceptions, and behaviours regarding sustainable building practices play an important role in the decision process. On the other hand, lack of trusted information about smart buildings, and lack of information about energy expenditure and possible savings are the main barriers to more sustainable decision-making[17]. One example of individuals in joint contracts especially relevant for energy behaviour for buildings are housing cooperatives; legal entities where residents are shareholders in the cooperatives[18]. The highest authority of the housing cooperative is a general assembly that is held once per year. During the meeting, the residents elect the board members who are responsible for daily operations. Depending on the agreed latitude for the board members to make decisions on behalf of the residents, decisions regarding financial matters such as rehabilitation of common building mass or windows, change of energy or internet supplier

[13] Hauge, Å. L., Thomsen, J., & Löfström, E. (2013). How to get residents/owners in housing cooperatives to agree on sustainable renovation. *Energy Efficiency*, 6(2), 315-328.

[14] ECHOES 2017 Report Social Science Perspectives on Electric Mobility, Smart Energy Technologies, and Energy Use in Buildings – A comprehensive Literature Review

[15] ECHOES 2017 Report Social Science Perspectives on Electric Mobility, Smart Energy Technologies, and Energy Use in Buildings – A comprehensive Literature Review

[16] Hauge, Å. L., Thomsen, J., & Löfström, E. (2013). How to get residents/owners in housing cooperatives to agree on sustainable renovation. *Energy Efficiency*, 6(2), 315-328.

[17] ECHOES 2017 Report Social Science Perspectives on Electric Mobility, Smart Energy Technologies, and Energy Use in Buildings – A comprehensive Literature Review

[18] Hauge, Å. L., Thomsen, J., & Löfström, E. (2013). How to get residents/owners in housing cooperatives to agree on sustainable renovation. *Energy Efficiency*, 6(2), 315-328.

can be put to a vote during these meetings. Thus, these forms individual contracts are of particular importance for energy related behaviour for buildings. Most housing cooperatives are members of a local cooperative housing association, ex. TOBB in Trondheim, and OBOS in Oslo in Norway[19]. Among households who live in such housing cooperatives in Norway for example, 68 percent live in multifamily blocks, and 23 percent live in townhouses, chain houses, or other detached houses[20].

Electric mobility

Car sharing collectives, electric car associations, housing cooperatives/associations, and condominiums are involved in the electric mobility technological focus. Car sharing collectives and electric car associations are important driving forces in the spread of electric mobility technology and serve to increase consumer's awareness and knowledge about electric cars. Housing cooperatives/association and condominiums are also relevant, because charging infrastructure expenses need to be approved by joint decision, and the individual house owner is more likely to consider purchasing an electric car if existing charging infrastructure is already in place.

Smart energy technologies

Housing cooperatives, zero-emission neighbourhoods, condominiums and small company cooperatives can be identified as stakeholders involved in the smart energy technology focus. The most relevant hindering factor for individuals to adopt smart energy technologies is low consumer acceptance, which can be the result of lack of knowledge, short-term financial concerns, and low environmental awareness[21].Therefore, it is important for policy makers and technology providers to raise citizen and consumer awareness and acceptance of smart energy technologies. One interesting form of individual joint contracts in this regard are energy cooperatives in Turkey. Energy cooperatives are formal entities where local farmers, tradesmen and SMEs can become members by paying a participation fee and join forces to produce their own electricity. The business model of the energy cooperatives is self-sufficient electricity production for the members where surplus energy can be sold to the grid. The aim of promoting energy cooperatives is to popularize the use of domestic energy resources such as wind power, solar energy and biomass energy[22].

2.1.4. Summary: Identification of stakeholders for each technological focus

This section provides an overview of the stakeholders described above. While some of the stakeholder groups are naturally overlapping between the different levels (i.e. national authorities), others are more strongly connected to single technological foci (i.e. car sharing collectives). The tables below sum up the stakeholder groups according to their technological foci.

Table 2.1: Stakeholders involved in various building policy contexts

Formal social units	Collective decision-making units	Individual level units
EU	Interest groups	Housing associations
National authorities	Entrepreneurial actors	Housing co-operatives

[19] Hauge, Å. L., Thomsen, J., & Löfström, E. (2013). How to get residents/owners in housing cooperatives to agree on sustainable renovation. *Energy Efficiency*, 6(2), 315-328.

[20] Housing condition statistic in Norway, 2015 https://www.ssb.no/bygg-bolig-og-eiendom/statistikker/boforhold/aar/2016-09-29

[21] ECHOES 2017 Report Social Science Perspectives on Electric Mobility, Smart Energy Technologies, and Energy Use in Buildings – A comprehensive Literature Review

[22] *Turkish businesses to use electricity for free from energy cooperatives*: https://www.dailysabah.com/energy/2016/08/31/turkish-businesses-to-use-electricity-for-free-from-energy-cooperatives

Counties	Actors involved in materials	Condominiums
Municipalities	Actors involved in construction	Small company cooperatives
Energy providers	Actors involved in planning and concept development	

Table 2.2: Stakeholders involved in various electric mobility policy contexts

Formal social units	Collective decision-making units	Individual level units
EU	Interest groups	Car sharing collectives
National authorities	Electric car associations	Housing co-operatives
Counties	Actors involved in charging infrastructure	Condominiums
Municipalities	Actors involved in production of electric mobility related products	
Energy providers		

Table 2.3: Stakeholders involved in various smart energy technology policy contexts

Formal social units	Collective decision-making units	Individual level units
EU	Industrial chambers	Zero emission neighbourhoods
National authorities	Interest organizations	Housing co-operatives
Counties	Consumer associations	Condominiums
Municipalities	Organized industrial clusters	Small company cooperatives
Energy providers	Energy producers	Energy Cooperatives
National regulatory authorities		
TSOs		
Power exchanges		

3. CURRENT POLICIES[23]

This chapter presents relevant EU policies for the three levels of formal social units and technological foci. These constitute an essential basis for the policy recommendations together with the empirical analysis in chapter 4. The chapter elaborates on what types of policies exist in terms of legislative, political, financial and environmental policies[24].

3.1. A general overview of EU climate and energy policies

To avoid dangerous levels of climate change, the international community, including the EU, committed to a target of global climate change mitigation below 2 °C at COP15 in Copenhagen in 2009[25]. To contribute to this global goal, the EU has pledged to continually reduce the amount of GHGs it emits and to reduce these emissions by 80–90% by 2050 compared with 1990 levels. In 2011, the European Union published "A roadmap for moving to a competitive low carbon economy"[26] and the related document "Energy Roadmap 2050"[27]. Most of the EU member states have further established national low-carbon roadmaps and strategies.

The Europe 2020 Strategy[28] puts a clean energy transition as one of the top priorities of the European Commission. Its overarching target is *"…to deliver high levels of employment, productivity and social cohesion in the Member States, while reducing the impact on the natural environment*". The 2020 strategy includes eight ambitious targets in the areas of employment, research and development (R&D), climate change and energy, education and poverty reduction to be reached by 2020. The target for sustainable growth includes so-called "20-20-20" targets for GHG mitigation, renewable energy and energy efficiency. Thus, climate and energy policies contribute to the core objective of the Europe 2020 strategy of enabling sustainable growth.

The EU 2020 framework for climate and energy included several policy instruments to reach the "20-20-20" targets. The main policy instruments are the EU Emissions Trading System[29] (EU ETS) and the Effort Sharing Decision[30] (EDS). In addition to the EU ETS and EDS, the Renewable Energy Directive[31] (RED), Energy Efficiency Directive[32] (EED), Energy Performance of Buildings Directive[33], Ecodesign Directive[34], Energy Taxation Directive[35], and

[23] This chapter is based on ECHOES deliverble „D3.3 Policy Potential Analysis".

[24] See ECHOES deliverable "D3.3 Policy Potential Analysis" for a more comprehensive elaboration.

[25] UNFC (2009) United Nations Framework Convention on Climate Change, Copenhagen Accord, Copenhagen, United Nations, 2009. http://unfccc.int/meetings/copenhagen_dec_2009/items/5262.php

[26] European Commission (2011), A Roadmap for moving to a competitive low carbon economy in 2050, Brussels, 2011.

[27] European Commission (2011), 'Energy Roadmap 2050' (COM(2011) 885 final of 15 December 2011), Brussels

[28] European Commission (2010), Europe 2020 - A strategy for smart, sustainable and inclusive growth, (COM(2010) 2020 final), Brussels 2010. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:2020:FIN:EN:PDF

[29] See: http://ec.europa.eu/clima/policies/ets/index_en.htm

[30] *Council Decision 406/2009/EC* on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020. https://ec.europa.eu/clima/policies/effort_en

[31] Directive 2009/28/EC of the European Parliament and the European Council on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, 2009.

[32] European Commission, Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC. European Commission, Brussels, 2012, Art. 3.

[33] Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.

[34] Directive 2009/125 of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products.

[35] Directive 2003/96 of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity.

directives setting mandatory emission reduction targets for new passenger cars[36], light-duty vehicles and vans[37] have been implemented. The EU ETS is a market-based instrument to mitigate GHG emissions below the so-called EU cap and all the sectors (e.g. power and heat production, energy intensive industries, air transport inside the EU), companies, and other operators included in the EU ETS scheme need to buy emission allowances or reduce their emissions per each ton of emitted CO_2. There are, however, a few problems with the ETS. First, the excess quotas handed out at the beginning of the EU ETS as well as the resulting surplus created after the economic crisis of 2008-2009 still haunt the pricing mechanism and have thus led to an oversupply of quotas and consequent lower prices. As a result, the European Commission has issued both short-term and long-term measures to deal with this issue. As a short-term measure, the Commission has postponed the auctioning of 900 million allowances until 2019-2020. However, this back-loading of auction volume will not reduce the overall allowances during this phase, rather it will change the distribution over the period. As a long-term measure, the European commission has proposed and ratified a new mechanism called the Market Stability Reserve. It will ramp up the removal of excess quotas that will start operating in January 2019, and will, according to the Commission, address the current surplus of allowances. Furthermore, it will improve the EU ETS resilience and capacity to handle major shocks by adjusting the supply of allowances.[38]

Of the aforementioned directives, The Renewable Energy Directive is especially noteworthy because it introduced a new era in national supporting systems for renewable power, heat, and transport fuels. The Renewable Energy Directive, with its binding 20% renewable target for 2020, broken down into national targets, was a core element of the 2009 EU climate and energy package. To reach the binding RES targets, new state level supporting systems, like feed-in tariffs and green certificates, initiated massive investments in wind, solar, bioenergy and biofuels, have been implemented. The increased use of renewables is not only motivated by climate and other environmental impacts but also by its positive impact on regional economies and increased energy independence. Thus, a few important impacts of new supports should be mentioned, e.g. more expensive energy bills and price spikes in global food markets. The former raised concerns about "energy poverty" and the latter increased regulation on sustainability on producing so called first generation biofuels from agricultural products, like soya, maize, or other field crops, that could diminish the available land area for food production. To minimize the impacts of increased biofuel production to food and feed production, the shares of first generation biofuels were limited by the EU regulation to 7% of total biofuel use in transport (e.g. the above 7% shares were not calculated in the national RES targets).

Currently, the EU and its member states are in the process of establishing new climate and energy strategies and policies. The 2030 climate and energy framework was adopted by EU leaders in October 2014 and the EU's Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy[39], was introduced in 2015. It complements the existing climate change and energy governance up to 2020 and guides the development until 2030. In November 2016, the so-called 'Winter Package' was published stating the goal of "Clean energy for all Europeans". It can be considered a "jumbo" package as it includes eight legislative proposals and more than 70 different documents. This is the first time that citizens and social aspects are put in the centre of the EU level climate and energy policy. The vision is that citizens take ownership of the energy transition, benefit from new technologies to reduce their bills, participate actively in the market, and that vulnerable consumers are protected. It is stated that the package is based on energy security, solidarity and trust, and the 2030 policy

[36] Regulation 443/2009 of 23 April 2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO2 emissions from light-duty vehicles.

[37] Regulation (EU) No 510/2011 of the European Parliament and of the Council of 11 May 2011 setting emission performance standards for new light commercial vehicles as part of the Union's integrated approach to reduce CO2 emissions from light-duty vehicles.

[38] EU ETS Market Stability Reserve https://ec.europa.eu/clima/policies/ets/reform_en

[39] European Commission, A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy, COM(2015) 80 final, Brussels, 2015. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0080

framework includes real targets and actions to enhance consumer choices by giving more and transparent opportunities for civil society. It also contains a number of measures aimed at protecting the most vulnerable consumers.

The new climate and energy strategy has three overarching goals: putting energy efficiency first, enabling active consumers and global leadership on renewable energies, and sets three key targets for the year 2030: 1) At least 40% cuts in greenhouse gas emissions (from 1990 levels); 2) At least 27% share for renewable energy; 3) At least 27% improvement in energy efficiency. These 2030 targets are in line with the 2050 low-carbon GHG mitigation targets for the EU. The legislative proposals of the 2030 package cover energy efficiency, renewable energy, the design of the electricity market, security of electricity supply and governance rules for the Energy Union. The 2030 policy framework might be considered remarkable because for the first time, the EU has set its core to energy consumers by motivating citizens to participate actively in the market by investing to their own renewable energy production, and where vulnerable consumers are protected. However, the more traditional pillars, e.g. to ensure secure, sustainable, competitive and affordable energy are also in the heart of the policy framework. The burden sharing of the GHG reduction between the MSs is defined in the new Effort Sharing Regulation by following the same principles as in the 20-20-20 package, e.g. the national binding emission reduction targets in the non-ETS sector is defined according to the GDP/capita in the MSs, but this time ambition levels have increased to a much higher level (e.g. the maximum GHG reduction is 40% in the non-ETS). In addition, the Commission proposed a new way forward for 'Ecodesign' as well as a strategy for connected and automated mobility. However, promotion of electric mobility is only a part of Commission's Strategy for Low Emissions Mobility, adopted in July 2016[40]. During the year 2017, several new proposals were launched, including the Communication for a socially fair transition towards clean, competitive and connected mobility for all,[41] which notes that increased production and uptake of clean vehicles, alternative fuel infrastructure and modern system services making use of the data economy in the EU. This aims for all European citizens to benefit from safe, attractive, intelligent, seamless and increasingly automated transport solutions, which will provide industries with new sources of growth and competitiveness. In addition, the Commission has made a proposal for the update of the 2009 Directive on the promotion of clean and energy-efficient road-transport vehicles (known also as the Clean Vehicles Directive),[42] which introduces a common definition of clean vehicles based on an emissions-based threshold (tank-to-wheel) for light-duty vehicles, combining CO_2 and air pollutant emissions. It also proposes new public procurement practices especially for heavy-duty transport vehicles where no legislative requirement for reducing CO_2 emissions exists yet.

EUs overall strategy for Public Procurement,[43] which was adopted in October 2017, is relevant for this study, as at least three of the six policy priorities arguably can be related to stimulating the energy transition: (a) ensuring a wider uptake of innovative, green and social procurement (b) increasing access to procurement markets and (c) cooperating to procure together. An increased focus on innovative and green procurement should have a positive effect on the development and adoption of cleaner technologies. Making it easier for SMEs to bid on public procurement contracts may broaden the scope of possible solutions for enabling the energy transition. Thirdly, the EU Commission's emphasis on making it easier for contracting entities to establish joint purchasing agreements

[40] European Commission, A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy, COM(2015) 80 final, Brussels, 2015. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0080

[41] European Commission. Europe on the move. An agenda for a socially fair transition towards clean, competitive and connected mobility for all. Brussels, 31.5.2017 COM(2017) 283 final. https://ec.europa.eu/transparency/regdoc/rep/1/2017/EN/COM-2017-283-F1-EN-MAIN-PART-1.PDF

[42] European Commission. Proposal for a direcitve of the European Parliament and of the Council, amending Directive 2009/33/EU on the promotion of clean and energy-efficient road transport vehicles. Brussels, 8.11.2017 COM(2017) 653 final. https://ec.europa.eu/transparency/regdoc/rep/1/2017/EN/COM-2017-653-F1-EN-MAIN-PART-1.PDF

[43] EU Public Procurement strategy, adopted October 2017, http://ec.europa.eu/growth/single-market/public-procurement/strategy_en

may be expected to provide smaller entities with a possibility to overcome economical and competence related barriers towards the energy transition.

Coinciding with EUs new, overall strategy for Public Procurement, a reform of the EU rules for public procurement was introduced in April 2016,[44] also containing several elements, which should be considered relevant for the study in this report. One of these elements is the introduction of an entirely new procedure for public procurement, called Innovation Partnership. This procedure is aimed at stimulating the development and adoption of innovative solutions needed by public sector entities, but not currently available at the supplier market. Another example concerns the possibility to include new award criteria that (p.12): "…place more emphasis on environmental considerations", for example by requiring suppliers to base their bids on life cycle costing principles.

3.2. Policy for the three technological foci

3.2.1. Buildings

Buildings account for 40% of the European Union's (EU) total energy consumption. The sector is expanding and so are its energy demands, too. By limiting them, the EU will reduce its energy dependency and greenhouse gas emissions and advance towards its goal of cutting overall energy consumption by 20% by 2020. As a whole, EU legislation aims to improve the energy performance of buildings, accounting for energy used for heating and cooling, hot water, ventilation and lighting, whilst taking into account various climatic and local conditions.

The 2010 Energy Performance of Buildings Directive[45] and the 2012 Energy Efficiency Directive[46] are the EU's main legislation instruments covering the reduction of the energy consumption of buildings and completion of the goals related to the building sector. Under the existing Energy Performance of buildings directive, EU Member States must make energy efficient renovations to at least 3% of buildings owned and occupied by central government, and governments should only purchase highly energy efficient buildings. Each Member State must establish inspection schemes for heating and air conditioning systems, and a minimum energy performance requirement must be set to apply to new buildings, for major renovation of buildings and retrofitting of building elements such as heating and cooling systems, roofs and walls. EU countries have to draw up lists of national financial measures to improve the energy efficiency of buildings as well as long-term national building renovation strategies to be included in their National Energy Efficiency Action Plans[47].

With regard to private homes, energy performance certificates are to be included in all advertisements for the sale or rental of buildings. The prospective buyer or tenant of a building or building unit should be given correct information about the energy performance of the building in the energy performance certificate and practical advice on improving the performance. Information campaigns may serve to further encourage owners and tenants to improve the energy performance of their building or building unit. Owners and tenants of commercial buildings should also be encouraged to exchange information regarding actual energy consumption, in order to ensure that all the data are available to make informed decisions about necessary improvements. The energy performance certificate should also provide information about the actual impact of heating and cooling on the energy needs of

[44] EU Public Procurement reform: Less bureaucracy, higher efficiency, https://ec.europa.eu/growth/content/new-eu-public-procurement-rules-less-bureaucracy-higher-efficiency-0_en

[45] Energy Performance of Buildings Directive (2012) Available at http://eur-lex.europa.eu/legal-content/EN/ALL/;ELX_SESSIONID=FZMjThLLzfxmmMCQGp2Y1s2d3TjwtD8QS3pqdkhXZbwqGwlgY9KN!2064651424?uri=CELEX:32010L0031

[46] Energy Efficiency Directive (2012) Available at http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1399375464230&uri=CELEX:32012L0027

[47] European Commisson (2018) National Energy Efficiency Action Plans and Annual Reports.

the building, on its primary energy consumption and on its carbon dioxide emissions. All new residential buildings should be 'nearly zero energy buildings' by the end of 2020.

3.2.2. Electric mobility

Europe's transportation sector is also a key contributor to global climate change and local air pollution, and since 1990, the CO_2 emissions from European road transport have increased by 17%. Currently, transport is responsible for about a quarter of EU CO_2 emissions and contributes significantly to reduced air quality (particulate matter, NO_x, HC and CO) and related health problems, in particular in urban areas.[48] Based on a report by OECD in 2014, the number of deaths due to outdoor air pollution fell by about 4% in OECD countries between 2005 and 2010, while this number rose by about 5% and 12% in China and India. Therefore, governments are suggested to maintain strong regulatory regimes, particularly strict vehicle standards. Because of the enormous size of the economic cost of the health effects of air pollution, the benefits of reducing this economic cost could easily outweigh the monetary cost of investments in more ambitious programmes to reduce pollution.[49]

The European parliament and EU council directive on the deployment of alternative fuels infrastructure[50] states that a coordinated approach is necessary in order to meet the long-term energy needs of various transport modes. Policies on the EU and the Member State level, should build upon the use of alternative fuels according to the specific needs of each mode of transport. The European Commission should facilitate the development and implementation of national policy frameworks by means of exchanges of information and best practices between the Member States. Nevertheless, the directive on the deployment of alternative fuels infrastructure does not intend to place additional financial burdens on Member States, regional and local authorities. Thus, the directive is open to different types of implementation and a wide range of incentives (regulatory and non-regulatory) and measures in close cooperation with private sector actors. It is explicitly stated that private sector actors should play a key role in supporting the development of alternative fuels infrastructure. The development of new technology and innovation, in particular regarding decarbonisation of transport, is eligible for EU funding. Additional funding may be granted for actions that exploit synergies between two or more sectors, such as transport, energy and telecommunications.[51]

Electrifying transportation is seen as a key measure to reduce pollutant and greenhouse gas emissions from road transportation. It is also a key in the diversification of carbon-free and renewable energy sources in the transportation sector, which could help the European Union targets on CO_2 emissions reduction (ICCT white paper). Electrification of transport is a priority for several EU level initiatives such as the Community Research Programme, the European Economic Recovery plan (2008) and within the Green Car Initiative. According to the European Commission, the policy related to battery-powered vehicles is mainly focused on technological optimization and market development. Identified future challenges in this field therefore include charging infrastructure and plug-in solutions, improving battery reliability and durability, super-capacitors, reducing battery weight and volume, safety and cost reduction.[52]

---

[48] European Commission (2013a), Commission staff working document guidelines on financial incentives for clean and energy efficient vehicles.

[49] OECD (2014) The cost of air pollution. Health impacts of road transport. Available at: http://www.oecd.org/env/the-cost-of-air-pollution-9789264210448-en.htm

[50] European Commission (2014), Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32014L0094

[51] Regulation (EU) No 1316/2013 of the European Parliament and of the Council of 11 December 2013 establishing the Connecting Europe Facility, amending Regulation (EU) No 913/2010 and repealing Regulations (EC) No 680/2007 and (EC) No 67/2010

[52] European Commission, Clean transport, Urban transport. https://ec.europa.eu/transport/themes/urban_en

From 2009 to 2020, EU CO_2 standards will reduce average CO_2 emission values of new passenger cars by roughly 5% per year, and force new technologies (e.g., more efficient gasoline and diesel engines, electric powertrains) into the market. Norway, which is not a Member State of the EU, introduced a more ambitious CO_2 standard for new passenger cars in 2012 according to which new cars must on average not exceed 85g CO_2/km by 2020. In contrast to the EU-wide CO_2 standard, however, the Norwegian scheme does not stipulate fiscal penalties for non-compliance with these CO_2 targets. Acknowledging that the CO_2 regulations are not sufficient to ensure mass-market adoption, the EU's CO_2 regulation includes additional incentives to promote EVs. The two primary regulatory incentives used are (1) to count BEVs and fuel cell vehicles (FCVs) as 0 g CO_2 /km, and (2) to increase the weighting of each low emission vehicle in the calculation of average fleet emissions by using "super credits" or "multipliers". These incentives make the deployment of EVs more compelling from a manufacturer's perspective, although they introduce some risk of reducing the overall regulatory program benefits as the share of EV increases.[53]

The European Commission supports a 41.8 million Euros, Europe-wide electromobility initiative, Green eMotion, in partnership with forty-two partners from industry, utilities, electric car manufacturers, municipalities, universities and technology and research institutions. The aim of the Green eMotion initiative is to exchange and develop expertise and experience in selected regions within Europe and to facilitate the market rollout of electric vehicles in Europe. The Commission will make 24.2 million Euros available to finance part of the initiative's activities. The transport-related envelope under the European Structural and Investment Funds totals EUR 70 billion, which includes EUR 39 billion for supporting the move towards low-emission mobility. This in turn includes EUR 12 billion for developing low-carbon, multi-modal sustainable urban mobility. The Connecting Europe Facility offers EUR 24 billion. A significant portion of Horizon 2020's transport research and innovation programme amounting to EUR 6.4 billion is focused on low-carbon mobility.

The electrification of transport is part of the larger Smart grid transition. As such, part of the EU policy is a focus on digital technologies as having great potential for optimizing the transport system and opening up new opportunities for manufacturing and services. Digital technologies also support the integration of transport with other systems. In order for this to be successful however, regulatory frameworks that incentivize the development and market uptake of such technologies would be necessary. As would standards ensure interoperability across borders and ensuring data exchange and data protection.

Public procurement is identified as a powerful instrument to create markets for innovative products and it should be used to support take up of such vehicles. Since a significant part of public procurement is undertaken by municipal and local authorities, there is particular potential for public transport vehicles, such as buses, using low-emission alternative energies. To make such public procurement even more effective, the Commission is working on the revision of the Clean Vehicles Directive, which introduced sustainability obligations into public procurement in the EU. The options that are currently being assessed include broadening of the scope, more robust compliance requirements and procurement targets. Zero- and low-emission vehicles will need to be deployed and gain significant market share by 2030. To support the transition, incentives on both the supply- and demand-side will be needed through measures at EU level, as well as at Member State, regional or local level. There are no indirect or direct incentives to electrifying transportation on the EV level. However, a number of such incentives, both direct and indirect, work on member state or regional levels.

3.2.3. Smart energy technologies

Smart grids are considered an enabler for implementing key energy policies. In the 2030 policy framework context, smart grids are presented as the backbone of the future decarbonised power system and are recognised as a facilitator of the transformation of the energy infrastructure in order to accommodate higher shares of variable renewable energy, improve energy efficiency and ensure security of supply. Smart grids are energy networks that

[53] Uwe Tietge, Peter Mock, Nic Lutsey, Alex Campestrini (2016) White Paper.

can automatically monitor energy flows and adjust to changes in energy supply and demand accordingly. When coupled with smart metering systems, smart grids reach consumers and suppliers by providing information on real-time consumption. The idea is that with smart meters, consumers can adapt – in time and volume - their energy usage to different energy prices throughout the day, saving money on their energy bills by consuming more energy in lower price periods. Importantly, smart grids are also perceived as able to better integrate renewable energy and other smart technologies. Smart grids open up the possibility for consumers who produce their own energy to respond to prices and sell excess to the grid.[54]

In Europe, over € 5.5 billion has been invested in about 300 Smart Grid projects during the last decade. Around EUR 300 million have come from the EU budget, but the EU is still in the early stages of the actual deployment of Smart Grids. Smart Grids are expected to generate new jobs and bring additional economic growth. The smart household appliances market is projected to grow globally from $ 3.06 billion in 2011 to $ 15.12 billion in 2015. It is further estimated that expected investments are roughly 15% for smart metering deployment and 85% to upgrade the rest of the system.[55]

Following the energy market legislation in the 2009 Third Energy Package,[56] the EU has started a smart meters rollout programme, according to which the Member States are required to ensure the implementation of smart meters. Subject to a positive cost-benefit analysis, the countries' rollout target is to reach equipment of 80% of consumers with smart meters by 2020. According to a benchmarking report (EC, 2014b), as of 2014 the Member States have committed to rolling out at a total potential investment of EUR 45 billion, including 200 million smart meters for electricity and 45 million for gas. That would help to equip by 2020 almost 72% of EU consumers with electricity smart meters and 40% with gas smart meters. Currently, all but five (Belgium, Bulgaria, Hungary, Latvia and Lithuania) of the EU-27 Member States have established the legislation for electricity smart meters rollout in own scopes, including a legal framework, timeline and technical specifications.[57]

The European Commission's staff Working Paper on demand response flexibility[58] argues that Demand Response (DR) programmes increase consumers' active participation and distinguishes price-based and incentives-based DR programmes. The SET plan (EC, 2014d) proclaims encouraging people's pro-active position among its ten actions. Directive 2009/72/EC and Directive 2009/73/EC state the need for active customer participation, etc. Although not defined explicitly, this active participation and demand response are most likely seen to be managing consumption by shifting peak hours, or shifting consumption in general to a cheaper timeslot, decreasing consumption through changes in equipment and behaviour patterns, etc.

The European Commission's Communication in its action plan on making the internal energy market work[59] assumes enhancing effectiveness of regional Initiatives and increasing their contribution to the integration of the energy market as one of the keys to achieve the enforcement of the latter. The latest Proposal for the Directive on

[54] See: https://ec.europa.eu/energy/en/topics/markets-and-consumers/smart-grids-and-meters

[55] EC (2011) COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Smart Grids: from innovation to deployment http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1409145686999&uri=CELEX:52011DC0202

[56] EC (2009a) European Commision Recommendation of 9.10.2009 on mobilising Information and Communications Technologies to facilitate the transition to an energy-efficient, low-carbon economy C(2009) 7604 final

[57] EC (2014b) Benchmarking smart metering deployment in the EU-27 with a focus on electricity. COM(2014)356.

[58] Commission Staff Working Document. Incorporating demand side flexibility, in particular demand response, in electricity markets. Accompanying the document Communication from the Commission "Delivering the internal electricity market and making the most of public intervention". SWD(2013)442.

[59] EC (2012b) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Making the internal energy market work. COM(2012) 663 final

common rules for the internal market in electricity[60] tackles community energy, energy cooperatives and initiatives to increase engagement of the consumers (individually and as a group) on one hand, and to influence consumer behaviour on the other (e.g. through facilitating the uptake of new technologies and consumption patterns). The SET Plan (EC, 2014d) considers participation of communities in the energy transition and smarter energy system being important (e.g. for enhancing the technologies uptake). The policies recognize the power of collective social units to actively participate in the energy market.

Structural measures for customer engagement and activation, technologies adoption and benefitting from them constitute the base of the EU policies for smart technologies and smart metering. There are three main groups of structural measures mentioned in the documents. Economic measures are the most often mentioned instruments of influence and count multiple options. Fiscal incentives and subsidies assume that financial help can facilitate better adoption of the smart technologies and smart meters the costs of the purchase or use will decrease for consumers.[61]

Smart metering and smart grid development has raised concerns about data protection, security and privacy. In an effort to protect consumers' personal data when it comes to smart meters and smart grids, the European Commission recommends various data protection and privacy provisions. According to the European Commission's "Data protection impact assessment template for smart grid and smart metering systems" (2014), consumer personal data is protected by EU rules on the processing of data and on the free movement of this data. This Regulation sets rules on who can access personal data and under what circumstances. The European Commission also has guidelines for data protection and privacy for data controllers and investors in smart grids, and is working on rules on the exchange of data. These rules aim to "allow market players to access vital market information while guaranteeing a high level of data protection, privacy and security". The Smart Grids Task Force was set up by the European Commission in 2009. Its task is to advise on issues relating to smart grid deployment and development.

[60] EC (2016c) Proposal for the Directive of the European Parliament and of the Council on common rules for the internal market in electricity 2016/0380 (COD)

[61] EU (2013) Regulation (EU) No 347/2013 of the European Parliament and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure and repealing Decision No 1364/2006/EC and amending Regulations (EC) No 713/2009, (EC) No 714/2009 and (EC) No 715/2009.

4. POLICY RECOMMENDATIONS

This chapter forms the core of the empirical work of this report. Based on the text corpus provided by the focus groups and interviews, the following sections will analyse for each level of social units (formal social units, collective decision-making units, and individual consumers engaging in joint contracts) how the respondents perceive the context policies on different levels operate in, the objectives these policies have, choices that have led to policies and how they were designed, and how policy is implemented. This will be related to policy examples that came up in the interviews in the three technology foci of ECHOES (electric mobility, smart energy technology, and buildings).

4.1. Formal social units

Based on the empirical data from the analysis of the in-depth interviews and focus groups, the policy recommendations on the formal social units' level will focus around three main areas. **Regulations and support schemes**, **cities and local governance**, and **public procurement**. These were recurring themes in our analysis and will be presented in this chapter addressing the formal social units level as well as relating them to each technological focus area. Given the differences in terms of the energy transition and the different geographic, demographic, economic and climatic conditions in the European Union and associated countries, some country-specific and country-technological examples will be highlighted, although country-specific issues are of secondary concern and not the main aim of this report.

4.1.1. Policy context

Regulations and support schemes

In order to have a successful energy transition, the focus on harmonizing regulations and frameworks is seen as one of the biggest measures the European Commission can implement, making regulations more predictable for all affected stakeholders, yet flexible enough not to hamper progressive and innovative stakeholders that wish to challenge themselves to produce and use new and cleaner solutions. The need for integrated approaches is also seen as one of the most important measures to deal with an increasingly complex world. This also means that transparency is more important than ever before, especially addressing the question around vested interests in both the political and the industrial system.

Regarding support schemes and general climate policy concerns, this report highlights the need for several policies and support schemes working in conjunction to produce the desired outcomes. While cost-effectiveness is a desired characteristic, other policy goals such as competiveness of industries, carbon leakage, and employment lead to a patchwork-approach that might not be as cost-effective as desired but provides the system with an opportunity space for new solutions to grow. As innovations and substitutes for polluting products or services emerge, it progressively lowers the bar for the political system, and the acceptance for such measures, to increase the stringency level of these market-based instruments, such as the EU ETS and other forms of carbon pricing without being severely at odds with industrial policy and issues around employment. In order to facilitate and encourage more environmentally friendly decision-making the proper use of public support schemes should revolve around a mix of early support and risk-management for new cleaner solutions and providing the right incentive structure for consumers that removes some of the early cost difference between these new solutions and their pollution counterparts. As these products and solutions become cheaper, public support should be phased out, in a predictable manner as market-forces take over, thus freeing up public support for other solutions that need support.

Cities and local governance

Cities and the local administrative level are identified as one of the most important impact areas for a successful energy transition. Cities are well positioned to take a leading role in many of the potential areas where new solutions and services will be needed. Local governance in general, is perceived by many as the main arena for energy-transition related decision-making. Also, while policy-making is often national, or as in the EU case supranational,

implementation very often remains local. Given the different structure and culture of various political systems, many local administrative officials deal either with a large degree of decision-maker freedom with relatively high autonomy, restrained only by budget constraints or ambitions to systems where local officials have heavy top-down control measures and restraints enforced on them, and are thus at the mercy of national or regional politics and their ambitions relating to the phase of the energy transition. Both systems have their strengths and weaknesses and as such must be addressed accordingly. The local administrative level, in most cases here, the municipality is in many places a real driver for the energy transition, within all of the technological foci.

Public procurement

As cities and the local administrative level are viewed as essential areas where energy transition-related decision-making is happening, the analysis highlights public procurement as one of the most powerful instruments these administrative officials have in their toolbox towards shifting to a low-carbon economy. The use and improvement of the public procurement process is a potent tool for driving demand for sustainable solutions and the shift to a low-carbon economy. In 2016, public procurements, that is, the buying of works, goods or services by public bodies, accounted for around 14% of EU GDP.[62] Thus, the potential for improvements in terms of focusing public procurement processes and process innovation and the shift towards demanding low-carbon solutions from the suppliers are potentially huge. Building better general guidelines, capacity and expertise at the local levels enables knowledge-based decision-making. This in turn creates an environment where local, regional and city administrative officials have the capacity and expertise to create public procurements that are constructed in a way that they can be decided on price alone, simply because the auction requirements are formulated in a way that facilitates low-carbon solutions and services. The public procurement process is seen as a pivotal tool in order to facilitate the energy transition in all the technological foci and can under the right circumstances create new markets for cleaner solutions as well as lead to new green business opportunities for business. The recent reform of the EU public procurement rules and regulations, as well as the newly adopted overall EU strategy for public procurement would seem supportive in this context.

4.1.2. Policy objectives and policy choices

Regulations and support schemes

One of the main goals of climate policy is to provide cost-effective measures in order to reduce greenhouse gas emissions. In Europe, this has generally translated into a focus on market-based instruments such as carbon pricing. In theory, such approaches provide the most cost-effective way to reduce emissions and are often referred to as the "polluter pays" principle. However, as nations seek to reduce emissions, other policy goals, such as competitiveness for national industry and employment, conflict with emissions goals, making it politically and economically difficult to implement these policies in such a measure that they actually have an impact. Thus, policy-makers have to balance several of these goals and routinely end up with a patchwork of instruments. As several respondents put it:

Norway

The European Union has built up some ground pillars in its policy on climate and the energy area, where you have the quota system ETS, where they have tried to make sure that it is adapted properly; don't make it too tight, don't make it too wide, in order to safeguard the competitiveness of European industry. If you make it too tight you quickly get carbon leakage, so the industry moves off to other countries with less restrictive climate policy; Asia, China, and so on. Interview Code (IDIN38NOD, M, Norway, Formal Social Unit)

[62] European Commission – Single Market Scoreboard - Public procurements 2016: http://ec.europa.eu/internal_market/scoreboard/_docs/2017/public-procurement/2017-scoreboard-public-procurement_en.pdf

Norway

So, if you get in place a market-based approach, where it in fact, for example, costs an awful lot to emit CO_2, and one does not stimulate in different ways to the use of fossil energy, then I think you can get very far. But as you guys are probably very aware of; there are an awful lot of industrial-political challenges with respect to this, and that is– we think and firmly believe that we know, really, that – much of the reason why the European Union has selected several instruments – that one chooses to subsidize renewables, because it's more industrially-politically acceptable. Interview Code (IDIN41NOG, M, Norway, Collective Decision-Making Unit)

However, the cornerstone of EU climate policy is still the European emission trading systems (EU ETS), and it covers about 45 percent of greenhouse gas emissions in the 28 EU countries plus Norway, Liechtenstein and Iceland,[63] with Switzerland linking up their own emission trading system to the EU ETS following an agreement in late 2017.[64] As a tool for cost-effective reduction of greenhouse gas emissions, most respondents also echoed the sentiment that the EU ETS is one of the most important ways for the EU to combat emissions. However, they were equally disappointed with the state of the emissions quota price stating several key problems that need to be addressed in order to establish an impactful and efficient system:

Norway

The price to emit is far too low. And this is what it is all about, and this political dance that made far too many quotas available so that there always is a surplus…this thing with the emission quota system is very demanding. Focus Group Code (FOGR11NOC, Norway, Formal Social Unit)

One respondent pointed to the need for supporting polices in addition to the EU ETS to produce the desired outcomes and trigger new technological solutions:

Norway

We relate strongly to the quota market, but in a way that we…it's not a tool that we want to eliminate, but we can clearly see that it has its flaws. That's where we play a vital role in Norway to strengthen the policy instruments within the sectors or the emission sources that are included in the quota system. It's like that as an industry, it is particularly on the technology side that it is inadequate…that the quota system is incapable as of today to trigger major technology solutions. (..) the most important feature is that the price is too low, but it had, what can I say, it would have been more effective if from the start you had cut the number of quotas faster (...) now, in a way, if there is an effect from it, it comes at the very end, right. And that's kind of a risky and potentially quite expensive way to reach the target. (...) In the EU context it is clear that the more one can tighten it, and the tougher you get, the greater the effect will be. But then there is political opposition among the Member States of the European Union. Pace is not as fast as it has to be if we are to avoid harmful climate change. Interview Code (IDIN37NOC, M, Norway, Collective Decision-Making Unit)

Several of the Norwegian respondents also highlighted their disappointment with the effectiveness of the EU ETS and that it has to be backed up by less cost-effective solutions:

Norway

Yes, I am disappointed with the EU ETS, I guess. That it is an effective tool that works, but is not allowed to work. I: Do you have any thoughts about that why it hasn't worked that well? (…) The issue, I think, has to do with the allocation effects between countries. It's not made controllable, in a way. So, it is difficult for countries to agree about this because they don't know entirely beforehand how it is going to turn out in each country. So, if you are in Germany, and there is a risk that the windmills will be built in the Nordic region and the solar panels will be built in Spain, and nothing happens in Germany, then you will be a

[63] EU ETS: https://ec.europa.eu/clima/policies/ets_en

[64] EU and Switzerland sign agreement to link emissions trading systems: https://ec.europa.eu/clima/news/eu-and-switzerland-sign-agreement-link-emissions-trading-systems_en

little skeptical, right. But there is no doubt that it is the most effective instrument. Interview Code (IDIN43NOI, M, Norway, Formal Social Unit)

Norway

It's "counterproductive" because you have instruments and measures that do harm to each other. It is sort of a patchwork of instruments. For example, in Germany: they won't make their CO_2 targets, and are burning brown-coal. What works is a carbon price that really bites. That would have resulted in a far more effective solution and actually more solutions. Would also lead to getting wind development where there is wind and solar where there is sunshine. Interview Code (IDIN43NOI, M, Norway, Formal Social Unit)

In the power sector in particular, one respondent pointed out that renewable energy subsidies or support schemes, like the German feed-in-tariffs, have had a greater effect on the emissions in that sector than the EU ETS:

Norway

And so, there are some problems at least with the power industry, i.e. a quota sector. Then we have the economists that keep saying that "Yes, we have gotten it [the system] to work, we have managed to get emissions to go down." Yes, emissions have decreased, but not at all because of the quota system, but because we have subsidized renewables. To a very great extent it is the German subsidies for solar and wind that has led to cost having been reduced so dramatically. Interview Code (IDIN37NOC, M, Norway, Collective Decision-Making Unit)

Several respondents highlighted the need for the EU and national governments to focus on harmonizing regulations and frameworks, looking especially at predictability and flexibility. Looking at regulatory differences:

Spain

I: So, you would say that even within the European Union there are regulatory differences?

R: Yes, yes, this example I tell you about, the ISO 50001 (Energy management system), for example, we also see this a lot in Portugal, where they push it a lot, they are very tight with regard to energy efficiency issues. Then, on the other hand, in this country they also have a lot of subsidies, so we see that the Portuguese plants are doing a lot of things, because, on the one hand they [the regulators] push heavily, but on the other side also, they subsidize 50% of investment, which makes this a much more attractive issue. (…) in Spain, it recently became mandatory that all major companies of I do not know exactly how many employees have to have an energy efficiency audit, which is a regulation coming from the European Union, and in Portugal they had already implemented this for years. Interview Code (IDIN28ESB, M, Spain, Collective Decision-Making Unit)

Several respondents pointed to how this is not easy in practice, and how different EU countries constantly defend their rights to make decisions themselves:

Finland

The constant set-up of the EU member countries versus EU. That is, the member countries are defending their rights to make decisions themselves, and, of course, the EU as an institution aims at harmonization of decision-making in every possible way. In the energy world, individual actions and efforts have for one reason or another been allowed, despite the fundamental fact that the EU was built up for common rules and free movement of products and services. The energy sector has not prioritized that, implying that it is against the elementary rules of the EU. Perhaps it reflects the somewhat special nature of energy. Interview Code (IDIN50FIA, M, Finland, Formal Social Unit)

They also pointed out that the level of urgency for change is low, even though overall plans are in place:

Finland

The first thing is to perceive the level of urgency – this is usually not understood. In the EU, we are still living in the year 2008, e.g. when the EU 2020 climate and energy package was approved. That time the basic framework for actions were established. Then we also have this strange 80-95% GHG mitigation target for 2050, which is not at all in line with the Paris Agreement. And Finland is such an executor

Finland

country, which nicely accepts the commitments stated from outside, and then nicely puts these into practice in Finland. Then we read from the EU papers that [the targets are] 80-95% [by 2050] and 40% [by 2030] and thus have the illusion that we have this all in our hands rather well, and our strategies are in line with these [targets]. Then nobody remembers to read the Paris agreement, which states "well below 2 degrees", e.g. we are targeting 1.5 degrees, and in that respect, all these numbers need to be totally revised - this is not understood in Finland. Interview Code (IDIN59FIJ, M, Finland, Collective Decision-Making Unit)

Furthermore, the respondents pointed out how associate countries like Norway have to go another round of negotiation after the EU countries have decided, and this takes a long time:

Norway

But the EU-side is committed to talk to us about these things, but the processes can take a long time. And then we have to safeguard Norwegian interests, and that's when we need to try to get the EU to understand that we have the same interests – that is, an effective energy system and reduced greenhouse gas emissions – but it may be that our instruments should be a little different than what directly follows from the directives. Interview Code (IDIN38NOD, M, Norway, Formal Social Unit)

Another area of regulations that needs attention has to do with regulatory frameworks and market design addressing new issues around the emergence of the prosumer, and collective and other small-scale power producers. This will be addressed further in chapter 4.3.

Furthermore, a point was made about the directives and EU policies, regarding unintended consequences that in some cases have severely hampered some countries' ability to reach overall EU targets.

Finland

The compensation system of [costs due to EU] emissions trading for industries and transferring new operations to the lower energy tax tariffs, energy support for agriculture has been increased (…) and in practice this supports imported fuel oil. Now I forget something, but anyway here are some examples, which shows that we have moved in totally the opposite direction of what we should have. Interview Code (IDIN59FIJ, M, Finland, Collective Decision-Making Unit)

Another recurring theme in the data material is the need for more integrated approaches. As the interconnectedness and complexity of systems increases dramatically with technological advances and digitalization, classical silo-thinking is no longer an adequate in order to have a successful transition.

Turkey

The transportation sector in Turkey does not have any efficiency criterion because the Ministry of Energy does not deal with the transportation sector. It is thought that the efficiency in the transportation sector is regulated by the Ministry of Transportation. However, the Ministry of Transportation does not take any step regarding energy efficiency. (…) The Ministry of Energy does not have any authority in transportation and traffic signalization. (...) every different ministry deals with different subjects. For instance, the Ministry of Energy and Natural Resources does not dictate anything about the environment. Instead, it develops policies so that the power plants can operate with the most suitable equipment for the environment. On the other hand, the Ministry of Environment does not aim to change the carbon emission levels. It tries to produce equipment in accordance with carbon emission standards. Contrary to Northern Mediterranean countries, the ministries in Turkey are more consistent in their policies. Interview Code (IDIN16TRP, M, Turkey, Formal Social Unit)

Austria

Recently, for example, we talked to the department that manages the city's plots of land. You might think that this has nothing to do with Smart City, but it does have something to do with it, because you can consider setting certain conditions for the sale of land. This is extremely difficult from a legal point of view, but one can discuss it. And when you point out the Smart City strategy, people are often more open and willing to discuss the topic, which was not the case in the past. In the past, these departments would have

thought that they weren't involved in the issues of energy and energy criteria at all. So, it's just easier to get involved in processes and conversations and discussions about the energy transition. This is my view and also the framework that is laid out in the city. Interview Code (IDIN60ATA, M, Austria, Formal Social Unit)

Austria

The second thing that is relevant in terms of energy is the transport sector, and we have seen this from an interdivisional perspective from the outset. Mobility is often considered from a perspective outside of energy. Fortunately, it is included in the climate protection programme. The advantage here was that climate protection is anchored in the [responsible city department], which has integrated mobility into its strategies. Interview Code (IDIN60ATA, M, Austria, Formal Social Unit)

Norway

D: It creates increased room for maneuver in that we are more focused on these things, for instance, what environmental criteria we have to look for when we do procurements and we need to have more expertise to be able to consider these criteria's as well.

B: and set them in the first place.

D: And to set them, yes. And I see that the biggest challenge, and the most important is to get all the players involved, not only those who do the purchases within an area, but the Environmental Unit in the municipality that should be able to give advice to those who are working with purchases and they need to get more expertise on the legal possibilities there. Focus Group Code (FOGR11NOC, Norway, Formal Social Unit)

In general, several respondents pointed out that one of the biggest and most hampering issues for a successful energy transition is the way in which the political system is set up. The political opposition is against policy proposals just for the sake of being against, as some respondents point out:

Norway

R3: There is something about the periods that politicians are elected for that dictates how long-term and strategic you are going to be because of the four-year perspective and things like that. R2: And it has been like this in the last few years that the Conservative party and the Labor party have in a way decided that they have to be opposed to one another, so then the two largest parties by definition have to disagree. Focus Group Code (FOGR11NOC, Norway, Formal Social Unit)

Bulgaria

I feel oppressed by the political situation in the country – even if there are meaningful proposals, the political opposition is usually trying to push them down, simply because the proposal does not come from them – and that should not be so. Interview Code (IDIN18BGB, M, Bulgaria, Collective Decision-Making Unit)

The detrimental short-termism and length of election cycles also lead in many cases to discontinued policy, thus leading to a felt sense of unpredictable regulatory frameworks. Therefore, finding areas within the energy transition that most parties can get behind is seen as an increasingly important aspect of the political system. Without broad political coalitions and broad acceptance, progress and policies are at the mercy of the next political elections and its outcome, this again leads to less predictability and uncertainty for stakeholders and businesses that are willing make bets on the low-carbon economy.

In Finland, peat has been a controversial topic and has led to an unpredictable environment for stakeholders:

Finland

Then we have peat, which is our national disgrace – if we had succeeded in decreasing the use of peat, then we Finns would have been on a much more solid ground already now. For this, political situations have had a great impact. During the time I was acting in the Governmental party, the Government decided to decrease the use of peat and to cut down subsidies for peat. The next Government cancelled these

decisions and we moved back to the old situation. However, probably the greatest disappointment is more general and principal. Interview Code (IDIN59FIJ, M, Finland, Collective Decision-Making Unit)

Others pointed out that some politicians changed their stance on issues depending on whether they were in the opposition or in the government, leading to mixed signals and difficulty in creating long-term predictable policies:

Spain

Maybe the biggest disappointment is the reaction of politicians in general. You can never generalize, because there are some politicians, with whom I have a great relationship, but, it is desperate; there is a desperate lack of capacity in decision-making, in general, the lack of being able to commit to something in the long run. The way, in which they change their criteria, especially when they move from opposition to government. How people you talked to when they were in the opposition suddenly become airtight when they are in government and do not want to listen to anyone. Well ... this may be the worst part of all this experience. Interview Code (IDIN31ESE, M, Spain, Collective Decision-Making Unit)

They pointed out further that politicians are very afraid of making unpopular decisions:

Austria

If one attends these meetings, and someone mentions the transportation sector, everyone is frightened, politically, to take any measures that might not be popular, and then the issue of e-mobility is immediately brought up, as a kind of magical cure that will fix everything. However, I honestly do not believe that every car journey that is currently being made with a petrol- or diesel-fueled car will be replaced 1:1 by an electric vehicle. I don't think this is going to happen. At least not to the extent that you'd expect. It will gain you a few percentage points, but not as many as we would need. Interview Code (IDIN61ATB, M, Austria, Formal Social Unit)

A successful strategy however, has been to come to consensus on a few main policies that will then have a strong foundation. Thus, in some few areas, such as the electric car policy in Norway, it has been possible to reach a consensus across party lines. This makes policy far more stable and less likely to suffer from political swings:

Norway

We noticed that our proposals for instruments and suggestions can be found with the main parties. The conservatives and the Labor Party. (..) The electric car policy is an example of this. It has a strong foundation. Interview Code (IDIN37NOC, M, Norway, Collective Decision-Making Unit)

Finally, a transition of this magnitude will create winners and losers. Thus, vested interests connected to the old paradigm, will in some cases embrace the new paradigm and position themselves in order to be competitive in the emerging green economy. Some will however, undoubtedly attempt to preserve the status quo. This is also why transparency at all levels of government is so important.

Turkey

When the economy faces bottlenecks, the short-term decisions taken with the aim of providing an immediate solution to any problem can further worsen the situation. Transparency is of great significance in the energy market. Anyone should not make tricky and unfair sales in carbon emission. Neither consumers nor other authorities should pay for wrong decisions. Therefore, the transparency in the decision-making processes and transactions of banks and financial institutions is extremely important. The majority of the bankrupt projects in Turkey were started to be implemented by calculating short-term returns. However, any project cannot provide a return within a period less than 7 to 11 year no matter how favourable the conditions are. Interview Code (IDIN10TRJ, M, Turkey, Collective Decision-Making Unit)

Again, the problem with the use of peat came up as an example:

Finland

We have this big problem, which is the use of peat. It is not only that we use peat but also that we actively support its use by many means. Maybe the taxes that are harmful for the environment should be raised as a whole, because it is a great deal. Despite all the talking, no progress has happened, instead the level of peat support has increased, and new support measures have been brought into use. Interview Code (IDIN59FIJ, M, Finland, Collective Decision-Making Unit)

A similar example was provided for how government subsidies created an investment environment that made it economical to build a coal-fired power plant:

Turkey

I: Why did your company establish a coal-fired power plant? Is it about the policies of Turkey?

R: As the domestic coal is subsidized and the transportation costs are quite low, the coal-fired power plant was established. When the State started to subsidize it, its value increased to a great extent. (...) Coal is more profitable as it is subsidized. Under these circumstances, there is not a conscious transition to low carbon economy as a motivating factor. Interview Code (IDIN7TRG, M, Turkey, Collective Decision-Making Unit)

Another respondent pointed out problems with artificially low electricity prices where political forces to some extent dictate these market prices:

Bulgaria

Since market prices in Bulgaria are artificially low in electricity, and that is the political will, it cannot remain this way forever. This is a system, which operates at the highest level and generally the interests of all the players are to maintain the status quo and these interests are of course political. Interview Code (IDIN20BGD, M, Bulgaria, Individuals Engaging in Joint Contracts)

Then it was highlighted that the European car industry has not been a real driving force for electric vehicles:

Norway

It's going in the right direction in the EU, but it is not the EU which has pressed Norway, to put it that way. But we are totally reliant on electric cars being made by other car-producing countries, preferably. And we know that the car industry is very strong in Germany, Italy and England, where there is large car industry, and France. And they are large EU countries. I mean, England was ... So, it's a bit conflicting interests in parts of Europe. The car industry in general in Europe hasn't been a driving force to put it like that, on the lobby side. They want to slow it down and make money on selling the cars they make today, to quite a large degree. Interview Code (IDIN42NOH, M, Norway, Collective Decision-Making Unit)

New solutions are often expensive and require some form of support until the product, process or service gets off the ground as a result of economies of scale and learning curves. Renewable energy technologies like solar PV and wind, electric cars and battery storage are but some examples of technology that have had enormous cost reductions and technological development in the last decades. This is partly due to generous subsidies and governmental support, but also private capital investment and the increasing desire from the market for clean and low-carbon solutions, for example business opportunities in the renewable sector or charging infrastructure. For the government, these support schemes usually evolve around what national governments see as reasonable, economically and politically acceptable subsidy schemes that can incentivize consumers and producers in a given direction.

Several respondents highlighted costs as a major barrier for most new solutions:

Norway

You will never get away from economics. You have to be that honest. That also applies to (a municipality), like all other counties. A transition can quickly cost. So, it is the ... You get so far with willpower alone, but ultimately, you need the budget to go up, so that's a huge barrier. Interview Code (IDIN44NOJ, M, Norway, Formal Social Unit)

Turkey

The costs for energy efficiency are pretty high, which means that not every sector lean towards energy efficiency. Interview Code (IDIN5TRE, M, Turkey, Individuals Engaging in Joint Contracts)

Turkey

The main problem is that renewables as the first priority are yet to be adopted in the companies. They are regarded as second priority for the sake of protecting the environment and shifting to low carbon economy when you only consider economies of scale. (...) Unfortunately, financial concerns are the first priority. Therefore, incentives should be provided in order to accelerate the transition process. The consciousness and awareness are still not available in Turkey compared to Central and Northern Europe. Interview Code (IDIN7TRG, M, Turkey, Collective Decision-Making Unit)

However, tax-systems and subsidies schemes are powerful tools that the government can use to produce desired outcomes, and without any economic steering, the toolbox becomes rather empty, as commented on in particular by one respondent:

Finland

Another slightly similar barrier is the implication of policymaking on the [national] budget, e.g. whatever the discussion is, the Ministry of Finance takes care that the impacts on the budget do not exist and no taxation is changed. If you think that we know very well that economic steering is the most efficient also in the climate work, and if you drop this out from the discussion, the toolbox becomes rather empty. Interview Code (IDIN59FIJ, M, Finland, Collective Decision-Making Unit)

And generous policy instruments or subsidies do work, its rather a question of priorities and how generous they should be:

Norway

It is after all no more than ten years ago that Think and Buddy was sort of the state-of-the-art on the electric car, right. When A was founded, that is 15 years ago, that was the state-of-the-art. Yes. But then, right, then comes the MiEV, the Leaf, and the Tesla. And with the Tesla there was a paradigm shift in terms of what could be expected of an electric car, right, with the size, length and everything then. So, all of a sudden, it was a game-changer for the dynamics of the car industry. So, that change has happened faster than expected. And it came as a surprise to everyone. The growth of electric cars has superseded everyone's expectations. (…) It just shows that when you're willing to use policy instruments, then something happens. Then a change happens. Then you create something. So, it provides optimism politically as well. Interview Code (IDIN37NOC, M, Norway, Collective Decision-Making Unit)

However, another respondent pointed out that some subsidies could actually be a barrier for innovation, because it will not encourage manufacturers to improve their products and reduce the price:

Bulgaria

Subsidies are a barrier because subsidies do not encourage manufacturers to improve their product parameters and reduce the price. If you look at the price of the PV panels while there were subsidies including in the civilized world. At the moment when the subsidies disappeared it suddenly became clear that producers could make good profits at much lower prices. Now, it is the same with both electric vehicles and many new technologies. Interview Code (IDIN23BGG, M, Bulgaria, Collective Decision-Making Unit)

One respondent suggests that most broad support schemes should adopt a technology-neutral stance:

Norway

Then I think it is important that it is not the politicians or the bureaucrats that choose technologies, as for example to decide that now we are "have our moon-landing" with CO_2 capture, or begin to allocate appropriations to the hydrogen filling stations or for special types of ships that will be charged with a special type of technology, or something like that. But instead create the greatest possible flexibility, without selecting technology, without selecting earmarking. And use both positive and negative instruments, and I think it is important to have good tax systems, where there are added fees on business that emit CO_2 emissions. And when you use big money on support, then you have to use it where it seems the most effective. Interview Code (IDIN38NOD, M, Norway, Formal Social Unit)

As some respondents put it, governments and companies are changing their perception of climate change, towards it being an opportunity for new green business, rather than just a burden. This suggest that policymakers have to be very careful in the way that they construct their support schemes in order not to subsidize solutions that the market is both willing to engage in and also willing to pay for without governmental intervention:

Norway

There's a shift in the climate discourse. Which has gone from being one of looking at the climate challenge solely as a burden that must be resolved as cheaply as possible, to looking at it as a possible new business area from which anyone can make good money. Interview Code (IDIN37NOC, M, Norway, Collective Decision-Making Unit)

Turkey

Turkish people have such a high level of entrepreneurship that they try to purchase lands to construct charging stations in these areas. The major reason behind this situation is that electric vehicles will be widespread in the upcoming years. Even the petroleum companies try to invest in this sector. Furthermore, (a company) will bring Tesla to Turkey to create their own electric car fleet. Accordingly, they will construct their own charging stations. However, some infrastructural problems might be experienced in Istanbul due to capacity restrictions and high population. As a solution, the Ministry of Energy took a new decision to encourage the installation of rooftop solar panels to meet excessive demand of electricity. Interview Code (IDIN16TRP, M, Turkey, Formal Social Unit)

Norway

The present Government, for example, thinks, or the idea that it is quite possible to make this into profitable business activities for Norway, by creating new climate technologies and solutions. So, if it can pick up a little speed, I hope that we can avoid somehow having to fight over all these new measures, and that instead of seeing everything as a climate measure [only] it can [also] be seen as an industrial or business measure, as an investment providing good opportunities for, commercial opportunities for Norway. Can we get there, then it can really gain momentum. Interview Code (IDIN37NOC, M, Norway, Collective Decision-Making Unit)

Another point made by several respondents on the administrative level, as well as interest organizations, was that as soon as technology and new solutions can stand on their own feet and have a sufficient market, public support and incentives need to be gradually phased out, but in a predictable manner. However, it is difficult for policymakers to know when this point arrives and an example from Denmark suggests that public support was phased out too fast and the electric car sales collapsed:

Norway

Up until now, the Parliament has very much agreed on the main features of electric-car policy, and we thought that they would keep the one-time exemption until 2020. It's something that has actually been signalled before, like everyone has perceived it. Almost everyone has perceived it like that. But we know that for example in Denmark, which changed the tax system last year, and electric car sales collapsed completely, so we know that the market is quite sensitive. (…) So, we see that when we're going to phase out the electric car-policy – and we are going to do that at one time or another – then we have to make it predictable. I think it is quite harmful to begin to cast doubt on the direction on these kinds of fees. And

it's also a market where it is to some extent, a long delivery time. You can order a car, and it can get much more expensive before you get to it extradited. Interview Code (IDIN42NOH, M, Norway, Collective Decision-Making Unit)

Norway

And this is the entire challenge, that as long as the Government does not want to make fossil [cars/fuel] less attractive, it's hard to, then it is problematic that they make changes to [the] electric cars [regime]. But as soon as they begin to increase taxes on fossil cars, then electric car subsidies must be phased out. And this we are clear about. It is not a goal in itself that [electric cars] should have a perpetual advantage. The goal is that there should always be advantageous to pick electric over fossil. Interview Code (IDIN37NOC, M, Norway, Collective Decision-Making Unit)

Spain

Suppose that the logical thing is that you are creating a market, or empower a market, such as the windows market, to develop skills of certain strength and from there on, the market will be able to create attractive offers that permit to replicate the action. That is, there comes a moment that subsidies must be stopped. Doping the market with free money does not make much sense either. Interview Code (IDIN30ESD, M, Spain, Formal Social Unit)

However, support schemes that are in place cannot be pulled out too soon without knowing the consequences of doing so, thus there is a very fine balance for policymakers:

Norway

So what has been proposed now is really just to remove the exemption for electric cars, but they're going to then get a weight allowance of 23 percent, which is the same as the rechargeable hybrids have, and the design of tax system in total, makes it so only the heavy electric cars that will get that fee then. So, it's not really a weight tax, there is a full one-time fee, but it will turn out for the heavier electric cars. And so, we know that today it is only Tesla that has heavy cars, but the upcoming family cars will also be relatively heavy, if they are to have long range, because they must have a large battery. So, we are a little worried that they simply are now beginning to impose a tax on what will be tomorrow's family cars a bit too early. Interview Code (IDIN42NOH, M, Norway, Collective Decision-Making Unit)

This particular proposal was later removed after budget negotiations in the Norwegian government and the tax incentives were kept at current rates.

In a system with many political, economic, social and environmental goals and priorities, the government cannot subsidize everything. It has to create political momentum and a strong enough consensus around solutions that make sense in their specific context. Take Norway as an example: Because of its almost hundred percent renewable energy supply, one sensible place to start the decarbonisation was in the transport sector, and thus, a generous support scheme for electric cars were deployed by the Norwegian government. As Norway is an affluent society, it had the resources to afford such a lucrative support scheme, although it must also be noted that one reason why electric vehicles are so competitive in Norway is because regular car taxes are among the highest in the world. Thus, a tax exemption makes a far bigger difference in Norway than in countries with more normal car taxes. Nevertheless, in doing so, the support scheme has contributed massively to getting the global electric car market going. That does not mean, however, that every country in the world should or can adapt Norway's policies, but it highlights the power of creating conditions where broad political consensus and targeted action can have a great impact on a key area of the energy transition. As one respondent put it:

Norway

I think it is important to also to hold back a bit, or else we use too much of the society's resources on solutions that are not going to fly. It must be ... we are not the ones that should be foremost in the pressure for new solutions, but there must be an adequate system, active agencies, which makes great projects on the ground. And I think that such a system will reject most new ideas, but a good system will let through those who work out best, in a collaboration between the authorities and private actors – It can't be the

case that the government should pay for everything, that is hardly a good solution. Interview Code (IDIN38NOD, M, Norway, Formal Social Unit)

Regulations and support schemes: Feasibility, flexibility and fairness for stakeholders

In terms of feasibility, as discussed, higher environmental taxes, like an effective carbon tax, or other market-based instruments are more likely to be politically feasible when substitutes are within reach in terms of costs and reliability. Without substitutes, high carbon taxes are a pipe dream and highly unrealistic politically. Thus, policy makers will probably still have to rely on a patchwork of instruments such as support schemes, in addition to the EU ETS and other environmental taxes, although they might not be as cost-effective as market-based instruments.

In terms of flexibility, regulations and in particular support schemes have to be able to change to circumstances and new technologies that suddenly become cost-competitive. Thus, there is a very fine balance between predictable frameworks and overly generous incentives, given that a technology is getting competitive in the market.

In general, one grave problem that we foresee, and one that we could read out of many of the interviews, is that most of our institutions are not set up to deal with non-linear growth and major technological disruptions. They can easily deal with slow and linear growth, but rather less with the kind of step-changes that are required of modern, industrialized societies if our future energy problems are to be resolved. Some examples of this is the rapid uptake of electric cars, massive renewable technology installations producing subsequent challenges surrounding the grid-system, in terms of its stability and reliability. The way in which technology is disrupting the energy system, grid upgrades and grid design has to be part of these developments. This will in all likelihood mean a more integrated system with more interconnectors:

Norway

R: Yes, there are many bottlenecks, both physical and political desired bottlenecks, in the European energy system. And it is clear that in relation to countries that have a lot of their commercial development built around fossil sources, it is clear that they want to work for the perception that this is just as renewable as we have defined as renewable. And with interconnectors in a European market it is a major challenge that, when we export energy into Germany and it is closed further on (further into Europe). It is a great challenge in the way that grid design is done. Focus Group Code (FOGR11NOC, Norway, Formal Social Unit)

In some cases, lack of grid infrastructure and grid planning can hamper the energy transition:

Turkey

Turkey has a great potential for wind energy. Turkey's wind energy potential is 25-30% more than European average. While a wind power plant operates 2000-2500 hours in a year in Europe, it operates 3000-3500 hours on average in Turkey per year. However, this data does not include offshore power plants, which have yet to be established in Turkey. Wind connection capacity constitutes a barrier for offshore power plants to become widespread in Turkey. In other words, the wind connection capacity on transformers and transmission lines is limited. (...) The major obstacles in Turkey were the conservative approach toward connection capacity and the problems in connection capacity allocation. Interview Code (IDIN10TRK, M, Turkey, Collective Decision-Making Unit)

In terms of fairness, the polluter pays principle should be a central pillar of governmental policy. However, as discussed, this is much harder in real life than in theory, thus governments must also pursue alternative policies, such as support schemes that can create conditions that enable suitable substitutes to come to the market and become competitive compared to polluting alternatives, in the process making it easier for politicians to tax the polluting alternative. In the words of some of our respondents:

Norway

R2: Then what we see is that if technology comes up from below in a way that can create changes, it will be easier to set those taxes because there is this new technology, right.

R1: The best example is car taxes in Norway and Sweden. Norway has had zero or, zero taxes on electric cars. Whereas Sweden has had very high CO_2 taxes on theirs, on the use of ... or on fuel. But it's in Norway that electric cars have become big. Interview Code (IDIN37NOC, M, Norway, Collective Decision-Making Unit)

Cities and local governance

Cities and the local administrative level will be at the forefront of the energy transition. Respondents consistently brought up issues relating to cities and the municipality, pointing out that these are places where a lot of the action will take place, including within all the technological foci. Cities and municipalities are thus well positioned to facilitate given that local administrative officials have the capacity and expertise, as well as the authority, to sanction energy-transition related decision-making for a low-carbon economy.

Austria

R: The action must ultimately happen at the local level, if you look at it that way.

I: The legal action also?

R: No, not the legal one. The de facto action. It really must be acted upon in the sense of building measures, projects and programmes for the population and much more, so that the system changes visibly. This can only happen at the local level, because the direct influence of the federal government is so small. What can the Confederation do? It can make measures for the railway company, make changes to the [(inter)regional bus company], renovate the tax offices in terms of building technology, but then the federal involvement will soon come to an end. Most of the action takes place in the cities and communities. This means that it is the sum of these thousands of cities and municipalities in Austria. And that is where action must be taken. Interview Code (IDIN61ATB, M, Austria, Formal Social Unit)

Finland

I see cities, municipalities, companies and citizens actually playing a very major role [in the transition]. I've become more and more sceptical about international climate policies and these negotiations, what is their impact, but I somehow consider them as those drivers. Cities are in very important role, there are a lot of factors regarding climate emissions, local emissions, waste, emissions to water. So, it is very holistic and on the other hand, you have to simultaneously create such an environment for the residents that is, where people want to live and to find them, or to control this as a totality, so cities play a very important role. Interview Code (IDIN53FID, F, Finland, Formal Social Unit)

Bulgaria

When reviewing our policy documents, it is overwhelming to realize that energy efficiency is mentioned in relation to all our priority areas – cultural, educational, sports infrastructure, etc. We are now starting activities in the area of intelligent transport systems. That is to say, our motivation is based on the effort for implementing our overall municipal policy. There is a strong political support for that, which responds to the will of citizens and of local business organizations; the explicit municipal policy is documented in the adopted Sustainable Energy Development Plan, which we currently implement and, according to my understanding, the best way to go on is to carefully monitor the process and to continually upgrade our strategy. Focus Group Code (FOGR4BGA, Bulgaria, Formal Social Unit)

Several of the respondents highlighted the importance of public transportation, which will be further discussed in the chapter about public procurements, and also the ability to impose restrictions in transportations in the cities:

Finland

Cities have a lot of opportunities, concerning transportation, for example. They have the possibility of making a lot of limitations in the cities. We can see that in the big cities of Europe, they are making quite bold decisions. Compared to that we are really shy of doing anything in Finland. Interview Code (IDIN58FII, F, Finland, Collective Decision-Making Unit)

Turkey

The inner-city transportation was pedestrianized. (..) The people were not content with the current situation when the implementation was first initiated. However, they got accustomed to pedestrianizing over time. Interview Code (IDIN2TRB, F, Turkey, Formal Social Unit)

Some cities are branding themselves as climate leaders and have ambitious climate targets that are far more aggressive than the national targets:

Finland

From the city's point of view, as far as I know, was the strong drive for the city to profile itself as carbon neutral. I think it was one of the first cities in Finland to have this kind of concrete carbon neutrality target. For a given year, I think it was 2040. Afterwards for example this city [name mentioned] has set more strict targets, but… our city got a lot of international visibility too, I think, from these climate actions, and their concrete plans to achieve it. I think mobility and transport, low-carbon mobility, came to the agenda of the city especially because of the carbon neutrality targets. Interview Code (IDIN57FIH, M, Finland, Formal Social Unit)

Turkey

From my point of view, city X will become a leader in climate economy in Turkey. As an Economic Development Agency, we are closely interested in sustainability and economic development of our city. Within this framework, we believe that city X will have a good reputation in green economy or climate economy. Furthermore, it will be able to pioneer the Eastern European, Central Asian, Mediterranean and Middle Eastern countries. Recently, our Development Agency had a grant of 3 million Euros from the Ministry of Science, Industry and Technology, in the Competitive Sectors Programme. The grant provided by this programme will be used to make further progress. According to the Ernst & Young's report called World Competitive Cities, our city is among the top 5 competitive cities of Eastern Europe and Central Asia in the energy sector. The potential of our city will lead us to take some actions regarding climate change. The fundamental purpose is to increase life quality. Energy has become a significant issue in recent years. Interview Code (FOGR3TRC, M, Turkey, Formal Social Unit)

Again, several respondents highlighted that cities and municipalities are well positioned to be more ambitious with their targets, and in some cases have self-imposed targets that they work towards:

Turkey

Our city certainly needs more electric vehicles so that carbon emission can be decreased to a great extent. We set a target for 2023 to decrease carbon emission by 20%. Interview Code (IDIN9TRI, F, Turkey, Formal Social Unit)

Norway

R1: Our original proposal was cut a little bit down, it was originally that we were going to reduce greenhouse gas emissions by 25% by 2020. Now it has been reduced to 10%. 2020 is not a long way to go, so it is possible to understand why it was adjusted down. The overall goal is 80% by 2030. And that is the most important thing. In addition, there are many sub-goals for the various sectors. R2: We are also subject to the same action plan in that we are (a department in the municipality). As far as I know, at the most at least four-five years, so we have had a self-imposed goal that we are going to save 2% on stationary energy use in the building in the year, and 7% over each four-year period. So now we are in time with the other four-year period. Also, it is as I said, I may think that with the new action plan that the focus for each to be over against the emissions and energy use, but so far we have it on energy use. Focus Group Code (FOGR11NOC, Norway, Formal Social Unit)

Bulgaria

I would stress upon the achievements. Despite the difficult situation in the country, there are really good practices. They are, regretfully, scattered and a lot of work should be done to promote them and to multiply results without always inventing totally new solutions. Focus Group Code (FOGR5BGB, Bulgaria, Formal Social Unit)

Another major driving force in several cities and local administrations is dealing with air quality, noise and other health concerns. This focus gives politicians (and individuals) an opportunity to get broader support from the public around cleaner solutions and more stringent air and climate targets:

Spain

That the big cities are getting bigger, the population is more and more concentrated in the big cities, in an exponential way for the next 50 years and then in the cities, the challenge of how to move people is getting bigger, how you move people in a society, in which noise is less and less tolerated, in which contaminated air is less and less tolerated. The evolution we have had in society for example with tobacco, 20 or 25 years ago in all the offices everywhere there were ashtrays with lots of buds, there was no meeting in which there were no people smoking. And that has disappeared. And that is fantastic. And at that time, it was unthinkable. Interview Code (IDIN27ESA, M, Spain, Collective Decision-Making Unit)

One participant pointed out that low air quality can even affect election outcomes:

Turkey

In Turkey, the most important issues are domestic production and air quality. Desulphurization in power plants is of great importance. The domestic coal technologies that have less carbon emission are encouraged in Turkey. The fact that low air quality disturbs the citizens of a region directly affects the election results. Interview Code (IDIN16TRP, M, Turkey, Formal Social Unit)

That again can lead to more stringent climate targets around the world:

Austria

There was the interesting case that, from next year and onward, 20% of new registrations in China must be electric cars because of air pollution control, not because of CO_2 although this is also affected by it, and then Mr. Gabriel went to China to lobby against it, so that they can continue to sell diesel cars because they do not have electric cars. And this is how the world works right now. I am in a very positive mood at the moment, because the trend-controlled technology causes all this and actually puts many companies, but also private individuals, in a position to do a lot of things themselves. Interview Code (IDIN60ATA, M, Austria, Formal Social Unit)

In some cases, differences in ambition, having different regional rules and regulations, lead to some regions having the opportunity to be much more ambitious than the national government or less ambitious regions, which certainly has an impact on the overall outcome:

Austria

(…) Denmark is much further along. So, it's not always the case that every member state of the EU does nothing. On the contrary. Unfortunately, Austria is pretty much in the last place. Other countries have the advantage of a centralized government. As an Austrian, you can see that as either an advantage or a disadvantage, but I see federalism as an absolute disadvantage in this case. Why? Because I could never explain in Brussels, why someone in Carinthia, on one side of the street, falls off a 1.1-meter-high railing and dies, while someone in Styria falls of a 1-meter-high scaffold and dies. Nobody can explain to me why we need nine different sets of building regulations and many more regulations for just nine million people. And, that has led to an unbelievably great amount of loss of efficiency. So, I recently led a working group composed by all provinces, when the OEB Directive was created. One product was the OEB Directive 6, which contains all the regulations that govern buildings and energy and even more. For years, we negotiated to work out details that shouldn't have required that much negotiation. And, there, countries like Denmark or, in part, France with their centralized organization – I won't even say government – just plain have it easier. Interview Code (IDIN64ATE, M, Austria, Formal Social Unit)

Another important point that was highlighted in the analysis was the need for integrated approaches at the city and local administrative level, and that this is actually possible at this level, with the area of transport coming up repeatedly. One example was that having important departments and areas in silos at the administrative level,

leads to very inefficient governance, relating to such a complex and interconnected shift as the transition to a low-carbon economy:

Finland

The city was collecting together the different initiatives relating to electro mobility. Concrete actions include planning of charging infrastructure, they prepared this general plan with criteria and locations for charging points, on the map even. The background is that if all charging points are individually planned, and then you can apply, façades committee and building committee and all possible sectors and departments, so if you do them one by one it will be a huge effort for one or two hundred charging points. We made a general plan for the charging network. (..) Then there were also municipal transports, the city buys transport with big money, different transports for the elderly, disabled… transports and others, school transports, so they brought in criteria in tendering and procurement processes about hybrid and electric vehicles. Then there's more, the vehicle purchase of the city itself, they had the objective to promote electric vehicles, the city had at least three full electric vehicles in joint use for personnel to begin with, so it was already beginning earlier. But the city itself prefers a low emission fleet. Electric bus line was one thing, a bus line from the harbour to the city centre and the airport, so they had the Finnish six electric buses from [company name]. All of these things, not a result only from our initiative alone. (...) From external stakeholders, [name of an energy company] had a central role I think. The energy company… Who else, yes, I think it was largely city internal, so that especially environmental departments…. all town planning, parking, road infrastructure related, or general planning. Then these public procurements were one thing, and public transport the operator [name mentioned] in the city. (..) I think carbon neutrality was so high on the agenda and had political support and the departments were favourable to these types of objectives. Interview Code (IDIN57FIH, M, Finland, Formal Social Unit)

Norway

But there is something that, we have to think like, what they do in the County now, that they are starting to place everything that has to do with transportation under the same section, whether it is the bus or the taxi, or whatever is going to transport you. For me, thinking like a customer who wants to order this service. Where moving from A to B is really what I want. Public transport in the city today is really about going from a place you are not, to a place you are not going to! If we manage to turn this into, take us from where we are to where we are going, and not be so concerned about what is going to bring us there. Then you could reduce and maximized the utility grade of taxies that today are stationary for 70-80% of the time, and they charge like they drive for 100%. Focus Group Code (FOGR11NOC, Norway, Formal Social Unit)

Several respondents also highlighted the need for networking between cities and municipalities. One explicit example being the Covenant of Mayors initiative, that in many cases gave cities a framework to be able to put forward an integrated plan for the energy transition, and not being hampered by the national politics, this also helped smaller cities and municipalities and these networks:

Turkey

Our purpose to become a party to the Covenant of Mayors is to collect all these actions in a common ground. Interview Code (IDIN4TRB, M, Turkey, Formal Social Unit)

After we became a party to the Covenant of Mayors, the target regarding carbon emission decrease was increased to 30%. Interview Code (IDIN2TRB, F, Turkey, Formal Social Unit)

Highlighting the help of preparing a Sustainable Energy Action Plan through the Covenant of Mayors initiative was further elaborated:

Turkey

The first perspective is from top to bottom through governments. However, this method is regarded as unhealthy and it is associated with state policies and political decisions. Instead, a bottom up method starting from individuals is accepted as more effective. According to the method, the cities make their commitments to decrease the carbon emission and take precautions about climate change in their area of jurisdiction. This system created by European Union is called Covenant of Mayors. We made a similar

suggestion to this system and we received approval from the Mayor and Council. After becoming a party, we were obliged to prepare the Sustainable Energy Action Plan. Interview Code (IDIN4TRB, M, Turkey, Formal Social Unit)

Turkey

Except for these organizations, the Metropolitan Municipality was included in Covenant of Mayors in 2015, and it made a commitment to decrease greenhouse gas emissions by 20% until 2020. Accordingly, we prepared the Sustainable Energy Action Plan. Firstly, the greenhouse gas amount in the city's and municipality's resources were determined and an inventory analysis was conducted. Within the scope of Covenant of Mayors, an action plan based on decreasing greenhouse gas emission in the municipality's own regions was made by excluding industrial and agricultural sectors. Currently, the actions regarding renewable energy were put into practice. The project based on the establishment of solar energy power plant in a public garden is an example of these actions. Moreover, we make preparations to establish solar energy power plants in 6 different areas. Pursuant to the Sustainable Energy Action Plan, the energy inventory and energy audit were applied in one of the buildings of the municipality. We try to raise awareness within our Directorate in order to improve the conditions. Another grant was received from the EU. Thus, a project based on climate change will be conducted in our city. Focus Group Code (FOGR3TRC, Turkey, Formal Social Unit)

This networking can also help smaller cities and municipalities with capacity and expertise building, by learning from others:

Finland

And then there are codes and requirements, so fulfilling those is clear for new buildings, but in repairs and renovations it's unclear and messy. Building regulations leave options for local authorities to apply in a way they want to, or not to apply, so oftentimes they are not applied fully. Especially in small municipalities, when we trained building inspectors a few years back, they told us they do not go into these, so it is just enough to fill out the forms, they don't know how to actually inspect it. In new buildings things go like this but in repairs, what are the regulatory requirements? Where do you calculate the energy efficiency improvements from, the part built, the whole building and how to use it? This is very unclear and messy. In repairs only, big municipalities can go into these. Interview Code (IDIN51FIA, M, Finland, Collective Decision-Making Unit)

Turkey

As Directorate of Foreign Relations in the district municipality, we have put great emphasis on these issues since 2010. Our first action in 2010 was to become a member of the National Photovoltaic Technology Platform founded by the Institute of Solar Energy. In 2012, we were included in the Covenant of Mayors, and we were one of the municipalities preparing the Sustainable Energy Action Plan in 2013. However, we could not have an opportunity to revise the approved Sustainable Energy Action Plan as we have problems in knowhow. We are public officials, but we need a more professional staff. Focus Group Code (FOGR3TRC, Turkey, Formal Social Unit)

Bulgaria

As a Municipality we are expected not only to meet these needs, but also to provide a better standard - a better environment for living and traveling; the overall lifestyle standard should be at a higher level. As Bulgaria is a member state of the EU, we are obliged to follow the adopted model for sustainable energy development and we are committed to the long-term European objectives in this direction - our municipality was also the first one to join the Covenant of Mayors. Focus Group Code (FOGR4BGA, Bulgaria, Formal Social Unit)

Several respondents also highlighted the positive outcomes of networking and collaborations between cities and that one city's actions can inspire and show others how it can be done:

Austria

There are many small, individual initiatives such as the E5 programme, which pushes strongly for energy efficiency in the municipal sector and the switch to renewable energy at the municipal level, as well as for the coordination that the country assumes for the climate and energy model regions. These are the federal

funding and the federal programme, which are co-financed by the province, because the energy master plan defines targets that should be applied to the entire country. This should be guided a little bit, so that not every region has to develop its own things or reinvent the wheel. And so that all these structures, which are to be set up at the national, regional and local levels, can be somewhat coordinated. (...) This guidance is very, very, very important, and I also believe that the basic task of a federal administration, a federal government, is also important, so that the individual initiatives do not simply appear and develop somewhere, but rather are controlled in a targeted manner. Therefore, it is coordinated and clearer and, above all, much faster. And you can, for example, use funding money in a much more specific way than when small, individual initiatives are all over the place. Interview Code (IDIN62ATD, M, Austria, Formal Social Unit)

Finland

A big challenge, maybe even a barrier, is that cities have enormous power. They own land. They can make decisions. They are agile. That is a huge strength in this. But if many decision-makers still consider us in a traditional way, that we are merely a project that from the outside is trying to accomplish something. They still look at the city as one unit. But we have here three cities in the X area, for example, whose purpose it is to combine all of these, then that is something that the cities are openly against. So that is maybe a barrier [laughter]. (…) City X is doing city X, city Y is doing city Y. And we should be doing things in common. That requires quite a lot of pushing. In order to achieve that, in the beginning, I was looking for common victories. But it is really difficult because, in principle, it is in no-profit targets or anywhere. Not even in the official papers. Well, now there was one sentence in the strategy of city Z. I noticed that their new strategy mentions cooperation with other cities in one sentence. Interview Code (IDIN58FII, F, Finland, Collective Decision-Making Unit)

The highlighted further that many of these cities engaged voluntarily into agreements and strive towards meeting those goals:

Turkey

Right after the Citta Slow label was attributed to our district, the investments started to become oriented toward projects reflecting environmental awareness. In our department in the municipality, we conduct projects to demonstrate the contributions of our district to the sustainable economy. (...) The energy performance constitutes a significant criterion for the Citta Slow movement. For this reason, it is prioritized in all investments. Within the framework of Citta Slow, there exist specific targets such as improving energy policies and raising awareness on sustainable energy and sustainable clean energy generation. Interview Code (IDIN2TRB, F, Turkey, Formal Social Unit)

Austria

In principle, it is also good for an administration if the politicians formulate clear goals and make clear statements about which direction it should go. Because it is a political instrument, however, it was a rather broad process, which means that practically all the kinds of target groups participated that you find in a country like this, but also the companies that have something to do with the issue. These were included during the preparation of the Energy Master Plan. We had working groups of almost 200 people. Interview Code (IDIN62ATD, M, Austria, Formal Social Unit)

The EU and expertise in the national departments can thus assist cities and local administrative officials by providing guidelines and showcasing best practices, providing benchmarking systems as well as educational courses or e-courses to build capacity and expertise for all governmental officials. The key point is that the best knowledge and expertise could be open for every official at all levels of government.

Cities and local governance: Feasibility, flexibility and fairness for stakeholders

In terms of feasibility, although regulatory frameworks and legislation are rarely decided at the local administrative level, the local level is nevertheless very often at the forefront when it comes to implementation. In many places, including Norway and Finland, the local and regional level have relatively high autonomy, and can in many cases be very ambitious in their decision-making:

Finland

In the case of Finland, municipal self-government is exceptionally high with a lot of power meaning that municipalities largely decide on their own practical solutions to mitigate emissions. In the same breath, I need to note that municipalities do not operate in a vacuum. Such things like emissions trading, taxation and legislation are decided on a national or EU level, meaning that municipalities always operate in the environment, which is given. That is why I also consider those discussions odd, where municipalities [or cities] are raised over the others to the problem-solver position. If national policy is very regressive, the possibilities of municipalities to act are rather limited. On the other hand, in Finland you can identify a group of municipalities, which have been ready to act more and move more rapidly than what is seen averagely across the whole country. In that sense, municipalities can push forward the climate momentum, which will hopefully drip into national policy so that it will not stagnate to decision making of single municipalities. Interview Code (IDIN59FIJ, M, Finland, Collective Decision-Making Unit)

In other countries, the structure of the administrative levels is much more hierarchical and thus have consequently lower relative autonomy:

Spain

After all, legislators and governments – in our case, a regional government that does not have all the legislative capacities that make up the [legislative] framework – we have the responsibility to create an adequate framework for the transition, but the transition in itself has to be carried out by society. Interview Code (IDIN34ESH, M, Spain, Formal Social Unit)

If the national government is not ambitious, this can slow down the transition at the local level as one respondent explains regarding the issue of the energy mix:

Spain

The thing is that we in our immediate environment, well, we do not have the autonomy to decide the mix. We do not have the tools to influence the installation of new capacity. This decision, to this day, belongs to the [Spanish] Ministry, then, we are at the mercy of what the Government of Madrid decides, which is responsible for this. To this day, when you talk to representatives of political parties in the Congress and talk about this topic, for example, what will be the future energy mix and what is the planning needed to make that change of a mix, then, well, I think they don´t have it clear. Interview Code (IDIN34ESH, M, Spain, Formal Social Unit)

In many places, local and regional administration as well as local politicians feel that they are constrained and hampered by national politics on issues related to the energy transition. Therefore, in a lot of cases the only way for local officials and politicians to have an influence is through awareness and information campaigns. And while these are certainly important tools to address and inform citizens, they are relatively toothless in terms of enforcing rules and provide officials with very few options to sanction non-action. As some respondents put it:

Turkey

We aim at 12% decrease [of energy use] in the buildings apart from the ones belonging to the municipality while we intend a 13% decrease in houses. However, we do not have any enforcement in this field. Therefore, we plan such a decrease by educating people and raising awareness. These precautions cannot be taken through legal regulations. Instead, the Ministry applies to the measurement of energy performance and energy performance certificate. We try to reflect insulation as a comfortable implementation although it is not a legal obligation. Therefore, we will organize events and distribute brochures on this issue. Interview Code (IDIN4TRB, M, Turkey, Formal Social Unit)

Austria

I: And the legal level you refer to? R: The legal level certainly comes from the top down. For example, there are practically no opportunities at the local level. In its own sphere of action: If you consider our city as a large city in Austria, it has practically no way to do anything legally. On the contrary. We are also subject to fiscal equalization and this must be coordinated at the level. Interview Code (IDIN61ATB, M, Austria, Formal Social Unit)

Some sectors, like big industry and agriculture, are not easy for cities and local administrative to include in their energy and climate plans, and thus must be left to the national government to regulate and set targets:

Turkey

The Covenant of Mayors is aware of the fact that some sectors are not under the control of local administrations and it excludes these sectors from the action plans. No matter how much we include industry in this system, we do not have any power of sanction. For this reason, we removed industry and agriculture from our reduction plan. However, this decision depends on the desires of the countries. For instance, local administrations are responsible for electricity distribution in some regions. However, our municipality does not have any effect on electricity distribution. In other words, the municipality totally looks like an individual user and it does not have any authority on infrastructure or pricing. When the industry and agriculture sectors are eliminated, we can only take into consideration the residences and transportation. Correspondingly, the shares of transportation, residences, street lighting, and building tests are 42%, 31%, 1% and 1%, respectively. We prepared our reduction plan by considering these percentages. Interview Code (IDIN4TRB, M, Turkey, Formal Social Unit)

In terms of flexibility, cities and the local administrative level can be said to have quite high flexibility when it comes to who they chose to cooperate with and what types of project they will engage in. One constraint is of course budget and funding, as one respondent put it:

Austria

You have to think systemically. Together with [4 provinces] and [city], we have now explored a project with the Climate Fund and have now also gained funding, whereby relatively large sums of money will soon be invested in pilot projects aimed at the energy transition. We have many projects in [province] and [province] on renewable energy and how urban areas can deal with this energy and how you can develop business models for it. This is going to be a great project, and I believe – this is the central theme – that we as a city must work with the region to analyse and locate regional energies and identify how they can be further developed and used. And this is where e-mobility and buildings also play roles. Interview Code (IDIN60ATA, M, Austria, Formal Social Unit)

Bulgaria

It very much depends on the mayor, the local structure, their attitudes as expert capacity, but there are many active municipalities. It is true that it is also about financial capabilities, but it is also about will. Some find ways to make good projects and apply. Interview Code (IDIN25BGI, M, Bulgaria, Formal social unit)

Another respondent highlighted the need to be flexible with partners, both from other parts of the public sector as well as the private sector, so that one can achieve common goals in collaboration:

Austria

We have developed an energy plan or an energy strategy by enlisting the help of a large number of institutions at administrative levels. I've always made and kept contacts in all the social partners, universities, private research organizations such as the Johanneum Research organization, but also to others. And as long as I did that, we always had a collaboration among many institutions, which was sometimes hard work but resulted in the achievement of a common goal, which was named the Energy Strategy 2025. Interview Code (IDIN64ATE, M, Austria, Formal Social Unit)

Cities and municipalities are also flexible in terms of joining in cooperation with private actors, in for instance charging services for electric mobility or heating services for buildings:

Finland

If we take City A [population over 200 000] as an example, where we are the local district heating actor. The way that energy sector contributes to the emissions of the city, as we look at it, that is, together with the city we have set certain targets on how we aim to decarbonize district heating generation. I see it quite possible. Thinking about other services, services related to electric cars, I see much contribution from us. Perhaps the question for us and for many others to be learn is what is the best way to operate

in collaboration with cities? (...) For example, in the case of charging services for electric cars, we can build it in co-operation with the local city, or solutions related to heating of buildings, part of these are perhaps further workable in co-operation with the city. A part, however, goes directly to consumers. Interview Code (IDIN53FID, F, Finland, Formal Social Unit)

However, the public sector can be perceived by private actors as a less flexible partner, because of the differences in structure and ways of working:

Austria

Companies that have participated in the process of creating the energy master plan and have invested themselves more are already giving us the feedback that they consider the process too slow. This is always the big difference between administration and community work, where local authorities are involved, and actors in the free market economy, who can, of course, operate in completely different ways. We have completely different structures. You have to ask five or six times more often than in a company, where you can simply talk about it internally or with another company and then do something. And we have totally different wheels that are turning, which is why the time factor is always a factor of two or three for us, I guess. And that is often too slow for the companies, because they would like do much more, and they expect a lot more from the province than is available at the time. Interview Code (IDIN62ATD, M, Austria, Formal Social Unit)

And if municipalities lack the capacity to prepare good project it will be harder to cooperate with business partners:

Bulgaria

Another major barrier, as we can boast with our good team, but in many Bulgarian municipalities there is lack of capacity within the municipalities to prepare quality projects altogether with the market. That market commitment in Bulgaria is not yet developed. We learn about new technologies in the process of their application directly on the sites. Further after the project is prepared, it requires a lot of changes, makes the projects more expensive and thus leads to a lot of trouble with government authorities. Focus Group Code (FOGR4BGA, Bulgaria, Formal Social Unit)

Municipalities can also try to work in collaboration with NGOs with common interests to achieve common goals:

Bulgaria

We are in active dialogue with all NGOs that have a common interest, or at least they have declared their interest in the Transportation sector, so they help us, sometimes with signals, sometimes with ideas that we take into account. We are trying to work in partnership here because our goal is a common one - to make our city more attractive. (IDIN26BGJ, M, Bulgaria, Formal social unit)

In terms of fairness, it can often be the perception that the administrative level that has the lowest expertise is often the level where most competence and expertise is needed. This can especially be true in smaller municipalities and among marginalized groups:

Bulgaria

Innovative technologies demand innovative management. There is a need for qualified staff who can handle them and the training of the personnel handling the equipment has proved to be very important. No matter how intelligent the technologies are, no matter that occupants of the building do not have to intervene, still it cannot go without intelligent people who can undertake adequate analysis and take relevant action. Focus Group Code (FOGR4BGA, Bulgaria, Formal Social Unit)

Finland

And then there are codes and requirements, so fulfilling those is clear for new buildings, but in repairs and renovations it's unclear and messy. Building regulations leave options for local authorities to apply in a way they want to, or not to apply, so oftentimes they are not applied fully. Especially in small municipalities, when we trained building inspectors a few years back, they told us they do not go into these, so it is just enough to fill the forms, they don't know how to actually inspect it. In new buildings things go like this but in repairs, what are the regulatory requirements? Where do you calculate the energy

efficiency improvements from, the part built, the whole building and how to use it? This is very unclear and messy. In repairs only, big municipalities can go into these. Interview Code (IDIN51FIA, M, Finland, Collective Decision-Making Unit)

Bulgaria

Another barrier, which is perhaps not a small one, because we talked about municipal administrations. I think the poor expertise in the municipalities, which of course is a consequence from a number of other factors. But now we are talking about the end result - insufficient expert potential. They have many obligations. It is difficult for the people. They do not always succeed to be at the expert level, to get the necessary knowledge and training or anything. It is often observed that there is no succession of policies at the municipal level. It takes too much time to enter into a responsibility for anything, for enforcements for efficiency and renewable sources. So, this is a barrier from time to time. Interview Code (IDIN24BGH, F, Bulgaria, Formal Social Unit)

In addition, as the technological development moves even faster, pressure for citizens to be informed is increasing, this would also to some extent fall on the lower administrative levels to provide, through for instance, education and other information programs:

Bulgaria

I am grateful to the (a University) for undertaking an educational project with students involved within a Bulgarian municipality aimed at educating the Roma people (who have the financial resource for building a home) on how building regulations work so that a home could be legally built. It was a very successful project. It was about energy efficiency of buildings, but we needed to start from poverty and the lack of education. I believe energy efficiency has to enter all the curricula in higher education and also in lifelong learning programmes. New technologies are a good thing, but their development is extremely dynamic, so we need to continually upgrade school programmes in energy, energy efficiency, environmental protection and health – this is of key importance. I myself graduated from a specialized secondary school as a certified electrician 20 years ago; I studied sociology later on and nowadays I am totally incompetent with regard to implemented new technologies in the field of electricity. Focus Group Code (FOGR4BGA, Bulgaria, Formal social unit)

Austria

We have a problem with the energy transition, that it is a very rapid change in technology or a very rapid technological development with a lot of expertise in the background, which people in the more highly-educated strata will be able to implement more easily than those in the less-educated strata. And I think it will be a big problem to catch the attention of those people who do not have a good education, who do not have a social background that includes a good income, so that they can go through this energy transition with all the technological bells and whistles that come with it. With Smart Meter and Smart Homes. It's all digitalized and there's no turning back. A reversal of these technologies is not expected in the near future. This will become much more severe. And we can already see today that people simply cannot participate in certain technological areas. They don't know how to program, they don't know why the heating works in the basement, how it works, and these are, of course, small problems, but they will certainly get bigger in the future. Focus Group Code (FOGR14ATA, Austria, Formal Social Unit)

Public procurement

As public procurements account for around 14 percent of annual EU GDP,[65] the potential for improvements and an increased focus on low-carbon solutions in public procurement could assist the shift towards a low-carbon economy. As shown in the chapter outlining current policies, the EU has recently issued a new strategy around

[65] European Commission – Single Market Scoreboard - Public procurements 2016: http://ec.europa.eu/internal_market/scoreboard/_docs/2017/public-procurement/2017-scoreboard-public-procurement_en.pdf

green public procurement, focusing on reducing bureaucracy, improving efficiency and the application of green criteria. Respondents also seemed to view public procurements as an area with untapped potential:

Finland

So, to be truly impactful it would need a process to make it stronger or develop somehow. Same with vehicle procurement and in creating a process for procurement to buy low emission vehicles, but for it to really have an impact you'd need almost all vehicles to be low emission. But we're still far from that. So, I think that in a way these are good beginnings, but if we really talk about achieving carbon neutral transport, the transition is on a whole different level. Interview Code (IDIN57FIH, M, Finland, Formal Social Unit)

Finland

Actually, if we look at the energy consumption of buildings, there we have a very big project starting, which very well describes our power, that there is this utilization of pre-prepared elements in renovations, large retrofit projects, which everyone knows, for the buildings constructed in the 1960s-80s. So far, at least 20 companies have confirmed their participation, and three or four big cities. Our viewpoint is that if there is such a solution that perhaps already has been piloted somewhere and found applicable, it needs to be scaled up a lot faster in order to get more impact. And now we have succeeded in getting a commitment from the cities in the X area to allow dozens of rental houses to be used as testing units. A major goal of course is that if this works, then we should get all the cities to develop public procurements and sort of innovative procurements towards more impact. So, if such a carbon neutral solution functions, it could then also really be multiplied. So, this renovation building case is now one that is officially beginning. It only needs the final labels to get the funding organized, and after that it will become a big case. Interview Code (IDIN58FII, F, Finland, Collective Decision-Making Unit)

Bulgaria

In a large municipality, a relatively conservative structure where things start slowly, I would say, this rehabilitation process and the implementation of energy efficiency measures began with the renovation of schools, kindergartens, as initially, around 5-6 years ago, the efforts were focused on joinery, insulation, some replacement inside some installations at this level. Almost no active experiments or pilot projects for the application of renewable energies resources have been made. There have now been such practices in recent years, I would say, which are slowly coming in. In this municipality there is a resource in this sphere, there were ideas, they were discussed, but the municipality is comparatively conservative for the implementation of such measures, even more so, as long as this is not regulated in the Spatial Development Act, in the requirements, in a number of documents, it is hard to get into these technologies. Furthermore, they make the price of any procurement or remediation higher, (as the number of objects is smaller) then it is always considered the lowest price, and one such application immediately raises the price. There are enough buildings in the city for renovation, schools and kindergartens, so the aim was always to cover more and more municipal buildings. However, a serious breakthrough has been made with the inclusion of the municipality in the Covenant of Mayors. Interview Code (IDIN17BGA, F, Bulgaria, Formal social unit)

Other participants describe how electric mobility is starting to be included in planning and municipal vehicle-fleets, and although some remote areas might have barriers regarding sufficient infrastructure, this will change in time:

Turkey

The electric buses used in transportation are included in the [Sustainable Energy] action plan. We also take actions to transform the vehicles used in our Directorate into electric ones. We will have an electric passenger car in 2018, and we aim to increase the number of these vehicles. This electric passenger car will be the first vehicle of our electric car fleet, and it will provide transportation services for the Directorate's personnel. Focus Group Code (FOGR3TRC, Turkey, Formal Social Unit)

Finland

In a way it is also the fact that the step for procurements is now perhaps smaller than ever for these cars, and there is supply on the markets. Thus, they have, have also probably gotten rid of those childhood diseases over the years so in that way even though their usability perhaps does not quite yet represent that of vehicles with combustion engines, but usability has anyway all the time come closer to it. There may be problems in remote areas but previously there were some sort of maintenance or repair services

offered only in larger cities. In addition, there is much less need for maintenance or repair in the present cars than there were in the old domestic ones. Interview Code (IDIN55FIF, M, Finland, Collective Decision-Making Unit)

Again, transport is highlighted as an area where public procurements can have a large impact:

Finland

Transport is something the city can influence quite a lot actually. Different planning solutions, competitive tendering and procurement, and also through making it possible for new technologies and solutions to be deployed. Interview Code (IDIN57FIH, M, Finland, Formal Social Unit)

Another respondent pointed out that simply having green or environmental criteria might be confusing, and will not always fit the desired outcome, however the respondent acknowledged that this type of criteria would seem much more reasonable in larger public procurements, such as the building of a new school.

Norway

We just got new procurement rules in [the municipality] and there it says that environment should count for at least 30 % of the assessment. But it's pretty new, but during my time here, I have only bought small purchases where this has been more of a nuisance really. So, it's well, more like; OK, I am doing an environmentally friendly measure in the first place. So, if I'm going to separate the two suppliers, what should I assess them against? If they are driving an electric car to and from work, should that also count into those 30%? It is a bit like that. But I can understand it better when we for instance are building a new school, not that I am involved in that in my position, but anyway, I am guessing it would have better and more important effects there. Focus Group Code (FOGR11NOC, Norway, Formal Social Unit)

One respondent was also disappointed with the slow phase of public procurement, especially with low ambitions:

Finland

The thing annoying me in public procurement is that increasing two percent clean-tech would make us two percent better in average, however, it does not have any impact. Interview Code (IDIN54FIE, M, Finland, Collective Decision-Making Unit)

From the analysis, the issue of the ambitiousness in public procurements seems to be quite context specific, as another respondent could explain that in their city, the municipality had actively taken steps to purchase electric buses for public transport, and while sufficient infrastructure at bus stations was not optimized yet, the city expects around 400 buses by 2020. However, while the electric bus is a low-emission transportation alternative, the source of the electricity these buses run on is very much determined by how much renewable energy supply there is, thus highlighting the need for an increase in renewable energy to fully have a low-carbon public transport sector:

Turkey

The correct step to be taken is to shift towards electric mobility as Europe has already made decisions to abandon the use of vehicles based on fossil fuels in 2030 and 2040. We have also taken some steps to increase the use of electric buses. We have 20 electric buses right now. Although Europe does not have any electric car fleet, there are other vehicles based on CNG. We can also see similar vehicles based on CNG in Ankara. However, the technology for e-mobility is not mature enough for the time being and the conditions for infrastructure should be improved, which means that a huge investment has to be made for e-mobility. For instance, there should be charging stations at bus stations and the route optimization should be ensured. The number of electric busses will gradually increase to 400 by 2020. When electric busses become widespread, the bus fleet will be totally based on e-mobility as the emissions in e-mobility are zero percent. However, carbon dioxide emissions are not zero percent. This means that emissions are not observed in electric busses since there is no exhaust port. On the other hand, the electricity used in these vehicles is not clean. The electricity generated in Turkey has emissions of half a kilo per kWh. The electricity is generated from fossil fuels, natural gas and thermal power plants in Turkey. For this reason, the whole transformation can only be achieved if the electricity to be used in e-mobility is

generated from renewable resources to decrease the carbon emission. Interview Code (IDIN4TRB, M, Turkey, Formal Social Unit)

The same respondent also highlighted that although electrifying public transport is very important, other vehicles, such as privately-owned cars and other vehicles are responsible for most of the emissions in the transport sector. However, adding that when the scope of public transport, especially low-carbon public transport increases, the share of individuals using their vehicles will decrease, thus leading to a larger effect on overall emissions:

Turkey

The vehicles except for public transportation vehicles are responsible for 80% of carbon emissions in the transportation. Although the municipality buses are regarded as a major problem, their share in carbon emissions is not so high, contrary to the general opinion. Public transportation vehicles are responsible for only 4% of the carbon emissions in transportation. Therefore, our focus point should be other vehicles. The fact that the number of municipality buses increases means the individuals will not use their cars so often. When the public transportation vehicles become widespread, the number of vehicles used by individuals will decrease. The carbon emission share of the municipality's vehicle fleet and intercity buses is 2% in total. The electric vehicles such as subways have a share of 1% even though they serve a great number of people. This picture shows how environmentalist electric vehicles are. Interview Code (IDIN4TRB, M, Turkey, Formal Social Unit)

In other parts of the EU, where the power supply is regenerative close to hundred percent, such as in Norway, the reduced effect of using low-carbon public transport is even bigger.

As cities and municipalities are potentially large customers, they also have the power to create new markets with their large public procurements, as one respondent working in a county pointed out:

Norway

Yes, we are a big customer, potentially. You see it, for example, with hydrogen. If we choose one of our fleets, and turn it into pure hydrogen, then there will be a volume that is so large that it suddenly is more commercially interesting, it changes the game a lot. So, we have the power to do so. But there is enormous uncertainty, in relation to that we do not know what the actual cost really is, for example, by going with a whole new energy carrier. One thing is the material, which has a price, but you're going to build all sorts of facilities, so then you will have some unpredictable prices here and there, and so you end up with something that you are just guessing on. And what kind of economy do you have in 4-5-6-7 years. Interview Code (DIN44NOJ, M, Norway, Formal Social Unit)

Another respondent pointed out that as public actors, they could play a pilot role in which they can try out things and create new markets. One example is Norway, where the upcoming ban on the use of fossil-oil heating creates a large demand for new heating solutions, with district heating being one of them:

Norway

We, as a public actor have to have this pilot role that we can try out things and create markets. One example is this upcoming ban on the use of fossil-oil for heating. We are soon rid of all, in our buildings, and we are working on the rest. And it is clear that district heating is our first choice, even if some argue that it is not renewable and will not get us to zero-emissions. Nevertheless, it is still the first choice for us. But we do have some places such as (places in the county), where there is no district heating because it is too far away, so there we have built some chip firing plants and off-grid-solutions. Because it is not just a matter of just adding power lines out there. Then we have some buildings that lie outside of the concession area of (an energy company). Heating, for instance if it is too close to (large area of woodlands) or places where we cannot connect to the district heating system, where there is not sufficient capacity to add or replace with electricity, and in those places, there is often talk about going over to bio-oil. Today, this practically means that you have to buy the bio-oil from Eastern Norway, and then the shipping cost is significant. And then one might think that we can start something here, and that in the

long term we can create a market here and that we can have a large inventory here, or if they could have a facility that makes it here. Focus Group Code (FOGR11NOC, Norway, Formal Social Unit)

As for the procurements process itself, there are several major issues that have to be considered according to one respondent working closely with public procurements in a Norwegian county. First, a long-term perspective is important, both for the public side and the suppliers. This also highlights the importance for both sides to interpret where the technological and political direction is heading:

Norway

A long-term perspective is always important, and the security that they need to be able to ... They want to write off the material. A ferry lasts not only for ten years, it will last for thirty, right. So, to make sure that it's actually diligent. But then you see that at the same time that there is no operator today that is going to build a diesel ferry, because they know that it may be used in one contract, but they won't get a new contract on it, so it's a loss project. It will be too expensive. Interview Code (DIN44NOJ, M, Norway, Formal Social Unit)

A good and constructive dialog and interaction with the suppliers is important, in order to challenge and incentivize them to develop products that are environmentally friendly, as it is easy to lean on technologies that are available at the moment and likely not as low-carbon as possible:

Norway

By sitting around the same table, it is easier to lean on technologies that are available. For example, the County, I think has made a very good move, that in all their procurement contracts, they say that this here should be zero or it should have some environmental standard. So, I think they are using their purchasing power correctly. They contribute to that development is faster because they are actually challenging suppliers. Focus Group Code (FOGR10NOB, Norway, Formal Social Unit)

In this regard, Norway is among the leading countries in Europe when it comes to innovative, dialog-based public procurements. However, more interaction with the supplier market will also require longer time in preparation for procurements and thus increase costs, although it is in line with the emphasis on innovation and green criteria in the new EU public procurement strategy.

Secondly, the way of evaluating public procurements on different factors is a key element for the public buyer. The respondent working with public procurement highlighted how they had shifted from detailed-oriented requirements to functional-oriented requirements with success:

Norway

We have shifted from detail requirements to functional requirements; it is really these two that we find throughout. But with detail requirements is that you really specify exactly what you want. So, it's height, width, engine power, whatever it may be. Right down to the shoe number. And with functional requirements you go to a much greater degree towards that you say: "I'm going to buy a service, and you will have to carry this many, from there to here". And you cannot do that with more emissions than this, and you are allowed to spend this much money on it." But anyway, going to functional requirements is also a very big twist, where the former was very detailed, and to know where you begin with a description of the service that you actually want to buy. Interview Code (IDIN44NOJ, M, Norway, Formal Social Unit)

Evaluating on environmental impact is very difficult, and no one has really done this in their tenders. In a recent ferry-tender the county set an eligibility requirement, i.e., here, a limit on emissions, in order to bid, together with a financial compensation arrangement to incentivize even lower emissions, also during the contract period:

Norway

To evaluate, especially on environment, is terribly difficult. We have deliberately not done it in our tenders. We have set eligibility requirements, in place of the supply-requirements, which really distinguishes between absolute requirements and the requirements you are evaluating. And so, in connection with the

ferry-tender, for example, we set a limit; you cannot emit more than this, in order to be allowed to bid. And then you have a bonus plan that makes it so that if you emit less, you'll get financial compensation. So, it pays to potentially, emit less. And this goes over the whole period, so if you make any progress or measures during the period, then you can potentially get more compensation. Interview Code (IDIN44NOJ, M, Norway, Formal Social Unit)

Finally, the respondent also highlighted that the timing of contracts with technological developments is another important factor for a successful procurement relating to low-carbon solutions:

Norway

For we are always two-three contracts ahead, really, on solutions. And that has to do with: "How long should the next contract we put out be? Can we make technology shift now? We see that it comes in about five years, should we then run a short-term contract or a long-term contract? How are we going to rig this to get the desired shift and hit the market at the right time?" Interview Code (IDIN44NOJ, M, Norway, Formal Social Unit)

As technological development moves quicker and the pressure to shift to a low-carbon economy increases, public buyers will need to have additional expertise and an increasing understanding of the technological frontier and possibilities for low-carbon solutions. That also means that various administrative levels can be quite vulnerable if such expertise does not exist in their jurisdiction. Admittedly not explicitly discussed in the interviews or focus groups, the needs and barriers identified by the respondents nevertheless invites one clear potential policy solution: One way of dealing with such vulnerabilities and at the same time provide updated state of the art data, could be to open an official EU database or digital hub with life cycle analyses (LCA), and public contract registers – these are already available in some countries today. This database should include open and transparent LCA specifically aimed at public procurements and several of the issues surrounding the lack of expertise and other problems facing public buyers.

Public procurement: Feasibility, flexibility and fairness for stakeholders

In terms of feasibility of successful public procurement processes, expertise and purchasing skills of the officials that are involved are very important. The new EU strategy for public procurements calls for a "professionalization of public buyers", which is aimed at assuring that public buyers receive the required skills. This could be said to be an "easy" policy goal, however it could be challenging at the lower levels of governments, especially in smaller municipalities. Given the large range of issues to be addressed in large procurements processes, such as economic, environmental and social issues, there is an inherent vulnerability that some of these smaller entities are not sufficiently equipped to deal with in terms of complexity. This calls for guidelines and expertise and capacity building at all levels of government, especially at the local administrative level in accordance with the new EU strategy.

Given the right expertise and professionalization of public buyers, as well as the rapid rate of technological development for low-carbon solutions, public procurements can be a powerful tool in the shift to a low-carbon economy. In terms of ambition, one respondent working with public procurements pointed out that they could almost always be even more ambitious in their tenders, because of the speed of technological development:

Norway

We placed a requirement, or we placed a certain requirement for a ferry tender, on a certain possible effect on the dock, and in six months, it was outdated. It is hopeless, because we could have been even better, but as soon as it goes, that in the moment you have set something which has an "absolute", then you are out of date - it is a bit difficult, but very fun, by all means. So, you can really always do a little extra, but even then, you are out of date. Interview Code (IDIN44NOJ, M, Norway, Formal Social Unit)

In other places, it is about starting small and doing it step by step as time goes on and technology and budget allows the transition:

Bulgaria

R: Different ideas are being considered, but it's important to find a competitive price offer that covers the necessity of transport between the different units of the municipality. So, there is already an electric vehicle in the metropolitan inspectorate, which is used while getting around locations in parks and gardens. In this sense, most of the parks are maintained with light-duty small lorries that are entirely electric. We are aiming to buy such technology and it is done step by step. I: That is, as public procurement? R: Yes, absolutely. (IDIN26BGJ, M, Bulgaria, Formal social unit)

In terms of flexibility, standard public procurement processes follow quite rigid rules and regulations, although the trend is moving towards a greater range of the types of procedures public buyers can use. Given that the typical contract length could be as long as ten years, for a ferry operator for instance, it goes without saying that changes after contract signing can be very expensive, thus public buyers have a large responsibility of anticipating technological development so that the risk of signing lengthy contracts with emission-intensive technology are minimized:

Norway

But for us, it's all about that it happens at the right time in terms of the contracts. Because we are binding ourselves to often 8-10-12 years, without the possibility for change, or at least very little change. Changes before the contract are "cheap". Changes after contract signing are very expensive, and something you want to avoid. So, once we do something, we lock in for ten years. It is the largest technological hurdle, that we don't have the speed we need right now, in relation to the fact that we have big contracts going out now. For I have no doubt that when we're going out on the next contract, in 2030 or something, then this is not an issue at all. But right now, we are just in that period. Interview Code (IDIN44NOJ, M, Norway, Formal Social Unit)

In terms of fairness and equity, the public procurement process must have high transparency. As many public procurements involve large sums of taxpayer money and lengthy contracts, the emphasis on recordkeeping and oversight is very important. One respondent pointed out that they had repeatedly witnessed how some of these public procurements had been caught registering higher expenditures than the actual ones:

Bulgaria

We repeatedly witnessed how public procurement is caught, which a couple of times has claimed higher expenditures than the real ones made. Interview Code (IDIN18BGB, M, Bulgaria, Collective Decision-Making Unit)

This can ultimately lead to the breakdown of general trust in the government and in administrative officials and the acceptance of large publicly funded procurements contracts. Given that in some cases, the suppliers market is relatively small as well, transparency and adherence to competition rules are very important.

4.1.3. Addressing the technological foci for formal social units

Buildings

Buildings are one of the key areas of both energy consumption and overall emissions. According to the European Commission, buildings are responsible for around 40%of energy consumption and around 36% of the CO_2 emissions in EU.[66] Regulators have several ways of influencing emissions from buildings, especially through the building codes or the technical requirements. These influence new constructions and, in many cases, how retrofitting has to adhere to regulations. Several respondents highlighted the lack of regulations in the building

[66] European Commission – Energy efficiency - Buildings: https://ec.europa.eu/energy/en/topics/energy-efficiency/buildings

sector, or outdated or lax technical construction requirements to address key issues such as energy efficiency and that it can thus hamper the energy transition in buildings:

Bulgaria

The entire building envelope is so complex, but unfortunately it is not given the whole attention that it deserves. I recently became a chairman of an organization for facade engineering and we are now starting to work. Because this activity must be legalized so to speak, nobody is paying for it at the moment. We need more educated experts in this field. (…) You surely know one of the renowned architects. We worked together on quite a lot projects. I will mention them as examples. We started a research organization for zero energy buildings, we drowned ourselves and it didn't succeed, so we stopped a long time ago, because the idea was to gather experts who work in this field. I should mention from my experience with that organization in a project for a dormitory, which we basically just made for free. It is not that we are complaining about the money we didn't receive, but it is the lack of recognition and value of such project that was not satisfying for us. Then you are not payed. When you go to a lawyer, you pay, because otherwise he won't do the job. And this means that you haven't recognized the need. Legitimately no one from the government did any steps to make such activities obligatory. I just before the interview spoke to the export director from our company for Ukraine, that there from some years a project for the building envelope is required. In Bulgaria, such project is not required at any level of the process. This is a total crime. (...) What we were doing 10 years ago, we are still doing it in the standard buildings. Interview Code (IDIN23BGG, M, Bulgaria, Collective Decision-Making Unit)

Turkey

When we completed the construction of our building, there was not any regulation on energy efficiency. However, we made an effort to construct an energy efficient building. Interview Code (IDIN13TRM, M, Turkey, Individuals Engaging in Joint Contracts)

Given that municipalities usually own and maintain a large property base, their influence is big, but in the end, the budget dictates most decisions:

Norway

We have a very large property base, and we are building some new properties, we demolish some, and we do a lot of maintenance. Therefore, it is clear that it is possible to influence a lot. That being said, these processes are very budget controlled, and with maintenance, for instance, it is often the case that we switch like for like. There are no budgets to cover the extra cost of a new window with better u-value. This is something that the municipality to a certain degree, that is, something those at the top are aware of. So, for example, this year I have been sitting on some funds, around 4.5 million NOK aimed towards energy-efficiency/conservation investment projects, so I receive applications from those who control and do maintenance and then I can decide to grant money for things that they don't usually have a budget for. Focus Group Code (FOGR11NOC, Norway, Formal Social Unit)

Another respondent highlighted how the same technical regulations can apply to both new and old buildings, and that this simplifies things, but might not be the most efficient way of taking advantage of the energy saving potential in old buildings:

Norway

Yes, we have a challenge with perhaps, particularly with the technical regulations (TEK), which in a way is designed for new buildings, but applies to old, to do something with them, and the question has been raised about whether or not we ought to have two technical regulations; one for existing and one for the new, and when one could have made it so that one takes advantage of the energy saving potential according to the kind of category building you were dealing with. That is, where you were a little better at it, for what I think is often happening now, is that you get away with it, and so make you less than you could have done. But I think that it was put on the backburner, this thing about having a separate regulation for new and old buildings. Interview Code (IDIN39NOE, F, Norway, Formal Social Unit)

Several respondents also pointed out that old buildings should keep their original characteristics even after retrofitting, and that for instance a new three-layered window does not maintain this style and are not easily accepted by owners, thus leading to a limited scope of action.

Austria

What is sometimes overlooked is that we are dealing with existing cities here. If you look at a city like our city (with more than 100,000 inhabitants), in twenty years' time, 80% of what will be there already exists now. And in such a city, especially when you look at all these issues that range from cultural heritage to any kind of protection, the scope for action is limited. Interview Code (IDIN61ATB, M, Austria, Formal Social Unit)

Given the fact that the effect of inserting inner windows is very good, this could be one option to both get better energy efficiency and maintain building characteristics. However, as the respondent points out, it is more expensive than a three-layered window:

Norway

However, in connection with the old, there is almost always talk about energy efficiency, too, and then the attitude is: Insert inner windows with double glazing and gas, or whatever it may be. And that it is wide open for, but then when it comes to price, it is often more expensive to have two, that is, an inner-and outer windows, but cheaper to have one blade with proper glass. And it goes both on price and some of those practical things. So, it's often a question around that, but it is not a resistance to energy efficiency, but there is a reluctance to lose the ... I: The character of the building? R: These buildings are characterized by these windows that are kitted with small ... It goes on that sort of thing, then. Interview Code (IDIN39NOE, F, Norway, Formal Social Unit)

Another respondent highlighted the difficulty of fully utilizing decentralized energy in densely built inner cities:

Austria

A decentralized supply is partly possible in new construction areas, where relatively large areas are available or where there are some larger possibilities to use groundwater. There are not many possibilities for a densely built-up area like the inner city here, where I can hardly install solar systems, where the floor space for geothermal energy per house is very limited in relation to the floors above it. Interview Code (IDIN61ATB, M, Austria, Formal Social Unit)

The focus on buildings was also a general theme for several formal social units, both from new types of contracts with contractors, pilot-projects and the use of public procurements. The increased costs of new solutions and higher energy efficiency were highlighted, as well as climate conditions that have an impact on energy use:

Turkey

When the energy efficiency is considered, the first thing that comes to mind is insulation. However, there are also other tools and equipment for efficiency such as boilers, pumps and air conditioners whose efficiency should be analysed. (...) It is quite difficult and costly to insulate the building after constructing it. (…) The general principal is to insulate the building before the construction phase is completed. The insulation leads to an increase of 2-3% in construction costs. However, this cost increase will reach 15% in case that the building is insulated after the construction is completed. (...) high temperature shifts towards the inside of the house in summer months. City X spends more money for cooling as the cooling loads are relatively high in city X especially during the summer period. Interview Code (IDIN4TRB, M, Turkey, Formal Social Unit)

However, places like Norway have a good district heating infrastructure:

Norway

I am a very big supporter of district heating as a heating source, also because we are then taking hold of the environmental issue. So, instead of wasting that heat, we boil water and transport it around the network. Focus Group Code (FOGR11NOC, Norway, Formal Social Unit)

In one of the focus groups, respondents from the municipality and the county explained that they have themselves engaged in energy performance contracts or energy saving contracts (EPC), in some of their buildings and in a new ambitious project, and that they are starting to see more of them around the country:

Norway

We see that many municipalities now use the EPC, or energy saving contracts. They work out a tender to be allowed to analyse the entire building and any other facility and then propose measures. And then there are several providers who are in as well that make a selection of some sample building where all the providers will go in and do inspections and suggest what they can do there as energy solutions. And when they look at both the energy carriers and on reduction measures and such things. And there will be a dialog-based process at a later stage. So, it is widely used by the municipalities in recent years. Focus Group Code (FOGR9NOA, Norway, Individuals Engaging in Joint Contracts)

They further explained that EPCs can be used as a quality-assurance for a building's energy performance:

Norway

We have just chosen to venture into an EPC in connection with a new construction project. An ambitious project at [district in the municipality]. And also, to see whether it is appropriate to use it in other new projects where we set up contract commitments with the contractor on the energy measures in a period of five years after the building has been handed over. And we think that this could be a way to quality-assure and to do something in relation to the construction industry. Focus Group Code (FOGR9NOA, Norway, Individuals Engaging in Joint Contracts)

Furthermore, a focus on pilot-projects in collaboration with research institutions can show that something is feasible, and even economical, in time:

R3: For instance, from where we began with zero emission buildings, just look at the FME, it was established only 8 years back, how much focus and attention those types of initiatives have gotten. So, the use of instruments doesn't always have to work for a terribly long time before it can have a tremendous effect. I would think that a lot of people have been surprised by that.

Norway

R2: I can come with another example that has to do with passive houses, which was launched maybe 10 years ago, which was met with nervousness, and not a very positive outlook when we started thinking about it. And how fast it went once central actors in the market transitioned themselves. And then, well, we ended the passive house program because we believed that we achieved the market change that was needed, and now you have it in the technical regulations at that level. And to see that it has gone that fast, we really couldn't have foreseen when we started working on that idea.

R3: Yea, that's what I think as well, at these FMEs that were in the first round in 2008 or 2009 with zero emission buildings which in a way now has moved over to be the zero-emission neighbourhood FME. They have had a tremendous effect, where you have taken basic research to applied research at light speed. Because you have included everyone with a stake into it. Focus Group Code (FOGR11NOC, Norway, Formal Social Unit)

The lack of expertise was highlighted by several respondents as a potential barrier for large scale energy efficiency and low-carbon solution in buildings:

Norway

It [a swimming hall] was completed in 2000 or something, and in all the years until last year or this year, they had all the drainage from the showers dumped right out in the fjord, and they used new water from the water plant right, when they had to replenish the swimming pool. And then the water from the water plants, it comes in at 10 degrees, and has to be warmed up to 30 degrees. But now they have, they collect all the waste and drainage from the showers and push it through a filter, and we got to inspect that filter, and well, there was a lot of waste and hell, that's for sure. But that drainage comes out at around 30 degrees and then goes into a heat pump and it exchanges against the other water. And this, combined

with some other measures came in at a purely economic saving of 2 million NOK annually, with the additional emission and energy reduction. But currently there are not even exchanges between buildings. And then we only understand the flow of energy in a single building. So, we need to know where you lose energy, where you need energy and how we can transport energy between them. Focus Group Code (FOGR11NOC, Norway, Formal Social Unit)

With proper expertise and willingness to challenge old ways of thinking, a lot can happen, such as smart use of district heating for dehumidification, which is very energy consuming and the addition of renewable energy generation in buildings. Thus, a general theme is that cities and municipalities are very dependent on the expertise and knowledge of the officials that work there.

Norway

I also think that, at least internally with us, we are talking a lot about there starting to be a focus on life cycle or climate accounting and life cycle analysis and that sort of stuff. If you have to build the foundation and dehumidify the building, then you just drown in these big numbers because it is so energy-intensive. But then you have (a company) that offers a price guarantee on dehumidification using district heating now. So, from now on, one of the goals is that, if you are building a building that will use district heating anyway, you might as well get it going right away and use that to dehumidify the building, instead of someone coming in with an oil-fired generator that stands and burns for weeks. Focus Group Code (FOGR11NOC, Norway, Formal Social Unit)

Turkey

Before going into details, I can introduce you to our municipality building. Our municipality building was covered with glass instead of walls. Therefore, we utilize solar energy in heating. We do not experience any problem in cooling as well. Our glazing is supported by argon gas. At the beginning, the construction project was based on a smart building that would be able to generate its own electricity. However, this target could not be achieved totally. Nevertheless, we have a rain-water collecting pipe that can be used on the rooftop and the courtyard of the building. We also installed panels for a water heating system in the building. Moreover, we have photovoltaic panels located on an area of 320 m^2 in order to generate electricity. We also do not use any lighting system except for LED systems in the facade of the building. Not only in our municipality building but also in other facilities such as sports hall, we used solar energy systems for heating, and all the lighting systems were energy-saving LED systems. Furthermore, we plan to construct a cultural centre in which similar energy-saving systems will also be applied. Consequently, energy-saving implementations and energy conservation provide numerous opportunities for our municipality. Focus Group Code (FOGR3TRC, Turkey, Formal Social Unit)

One way to do deal with this lack of expertise and capacity in cities and the local administrative level is the use of a principle planner and an energy consultant that is heavily involved in all phases of the construction phase. This was highlighted by several respondents that have had a positive experience in their projects using such an expert and the need for such experts in the construction process:

Finland

R: The use of a principle planner [or designer] is one thing, like a battle against the windmills. Appreciating planning and understanding how important it is; something we have not been able to communicate clearly enough to get through. It's just not going forward, and I don't know what to do otherwise than write the requirements down in the legislation and put the principle planner in such a role that it cannot be as light as is.

I: Have you tried to influence such a legislative change?

R: Discussions with the ministry of environment are one thing but it does not lead to anything.

I: Do you have partners with similar agendas, like a coalition?

R: I would say that expert organizations are of the opinion, especially researchers, that roles should be clarified. In bigger building and construction projects, the principal planner does have a clear responsibility, clear role and task to supervise all other planning tasks. It is not enough to supervise just architectural design. I know a lot of planners who are fantastically familiar with heating, plumbing and air-

conditioning. They can look at pictures and tell what's missing, even if their background is in architecture. But with small buildings we should also have it like this, to make the role stronger. Interview Code (IDIN52FIC, M, Finland, Collective Decision-Making Unit)

Austria

Architects, developers and energy planners. They're all involved in a project. Energy planners are often so strong that they can push things through. It is best if the developer says that he/she or the developer wants to implement something like this. You have to address the whole community. Interview Code (IDIN60ATA, M, Austria, Formal Social Unit)

Turkey

The Turkish economy is mostly based in the construction sector and the awareness has been significantly raised in this sector with respect to insulation and energy efficient materials. The architects and engineers try to make a difference in the construction of luxurious and large buildings by providing solutions for energy conservation and energy efficiency. Interview Code (IDIN6TRF, M, Turkey, Collective Decision-Making Unit)

Electric mobility

The goal of the European commission of at least 60% reduction of greenhouse gas emissions from transport as compared to 1990 by mid-century and be firmly on the path towards zero[67] means that governments will have to focus their regulatory frameworks and incentive structures to stimulate the adoption and the technological innovation and development necessary in the electric mobility sector to reach these goals. However, as markets are becoming established, and electric cars are becoming competitive, subsidies should be phased out, in a predictable manner. However, some respondents even felt that there was no need at all for incentives because the markets were already very good:

Finland

Markets are introducing now very good electric vehicles, reasonably priced. In two or three years, they will be even cheaper, and prices are constantly going down. There's no need to use tax money to support electric vehicle industry, there's no hurry. Interview Code (IDIN56FIG, M, Finland, Individuals Engaging in Joint Contracts)

In some places, support could mean providing sensible incentives for consumers to choose electric cars. Such as free parking and reduced fees on toll roads, while in other places it might mean tax credits or other economic incentives:

Spain

At my workplace: a companion who has bought an electric car, because with the electric car she can park right by the door. So how much has this helped to raise awareness on the energy issue? Well, in her case, I do not know, but it has encouraged her to buy the car, which otherwise would not have happened in any way. On the other hand, it does have the effect that, well, then, that people see another electric car, and this makes them think "yet another electric car", even if you only have that thought for a moment, which otherwise you would not have had. The same with the electric cars that go around Madrid and that..., well, it is clear that if you do not make any kind of noise people will not think, the fact that more and more people have them, this helps to increase awareness, or at least that moment to think about the subject. Then, if action is taken or not, this is more difficult to evaluate. Interview Code (IDIN28ESB, M, Spain, Collective Decision-Making Unit)

Bulgaria

R: The first thing is that electric vehicles are free from local taxes, that is, the owner of the electric vehicle does not pay taxes for having a car that he would pay for a normal car. And the second major motive is that the electric cars park for free in the city centre. I: And could they also find infrastructure for re-charging there? R: This is about to happen. At present, with the Chief Architect, we are developing a map based

[67] European Commission (2016) A European Strategy for Low-Emission Mobility: http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:52016DC0501

on which in the centre of the city points will be set up for building 80 charging stations, where electric vehicles could be charged while being parked at a public municipal parking space. It does not matter what zone there is because they park for free everywhere. (IDIN26BGJ, M, Bulgaria, Formal social unit)

Charging infrastructure for electric cars

Based on European Member States governmental plans submitted to the Commission as part of the groundwork and implementation of the Alternative Fuels Infrastructure Directive, a new analysis by the Platform for Electro-Mobility concludes that the number of planned public charging stations will be sufficient to reach the European Commission's recommendation of 10 EVs for each recharging point.[68]

As such, urban charging infrastructure and charging networks along major highways will likely not be a big concern by 2020 and one should thus withhold further major public spending on charging infrastructure as the markets for electric cars and mobility and consequent services around electric mobility is firmly established and gets progressively larger. This of course rests on the notion that already planned investments are followed through by the member states:

Norway

We believe that it is not the State that should build out the charging infrastructure, it's essentially up to private players to do it, but you may need to change some of the frameworks and the terms, such as the net-tariffs, to get it done outside the urban areas. So, we're working a lot with giving input to the political parties in these areas. Interview Code (IDIN42NOH, M, Norway, Collective Decision-Making Unit)

Furthermore, along major highways and heavily trafficked routes the economics for privately operated high-speed charging networks are already on their way. Among these are several large manufacturers in the German car industry, with companies like BMW, Mercedes and Volkswagen and the American car manufacturer Ford that have formed a joint venture called IONITY, which will build and operate an ultra-fast charging network, following in the footsteps of the Tesla Supercharger network. Around 400 charging stations will be built, with a capacity of up to a future-proof 350 KW across main highways in Europe, using the CCS charging plug-in standard.[69]

One respondent highlighted the speed in which companies have changed their minds on high-speed charging networks:

Norway

But the thing that in a way, is the most exciting, is that we see that at around the X-region, there are many electric cars, so they are building charging stations, high-speed chargers, without support. So, there in a way, the market forces have started to work. They have not used a lot of money on this, it's kind of 120-ish million NOK, 110-120 million NOK in public support for the high-speed charging network, since 2011. So, it's not a huge public support, but it has been necessary to get the market going. If you go five years back, there was no thought that you could make money on high-speed charging. It was at least incredibly few. It was sort of generally accepted that it would be hard to make money. But now we see that they are starting to make money, at least along the more heavily trafficked roads, and in the cities. So, around Oslo now, you got pretty big high-speed charging stations popping up without support. Interview Code (IDIN42NOH, M, Norway, Collective Decision-Making Unit)

As urban charging networks and along major highways will continue to develop without much need for governmental support, policies around and if needed, support and incentives for adequate infrastructure in rural

[68] Platform for Electro-mobility (2018) Enough public chargers planned; infrastructure can't be blamed for the slow uptake of EVs - analysis: http://www.platformelectromobility.eu/2018/02/27/enough-public-chargers-planned-infrastructure-cant-be-blamed-for-the-slow-uptake-of-evs-analysis/

[69] Ionity – Ultra-fast charging stations: http://www.ionity.eu/ionity-en.html

and remote areas should be considered as part of a larger plan towards an electrified transport system in the long term. As a case in point, unsuccessful tenders in Norway's northernmost County, Finnmark, suggests that some remote parts with few inhabitants and long distances will lack the sufficient willingness for suppliers to provide and operate charging station networks, even if heavy subsidies are offered, simply because they will be very expensive to operate. Thus, policymakers must either acknowledge that some parts and regions will have insufficient infrastructure in the short to medium-term or decide on firmer measures and transfers in order to have sufficient coverage nation-wide. This point is also highlighted in the Platform for Electro-Mobility analysis as well as some of the respondents:

Norway

In Norway, we have got the cars, and then we started to build the charging infrastructure afterwards. So now at the end of the year, so ... in 2015, ///G/// finally went there and made a slightly more holistic plan. We need the chargers every 50th kilometres along the major road network, and so they have been using public tenders to get competition from private actors on that network, and it's supposed to initially, be done now at the end of the year. Apart from Finnmark, where no one will build. Even with 100 percent investment support. Interview Code (IDIN42NOH, M, Norway, Collective Decision-Making Unit)

Norway

The European Union has not been a frontrunner on this [electric cars]. (..) Now it has started to happen in England, and things are starting to happen in France and Germany. Market shares are starting to go up, you've got a little more incentives going on, they have started to build the charging infrastructure. German car industry has now gone together and to begin to build a charging network à la Tesla in Europe and the United States. So, there are things starting to happen, but if ... It is not the EU that might have been the biggest driving force, but they've set important goals on emissions since that makes that car manufacturers have to sell some low-emission cars to reach those goals. Otherwise, you risk quite large fines. Interview Code (IDIN42NOH, M, Norway, Collective Decision-Making Unit)

Rather than being a problem of charging infrastructure, the biggest obstacle for rapid EV uptake, apart for the cost of the car itself, seems to be the lack of choices of models in different consumer segments. Respondents especially highlight the need for family-sized EVs that cost substantially less than the Tesla model S and X. As car manufacturers across the world starts to engage fully in the shift towards a future with more electric cars, these models are expected to come, with several competitors to the aforementioned models are on their way to markets in 2018-2020. As EV production ramps up, economies of scale will lead to cost reduction in the supply chain as well as increased competition between major players in the battery industry, and thus industry experts expects a steady decline in battery cost and increases in company R&D expenditure.

Norway

We must get more cars in all categories. As of today, we buy, in Norway ... About half of the cars we buy are mid-range or larger. Thirty-something percent are SUVs. And in that size group, there is only Tesla that has cars today. And so, we know that there are new cars next year, and there are coming new cars up towards 2020. We must in a way, get the more the classic Norwegian VW, which can tow and have the whole family in, and that does not cost 700 000-800 000 NOK, but that we are relatively sure that that's coming. Interview Code (IDIN42NOH, M, Norway, Collective Decision-Making Unit)

Norway

R1: you probably need to have enough models that are appropriate for family buyers. And the cars for instance need to come with features such as towing hitches. R2: In the Norwegian market at least. Interview Code (IDIN37NOC, M, Norway, Collective Decision-Making Unit)

Electric ferries and high-speed shuttles

The shift from diesel-ferries to fully or hybrid-electric ferries is an area where there is significant emissions reduction potential. Both in terms of CO_2 emissions, and NO_x and SO_x pollution. As one respondent put it, ferries account for around 2.5% of global CO_2 emissions. Driven by an extensive partnership between Norled AS, a shipping company and ferry operator, Fjellstrand Shipyard, Siemens AS, and Corvus Energy, the MS Ampere was the world's first fully battery driven electric ferry. It highlights an example of public-private partnership, where the public procurement

process is used to challenge suppliers to push the technological and environmental limits. The operators claim that their ferry cuts emissions by 95% and costs by 80% and that these remarkable characteristics has resulted in an increasing attraction of potential customers, with 55 ferries ordered from the suppliers.[70] As one respondent highlights the importance of sitting around the same table and discuss possibilities:

Austria

At the COP, it was interesting to see that large companies, in this case the Norwegians who are pioneers anyway, have started running electric ferries. And you didn't hear that before the Paris COP. That is 2.5% of the world's CO_2 emissions and an enormous amount of money that is in there, and that is where these companies decide to become frontrunners in the electrification of shipping and are grouped together in clusters to create concepts. The ferries will adapt anyway, and they quickly realized that this is better than diesel in terms of costs over the life cycle and the amount of dirt produced. And they are now thinking about remote-controlled cargo ships with hydrogen or hybrid propulsion. I was very enthusiastic. There's a great deal of energy behind it. We have retail chains such as Hofer or IKEA that implement climate protection measures. Interview Code (IDIN60ATA, M, Austria, Formal Social Unit)

One respondent highlighted the need for technological development and difficulties with sustainable options for high-speed water shuttles:

Norway

The big thing that I am working on now, is high speed shuttles. High-speed shuttles are incredibly challenging, because per passenger km, it is the worst form of transportation that you can have. It is much worse than flying. You should fly a helicopter instead, almost. It is that bad. But it is very efficient and takes a lot of shortcuts. And as a mode of transport along the coast, it is important. But it cannot continue in its existing form. It is a mode of transport where everything should be as light as possible, and in that moment, you are replacing traditional diesel engine with electric or something similar, then you replace the light with something heavy, then you can still run the boat, but you cannot have any passengers on board. So that's a bit unfortunate. Interview Code (DIN44NOJ, M, Norway, Formal Social Unit)

<u>*Electric buses and trollies*</u>

Public procurements for cleaner solutions to public transport in cities and municipalities will also drive a massive demand for low-carbon buses, trollies and trains. The electric bus is attractive as demand goes up and prices come down, and if the country's renewable electricity generation share increases, these buses will be significantly cleaner as time goes on and the energy mix gets cleaner. However, the high upfront investment cost is still a major barrier for municipalities for fully adopting electric public transport:

Turkey

The major reasons behind the fact that we did not volunteer for natural gas-powered vehicles are high investment costs and increasing dependency on natural gas. Turkey is already highly dependent on natural gas in the industrial sector. A further dependency on natural gas in transportation can cause unfavourable conditions for Turkish economy. Our municipality has awareness of electric mobility. Last year, we purchased first electric buses and we have currently 20 electric buses. Due to the fact that initial investment costs for electric mobility are quite high and the technology for electric mobility is not mature enough, it is difficult for public institutions to tend towards electric vehicles. Both the public officials and citizens are pleased with electric buses. The citizens wait for electric buses in bus stations as they are more comfortable and silent. (...) Due to city X's suitable geographical conditions, bus companies prefer our city to test their vehicles. City X has many hills and the buses should display the same performance in both hills and flat areas. Furthermore, the reason behind the fact that city X is preferred is high air temperature in summer so that the air conditioning system of the vehicles can be tested. In other words, city X is regarded as a testing area. (...) We plan to increase the number of electric buses. However, this transition can take a long time due to immature technology and high initial investment costs. (...) The major obstacle is certainly high price. We do not experience any problem regarding the vehicles'

[70] Lambert (2018) All-electric ferry cuts emission by 95% and costs by 80%, brings in 53 additional orders https://electrek.co/2018/02/03/all-electric-ferry-cuts-emission-cost/

operating mechanism. The electric mobility might be more widespread when the initial investment costs decrease. (...) 20% decrease in carbon emission is municipality's target. The construction of a tramway is also included in the municipality's target based on the decrease of carbon emission. In the area where the construction of the tramway was completed, the bus services were cancelled. Accordingly, a significant decrease in carbon emission was experienced. The new tramway line under construction will also contribute to the decrease of carbon emission due to the fact that there will be a decline in the usage of individual vehicles. Interview Code (IDIN9TRI, F, Turkey, Formal Social Unit)

Finland

They now have the one line fully running with electricity, I think, so it's really a case example what's been done on this line, and in principle there's no hindrance to spread it to the whole… I think that was the most concrete and visible promotion measure for electro mobility that also involved big investments. Charging infrastructure and big investments in the buses. Interview Code (IDIN57FIH, M, Finland, Formal Social Unit)

However, other low-carbon transport options are also suitable for public transport, such as metro systems in big cities or trams:

Turkey

The electric mobility should be definitely prioritized in public transportation. On the other hand, the transition cannot only be ensured with battery-powered vehicles. For instance, the tramway project will certainly accelerate the transition process to a low carbon economy. Moreover, the tramway project will replace a large number of buses generating high amount of carbon emission. When the tramway is started to be used, people will learn to travel with tramway and it will become a life-style and culture. These systems are effectively used in the biggest cities of the world. If the necessary steps are taken to raise awareness on this issue, these same systems are likely to be implemented in Turkey. Interview Code (IDIN10TRJ, M, Turkey, Collective Decision-Making Unit)

Bulgaria

Especially for transport - we are developing exclusively the electric transport so that people can move in a short time through sustainable means of transport. Project number 1 is the metro that is currently being built. It is, in fact, apart from being the fastest, the most convenient and the most efficient, also the most environmentally friendly, since everything is in practice, the entire drive of the system is electric. Then we develop the tramway transport, also electric, the trolley bus and lastly the buses. As with buses, we are planning to develop the so-called electric buses, the current trend in the world is to replace the conventional diesel buses with electric buses. (IDIN26BGJ, M, Bulgaria, Formal social unit)

Smart energy technology

<u>*Regulatory frameworks and support schemes around renewable energy production*</u>

In order to promote more distributed renewable energy generation, regulations and market design have to address regulatory frameworks surrounding this type of generation. This especially concerns small-scale producers. Some respondents called for long-term contracts with guaranteed sellback of excess energy to the grid through support schemes such as a feed-in-tariff:

Turkey

The consumers should have purchasing power. In other words, the energy price should be affordable for consumers. For this reason, incentives such as feed-in-tariffs should be provided for new technologies. Interview Code (IDIN10TRJ, M, Turkey, Collective Decision-Making Unit)

However, in some places, like in Spain, that have feed-in-tariffs, there seems to be a perceived lack of clarity on the results of the tariffs for customers. This is also seen as a barrier for investment:

Spain

There is a lack of clarity in the tariffs and the lack of information you get. Companies do not offer clear tariffs and it is up to you to actively bother to make those comparisons and you're never quite sure if

you're really going to get savings or not, if it's worth the trouble to switch or not to switch and that discourages a little, too. Focus Group Code (FOGR8ESB, Spain, Individuals Engaging in Joint Contracts)

Furthermore, time-consuming and difficult administrative and bureaucratic barriers were perceived as both leading to uncertainty and problems with funding:

Spain

Another real hazard is that the different legislative changes in Spain create a sense of legal uncertainty with regard to the future in which it is very difficult to promote an investment. Because of course, you go to a community or a fund, to a bank or wherever... and they say "well, but …no". Things that are becoming more and more common in other countries, such as the direct PPA agreements between producer and consumer, are not possible in the Spanish context, mainly – at least this is what producers and large consumers are telling me – because there is an uncertainty in the regulatory area both in the field of renewable generation and in the area of tariffs, so that we do not want to move away from the average. Interview Code (IDIN34ESH, M, Spain, Formal Social Unit)

Another barrier were problems connecting generation to the grid because of inefficient administrative procedures:

Spain

I, when talking about the barriers to self-consumption in Spain, [describe] the first barrier, which is not the best known, the so-called solar tax, ok? The first barrier is the bureaucracy that prevents many people from getting into self-consumption by the ordeal of administrative procedures they have to overcome before they can connect their facility. Interview Code (IDIN31ESE, M, Spain, Collective Decision-Making Unit)

These are even relevant for some municipal projects, because of restrictions and legislative hurdles related to the energy companies:

Turkey

We definitely give importance to the energy generation methods. The municipality has some projects oriented to energy generation. Within the framework of these projects, the energy can be generated from solar power after obtaining necessary permissions and approvals. The barriers behind the fact that these projects cannot be initiated are driven by the restrictions in legislation. The solar farms could be established, or the energy could be generated in our own buildings. However, the legislation restrains the development of these implementations. We attempted to generate our own electricity from solar energy in some of our workplaces. A small amount of electricity has been generated from solar panels in these areas. However, we cannot make further progress due to restrictions. In case the necessary permissions and approvals can be taken, our municipality wants to generate its own electricity. (…) In these conditions, the major barrier is the restriction in legal legislation. If the municipality and energy generation companies act accordingly, the investments to generate electricity at an affordable price can be made. Interview Code (IDIN9TRI, F, Turkey, Formal Social Unit)

In Turkey, one respondent pointed out that even though Turkey has one of the lowest electricity prices in Europe, customers are not eager to adopt smart grid systems unless subsequent volatile prices will be stabilized through for instance, storage technologies:

Turkey

Although the cheapest electricity is available in Turkey, the consumers still have some concerns. They do not prefer volatile prices for their consumption. For this reason, they will resist smart grid systems. Nobody wants to pay more for their consumption when the demand for electricity is high. Unless the storage technology is developed in Turkey, consumers will continue to resist smart grids. Interview Code (IDIN16TRP, M, Turkey, Formal Social Unit)

Market design and demand flexibility

Another emerging side of a smarter energy system evolves around demand flexibility. Market design and regulatory frameworks thus have to address and incentivize the potential for demand flexibility in a smarter system:

Finland

Probably one thing is how we increase flexibility in the system as a whole, starting from the fact that wind power is the cheapest way to produce if we only look at energy. Then there is the thing about how we can get the cheapest energy as much as possible and how we increase the flexibility, how we utilize it in heat, transport and utilize our existing assets such as batteries in electric cars or the walls of buildings etc., to make this systemic transformation cost efficiently and steer it in that cost-efficient direction. Interview Code (IDIN53FID, Finland, Formal Social Unit)

It also includes having larger entities, like a neighbourhood-storage technology or electric water heaters that can provide the system with more flexibility:

Norway

I think that battery technology will be able to be implemented as more decentralized solutions in the grid. So instead of having everyone having a battery in the garage, with the risks that this entails, we will see that you move the storage technology into the grid and, then perhaps you have a storage technology that can cover a neighbourhood for example. Focus Group Code (FOGR11NOC, Norway, Formal Social Unit)

Finland

Then we have this Service F, which is, have you heard about it, as domestic storage electric water heaters are being used for frequency regulation in electricity markets? (..) It is currently a product already available in markets, if you provide us with a permission to use your storage electric water heater, you will be granted a discount on your electricity bill and then you'll always see the instantaneous electricity consumption. There, the idea is that we aggregate them and supply to the national Transmission System Operator, to the markets. These ones came in mind ex-tempore. Interview Code (IDIN53FID, F, Finland, Formal Social Unit)

Norway

The world citizen has to contribute to that and to help to deal with the phasing in of unpredictable and intermittent renewable energy. Also, I think a lot of this will be automated, right. So, take a look at, I think the best example of smart housing is the water heater. The water heater we have today, it is not smart, in fact it is really stupid. Because what does this water heater assume? It assumes that when you are done showering, you want to shower again immediately. That is the underlying assumption it has. Let's heat the water as fast as we can! The biggest effect on the water at once. While, as you probably know and something that probably one can easily algorithmically predict that you actually won't shower immediately again, and that you are probably going to leave the house in the morning pretty soon after you are done showering. So, we can of course heat the water fast for those that are staying home, but for the majority that are not, and won't be home for a while, for them we don't have to heat the water instantly, right, and so on. Interview Code (IDIN43NOI, M, Norway, Formal Social Unit)

Another respondent pointed out that for some of the technologies coming into the market, we can do a lot of balancing automatically, without this necessarily being related to smart meters:

Norway

We work with (a charging company), and they have one of those tiny things that you can place in your fuse box regardless of whether or not you have a smart meter that will peak-balance your charging. So, in a way, you do not need the smart meter to do that. That's really the point. The smart meter was invented before the Internet of Things, right. And after everyone got over 100 MB at home, it's not that relevant anymore. This thing about smartness has become a little uninteresting. But supply measurement is still relevant. Absolutely. Like I said, with incentives right. It is important to provide the right incentives for people. If you try to somehow override and say that I must have a water heater that is extra expensive or something like that I'll just get grumpy, right. And I will try to cheat and trick. But if we instead are looking at ways to make my life better and I'm saving money on it at the same time, well then, I might be happy to control my water heater a bit. Interview Code (IDIN43NOI, M, Norway, Formal Social Unit)

As more technologies and services require effect from the grid, such as charging an electric car or using an induction stove, regulators could start to introduce effect tariffs in order for customers to pay for their effect, rather than simply their consumption in Kilowatt-hours:

Norway

R1: The intentions when it [AMS/smart meters] was first implemented in 2012, was that, yes, they can do something about the reporting, and that you could visualize consumption to the customers and those kinds of things. But the notion that they will be so damn smart in the energy system I am really not quite sure about.

R2: But if you manage to remove the worst peaks, then you have removed a part of the need to upgrade the grid, right?

R1: Yes, you could do that. And this is a little bit about this dilemma between regulators versus market forces. For basically, you could say that introducing it here, then you will be able to automatically let the market decide. But then effect tariffs are introduced, that are in a way on the other side, that also influences this. Therefore, there is something about how this plays together.

R2: Yes, we already have a part with effect, on power and district heating. However, it is not before this year that anyone has paid any attention to it, and we have had it for several years. I think we pay 500 per kilowatt annually, that is at maximum effect though.

R1: There are good solutions here; you can for instance place effect quotas that will reduce this. Focus Group Code (FOGR11NOC, Norway, Formal Social Unit)

However, looking forward to the next decades, several respondents suggested that the electricity bill system would be replaced by a system where the network connection is free, but costumers pay for services and applications instead:

Finland

R: Yeah, and it is very difficult to simulate, model or somehow forecast. Also, experiments are difficult, so, you have to make a holistic change in the environment, but it is very difficult to isolate from there. For example, a guy from [a company name] yesterday put it nicely, could energy be transferred so that we are not selling the kilowatt-hours anymore. This is due to the fact that no one wants those kilowatt-hours, as for example, you do not want the megabytes as you'd probably want to watch a movie using a Netflix, but you pay for the movie. I'm just thinking if this is more and more going to a Wi-Fi type of thing. That is, your connection to the electricity network is free of charge and you are paying for the applications and service. As you are paying for the Netflix and so on. Then, electricity is sort of a free carrier similarly as Wi-Fi.

I: So, to speak, the energy internet model of thinking.

R: Yeah. But if you look at it this very way, the change is very holistic. You cannot isolate a service to be paid for and then electricity to be paid for. Instead, electricity would be free of charge and all the services should be paid for. A little bit similarly as the internet, Wi-Fi or things like that. (...)

V: Instead, you are selling the broadband, sort of as power, megabytes per second. If the band gets stuck on Friday when you are willing to watch the movie, perhaps the movie should be downloaded on your hard disk the day before. It is completely the same thing in energy business, you have the batteries, storages and you charge them. But it is all about the bandwidth. Interview Code (IDIN54FIE, Finland, Collective Decision-Making Unit)

Or a system where energy is free, but you pay with your data, to companies willing to pay for this data from the energy providers:

Yes, it the reason that you are able to get something for free, and there is someone else that is willing to pay for the data. And that is quite interesting, I think, if you're thinking traditionally as of today, then our power subscriptions are made up in the following ways: you have a cost price, with a mark-up. It is a cost-

Norway

plus model. You buy from the stock exchange, and you add on a bit as administrative mark-up. And in a way, in common power contracts today, there are marginal differences, it really is just pennies in difference. So, what we are seeing now in terms of new business models in the space, it is all about having a large customer volume. Then you can work with cost-minus. Then you can basically price for zero. Because we are sitting on data on customers, that Google and Facebook and others are willing to pay for. That the advertisers are willing to spend quite a lot of money on. The advertising market in Norway, annually, only on digital media, is at three and half billion NOK that Facebook and Google now have taken over. And it's about the same with the media also. So, this is a billion industry in terms of actually being able to offer data. This will change the entire system tremendously. I really believe that energy will be free, but you are the product instead. Focus Group Code (FOGR9NOA, Norway, Individuals Engaging in Joint Contracts)

Grid-infrastructure investment and upgrading

Renewable energy technologies like solar and wind power are intermittent energy sources, the sun does not always shine, and the wind does not always blow. Therefore, the grid-design of the future with high penetration of intermittent electricity generation requires a grid that can tackle these challenges. This also implies a need for interconnectors in order to move electricity around in the system. This also raised the question for policymakers, around who and how it will be financed:

Norway

So, what is a little demanding with this is that the desired climate policy leads to a situation that all the reinforcements to the grid is all about upgrading to high-voltage, and network facilities will be put on the electricity bill for the consumer, that will lead to the grid-part of the vertical value chain going up. This will then motivate more off-grid solution and basically different technology choices by the end-users. And this means that there will be even fewer customers to share the investments for these grid upgrades. So, this is really a political dilemma. And in addition, both power production and the grid-part are used as tax revenue generators, politically, both through what gets taxed and how this is managed. Focus Group Code (FOGR11NOC, Norway, Formal Social Unit)

The need for a more integrated European energy system to provide stability with new energy technologies connected to the grid was also proposed:

Bulgaria

Bottom-up initiatives are surely what I like best, but I think the combined approach brings the best result because there are things as energy infrastructure and projects that require decisions at regional, national and even higher level, to say the development of a common European electricity grid can be balanced at some point at minimal losses from the different ends of the continent so that the stability of the integral energy system could be maintained at lower expenses and without the basic energy infrastructure we currently rely upon. Interview Code (IDIN18BGB, M, Bulgaria, Collective Decision-Making Unit)

Another respondent highlighted that one of the barriers for offshore wind power in Turkey was the lack of governmental initiative towards connection capacity allocation:

Turkey

Turkey has a great potential for wind energy. Turkey's wind energy potential is 25-30% more than European average. While a wind power plant operates 2000-2500 hours in a year in Europe, it operates 3000-3500 hours on average in Turkey per year. However, this data does not include offshore power plants, which have yet to be established in Turkey. Wind connection capacity constitutes a barrier for offshore power plants to become widespread in Turkey. In other words, the wind connection capacity on transformers and transmission lines is limited. (...) The major obstacles in Turkey were the conservative approach toward connection capacity and the problems in connection capacity allocation. Interview Code (IDIN10TRK, M, Turkey, Collective Decision-Making Unit)

Intervention in nature due to deployment of renewable energy generation

Building large scale renewable energy generation such as wind parks will in most cases lead to quite severe interventions in nature. This might result in habitat loss and negatively affect a biodiversity and eco-systems that are already under pressure in densely populated European countries. There is a trade-off between building renewable energy to deal with climate change and protecting land areas, and this balance has to be managed by policymakers.

Norway

The main impression is that you cannot build wind power everywhere, but that you can very often make adaptations, both in processes in Government and to identify big areas, now, really. But then there's this people's opinions, if you like wind or not, whether you like it in your backyard or not, or NIMBY, if you will (…) The population generally has positive associations regarding wind power and looks favourably upon it. But of course, when it happens locally, then, objectively this may also have some disadvantages. We see that acceptance often rises after something has been built. There are some surveys that suggest this. Interview Code (IDIN41NOG, M, Norway, Collective Decision-Making Unit)

Other respondents portrayed it as a trade-off:

Austria

The decentralisation of renewable energy is a duty. There's no other way. Because, compared with a nuclear power plant, I can never put up a block producing the same amount of energy from renewable sources. That is to say, when we talk about decarbonisation, we are automatically talking about diversification to a wide range of locations, and then, of course, politicians and all the other organisations that are active in the interest of environmental protection and construction, must be aware that this is always an intervention in nature. No matter what it is. (..) If it is possible and the environmental impact is proportionally positive, it must be said in future that it must be done. But that's exactly this tightrope walk, where you can really argue massively about what is ecologically justifiable. All you need to do is read studies. The one says, exaggeratedly said, that whenever there is a frog worthy of protection or a bird, and accordingly I have no chance there to establish a wind turbine or a hydroelectric power station. On the other hand, there is the question of what to do without energy supply. Interview Code (IDIN67ATH, M, Austria, Collective Decision-Making Unit)

Turkey

The most serious challenge for decision makers in decision-making process is the fact that Turkey is in lack of regulations. The state is the major player and decision maker in energy sector. The recently created models such as YEKA tend to prevent competition as their specification and necessary lands are provided by the State. A facility of 700 MW out of 1000 MW wind power will be established in Thrace region. Accordingly, a large forested land will be destroyed due to this project. However, the State supports this project. On the other hand, consortiums also constitute important players in the energy markets thanks to their internal dynamics. Interview Code (IDIN10TRJ, M, Turkey, Collective Decision-Making Unit)

A respondent from Norway suggested that people might be inclined to save some on their energy consumption if it meant that the government would not place more tenders for large-scale wind farms in the Norwegian wilderness:

Norway

For those who build it is always about profitability, and the most savings. But the Norwegian Home Builders' Association and Nelfo looked at profitability in relation to the largest possible use of clean Norwegian hydropower. So, they want more Norwegian hydropower. And their conclusion was that as we get so much clean power in Norway we do not need to save more in our buildings. It would not be profitable to save more in buildings. It also concluded that because of the given license to build four TWh of new wind power, therefore we don't need the saving. So, then I started calculating a bit, and then I find that, there are a thousand giant windmills, right. They are really gigantic giant windmills, to be placed in the Norwegian nature. So, if you ask me, or perhaps many customers in this country that would like to walk in the mountains and rather save a bit [of energy] instead of having to look at those giant windmills in the Norwegian mountains and fjords. So that is sort of a trend now that, we get so much cheap clean power in Norway that

we don't have to save anything, because we are on the verge of it not paying to save anymore. But those giant windmills, their footprint, they are regarded as almost nothing. Focus Group Code (FOGR10NOB, Norway, Formal Social Unit)

4.2. Collective decision-making units

Collective decision-making units refer to more formally structured groups with relatively lower power asymmetries as compared with formal social units. Examples of collective decision-making units in this project include energy producer or consumer associations, commerce or industrial chambers, and organized industrial zones.

For collective decision-making units, several key factors can play a role in energy-related decision-making for stakeholders. These can be effective incentives, environmental concerns, confidence in business, local participation, solutions to charging and infrastructure and overall changes in the energy industry.[71] Also, changes in policy targets and ambition, changes in public procurement policies and requirements, new or changed support schemes, and effective pricing of negative externalities such as carbon emissions and other greenhouse gases or environmental hazards can all lead to changes in behaviour and decision-making among relevant actors. Addressing the collective decision-making units level, this section attempts to provide insights and policy recommendations relating to how collective energy-related decision-making can be facilitated and incentivized, and in what way policymakers might implement policies that trigger more such decisions as Europe shifts towards a low-carbon economy. Thus, for the collective decision-making unit level, our conclusions point to the fact that ambitious and consistent, but sufficiently flexible energy and climate policy can facilitate collective energy-related decision-making. We will also identify various conflicting and discouraging policies and bureaucratic barriers that hamper the energy transition.

In this section, we will provide insights and policy recommendations relating to how collective energy-related decision-making can be facilitated and incentivized, and in what way policymakers might implement policies that trigger more such decisions towards a low-carbon economy. In order to provide valid and effective policy recommendations that trigger more collective decision-making to a low-carbon society, we will discuss the recommendations addressing the collective decision-making units both as individual firms and formally structured groups.

4.2.1. Policy context

In this section, we introduce the basic assumptions about preferences and energy choices of firms and collective decision-making units. Based on the 2020 Energy Strategy, the European Commission aims to make Europe more energy efficient by 'accelerating investment into efficient buildings, products, and transport. This includes measures such as energy labelling schemes, renovation of public buildings, and eco-design requirements for energy intensive products'.[72] The EU also aims to accelerate the development of low carbon technologies such as solar power, smart grid, and carbon capture and storage.[73] Also, the EU aims to develop new technologies and establish renewed infrastructure to cut the energy costs for households and companies, create new jobs, and help companies to expand exports and boost growth, which will lead to sustainable, low carbon and environmentally friendly

[71] See: https://www.echoes-project.eu/sites/echoes.drupal.pulsartecnalia.com/files/ECHOES_D3.1_literature_report_1.pdf

[72] European Commission (2010), COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Energy 2020 A strategy for competitive, sustainable and secure energy

[73] European Commission (2010), COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Energy 2020 A strategy for competitive, sustainable and secure energy

economies.[74] In this section, we introduce the policy context from the perspectives: (1) corporate sustainability responsibility and economic performance, (2) corporate sustainability responsibility and global competitiveness, and (3) corporate reputation and sustainability initiatives.

Corporate sustainability responsibility and financial performance

A company as a production function that improves economic efficiency to achieve profitability, similar to the logic of environmental sustainability, a firm must ´maintain on its balance sheet an undiminished level of total net assets to be sustainable, measured at their social costs´ (p.26).[75] A company's sustainability responsibility is defined as ´meeting the needs of a firm's direct and indirect stakeholders (such as shareholders, employees, clients, pressure groups, communities, etc.), without compromising its ability to meet the needs of future stakeholders as well´ (p. 131).[76] A firm´s sustainability is identified as ´(1) integrating the economic, ecological and social aspects in a 'triple-bottom line'; (2) integrating the short-term and long-term aspects; and (3) consuming the income and not the capital´.[77]

Energy costs are one of the largest concerns for a manufacturing firm, therefore, firms are willing to apply new technology that can reduce the energy cost, such as photovoltaic technology and wind power technology. As one of the respondent mentioned, his or her company has established solar energy panels to reduce the electricity cost:

Turkey

Our company's electricity consumption is extremely high since our production is mainly based on electrically driven tools. The tri-generation method is applied, and solar energy panels are established in order to compensate the excessive electricity consumption. Interview Code (IDIN6TRF, M, Turkey, Collective Decision-Making Unit)

When the economic efficiency is consistent with sustainability goals, companies are willing to engage. There has been a debate about business, the environment and the social responsibility of firms, which addresses the social, environmental and economic (performance) aspects of a firm's sustainable development.[78] In other words, firms have to face the question how their sustainability management can be implemented without jeopardizing their economic performance.[79] As one respondent mentioned: in the win-win case the sustainability goal is consistent with economic efficiency,[80] firms are motivated not only by economic performance, but also environmental sustainability, so they are willing to take the responsibility of reducing their carbon footprint:

Spain

The company is in fact ... one of its five pillars is sustainability, right? But ... well ... eh ... companies are always going to say that it has to do with the topic of decarbonisation, but hey, it's also clear that there is an economic background, right? So I think it's a bit of both, that the fact that, well, in this case it's a win-

[74] See: https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/building-energy-union

[75] Reinhardt, F. (2000). Sustainability and the firm. *Interfaces*, 30(3), 26-41.

[76] Dyllick, T., & Hockerts, K. (2002). Beyond the business case for corporate sustainability. Business strategy and the environment, 11(2), 130-141.

[77] Dyllick, T., & Hockerts, K. (2002). Beyond the business case for corporate sustainability. Business strategy and the environment, 11(2), 130-141.

[78] Wagner, M. (2010). The role of corporate sustainability performance for economic performance: A firm-level analysis of moderation effects. Ecological Economics, 69(7), 1553-1560; Dyllick, T., & Hockerts, K. (2002). Beyond the business case for corporate sustainability. *Business strategy and the environment*, 11(2), 130-141.

[79] Wagner, M. (2010). The role of corporate sustainability performance for economic performance: A firm-level analysis of moderation effects. *Ecological Economics*, 69(7), 1553-1560

[80] Porter, M. E., & Kramer, M. R. (2011). The Big Idea: Creating Shared Value. How to reinvent capitalism—and unleash a wave of innovation and growth. *Harvard Business Review*, 89(1-2).

win, that is, you manage to save money and it also has a positive impact on the carbon footprint, right? Interview Code (IDIN28ESB, M, Spain, Collective Decision-Making Unit)

Spain

With companies, for example, it is simpler because of the amount of energy consumption we are talking about and the improvements that can be achieved. It is easier that an economic calculation favours the change; that is to say that change is no longer motivated by criteria of efficiency or by criteria of environmental sustainability but by criteria of economic sustainability of the company. For example, the change of an old boiler or the change of an old furnace for a new one can in itself bring sufficient economic advantage so that the benefit is obvious without additional considerations. Interview Code (IDIN34ESH, M, Spain, Formal Social Unit)

However, when the economic efficiency is conflicting with sustainability, firms tend to prioritize cost saving instead of environmental protection. This point is emphasized by multiple respondents:

Turkey

Unfortunately, the energy consumption and environmental pollution are not regarded as first priority. Any company does not change the engines and machines only to protect the environment. The costs are the determinant factor for such a change. However, the investments in the long run are made by taking into consideration both energy consumption and environmental factors. Interview Code (IDIN1TRA, M, Turkey, Collective Decision-Making Unit)

Turkey

The main problem is that the renewables as the first priority are yet to be adopted in the companies. They are regarded as the second priority for the sake of protecting the environment and shifting to low carbon economy when you only consider economies of scale. (...) Unfortunately, financial concerns are the first priority. Therefore, the incentives should be provided in order to accelerate the transition process. The consciousness and awareness are still not available in Turkey, contrary to Central and Northern Europe. Interview Code (IDIN7TRG, M, Turkey, Collective Decision-Making Unit)

Norway

And there is also talk of business models, as they can picture separate companies owning the housing facades whereas the building owner only rents out. But how relevant is it for the housing companies, the building societies…that I don't know. I think this will only be interesting when it's profitable. Interview Code (IDIN35NOA, M, Norway, Collective Decision-Making Unit)

Corporate sustainability responsibility and global competitiveness

When entering into a global market, firms may meet two types of scenario: (1) a high sustainability demand or (2) low sustainability demand from the market or buyers.

There has been a growing number of multinational corporations to adopt voluntary codes of conduct and programs for sustainable supply chain management,[81] which regulate supplier performance in areas such as pollution, health and safety, labour rights, human rights and anti-corruption practices.[82] When dealing with this type of demand, firms that have already established sustainability management will have better global competitiveness comparing with those that have not.

On the other hand, global demand can be driven by economic efficiency, meaning that the buyers are not concerned about the environmental sustainability. In this scenario, if a firm´s manufacturing location is highly regulated by

[81] Carter, C. R., & Rogers, D. S. (2008). A framework of sustainable supply chain management: moving toward new theory. *International journal of physical distribution & logistics management,* 38(5), 360-387.

[82] Lerberg Jorgensen, A., & Steen Knudsen, J. (2006). Sustainable competitiveness in global value chains: how do small Danish firms behave?. Corporate Governance: *The international journal of business in society*, 6(4), 449-462.

environmental policy, the production cost will be higher, which causes barriers for the global competitiveness of the firm. In the end, this leads to the issue that many firms are reluctant to take the cost of sustainability, as the environmental protection should be a global issue, which also leads to the discussion on who should take the responsibility for protecting the environment. As one respondent mentioned that, his or her firm cannot afford the surcharge for green electricity because the firm is competing in a global market, where high energy cost will make the firm less competitive:

Spain

There are companies that sell energy and that they tell you: "I charge you the most expensive electricity for x euros, but you know it is green", and I choose. I do want that. And I say: "Well, look, I'm an industry that is very badly off, I have to compete with the Chinese, I cannot afford an electricity bill that is 10, 15 or 20% more expensive because it's green and I prefer nuclear energy ", listen to what I say, "or I prefer ... " (...) and I have to pay what it costs, in a country like Spain, to bring light to the Balearic Islands and the Canary Islands, which is very expensive. Great! Well, I agree, we will have to pay this in the general budgets of the state, there is no doubt. But on the electricity bill? Why on the electricity bill? You are penalizing me as a company and I am no longer competitive. (...) Now, what I don´t support is that it is a flat rate, that it is the same receipt for all. Interview Code (IDIN27ESA, M, Spain, Collective Decision-Making Unit)

Although not everyone is convinced this is the only reason some firms are less competitive:

Spain

Recently, with the discussion around a large steel company, the Secretary for Competitiveness said that what the company was not competitive because of the electricity costs... I don't know, I'm really a bit sceptical about that. Interview Code (IDIN30ESD, M, Spain, Formal Social Unit)

Corporate reputation and sustainability initiatives

Corporate reputation is a very important intangible asset that influences the financial and marketing performance.[83] Based on our previous analysis, firms are willing to make investments to improve their environmental performance only when it is consistent with the economic efficiency. However, some firms may invest in enhancing environmental performance to build the corporation's reputational advantage.[84] A firm´s market and profitability growth is highly relevant to the improvement of reputation and corporate image, resulting from the green product development and innovation.[85] Therefore, by taking environmental responsibility, a firm can gain superior reputation, which increases the competitive advantage in the long-term. As one respondent mentioned:

Norway

A private company will think differently than a public company. The public company will largely focus on environment plans and climate accounting that they are required to deliver on. While a private business to a large extent are using it to build reputation. And end-customers don't really care. Focus Group Code (FOGR9NOA, Norway, Individuals Engaging in Joint Contracts)

In sum, we discuss the basic assumption of energy related decision-making for the collective level. We focus on the basic composition unit of the collective energy related decision-making: The firm and introduce a firm´s sustainability and environmental responsibility and how it interacts with a firm´s financial performance. It is evident

[83] Miles, M. P., & Covin, J. G. (2000). Environmental marketing: A source of reputational, competitive, and financial advantage. *Journal of business ethics*, 23(3), 299-311.

[84] Miles, M. P., & Covin, J. G. (2000). Environmental marketing: A source of reputational, competitive, and financial advantage. *Journal of business ethics*, 23(3), 299-311.

[85] Dangelico, R. M., & Pujari, D. (2010). Mainstreaming green product innovation: Why and how companies integrate environmental sustainability. *Journal of business ethics*, 95(3), 471-486.

from our study that (1) firms are willing to engaging in energy transition when their sustainability goal is consistent with improving financial performance; (2) when the economic efficiency is conflicting with sustainability, firms tend to prioritize cost saving instead of environmental protection; (3) when production cost increases because of highly regulated environmental policy, firms may lose global competitiveness; and (4) firms may invest in sustainability to build the corporation's reputational advantage. Based on the above-mentioned policy context, we hereby make policy recommendation in terms of policy choice, policy design, and policy implementation for collective decision-making units.

4.2.2. Policy objectives

The EU has the ambition to become the world leader in renewable energy, which requires the EU to lead the development of the next generation of renewable energy technologies.[86] In order to accelerate the development of technologies to the commercial stage, industrial actors play very important role. Therefore, to stimulate the energy transition process at the collective decision-making level, the energy related policies can focus on (1) enhancing the role of collective decision-making units in the energy transition, and (2) raising awareness on sustainability and energy transition among industrial actors.

Enhance the role of collective decision-making units in the energy transition

The SET plan aims to promote research, innovation and competitiveness, accelerate the transformation of the EU's energy system, and bring promising new zero-emissions energy technologies to the market[87]. Collective decision-making units such as energy producer and industrial chambers, and organized industrial zones, are the main carriers for research and innovation activities in the energy sector. For example, the European electricity sector is undergoing radical changes. There is increasing penetration of local renewable generation and the emergence of demand response enabling solutions, which places new requirements on the distribution networks, posing challenges to the reliability and efficiency of system operation.[88] Therefore, relevant collective decision-making units need to provide innovative options to manage the distribution grids in a more flexible and efficient way, so that consumers can benefit from the energy transition.[89]

Moreover, collective decision-making units work also as a connection between public and private sectors. As one respondent mentioned, a collective decision-making unit contributes to the public sector by transferring information and opinions from the private sector:

Turkey

X Association creates a connection between public and private sectors with respect to the fact that the private sector's practices are reflected to the public sector. In this sense, the public sector creates a draft to prepare a regulation on renewable energy resources, in particular for wind energy. While creating such a draft, X Association contributes to the public sector in receiving opinions from the private sector by organizing several workshops. As a non-governmental organization, we reflect our own opinions to the public sector in a similar manner to the stakeholder involvement in Europe. Even though we have an interactive working structure with the public sector, the decision makers are the public institutions in determining regulations. We have a cooperation with many other ministries including the Ministry of Energy and Natural Resources, the Ministry of Forestry and Water Affairs, the Ministry of Environment and Urbanization, the Ministry of Cultural Affairs, the Ministry of Economy, and the Ministry of Science, Industry and Technology. The major purpose of our association is to benefit from the wind energy

[86] SET plan: https://ec.europa.eu/energy/en/topics/technology-and-innovation/strategic-energy-technology-plan

[87] SET plan: https://ec.europa.eu/energy/en/topics/technology-and-innovation/strategic-energy-technology-plan

[88] Prettico, G., Gangale, F., Mengolini, A., Lucas, A., & Fulli, G. (2016). Distribution System operators observatory - From European Electricity Distribution Systems to Representative Distribution Networks. JRC report EUR 27927 EN.

[89] Prettico, G., Gangale, F., Mengolini, A., Lucas, A., & Fulli, G. (2016). Distribution System operators observatory - From European Electricity Distribution Systems to Representative Distribution Networks. JRC report EUR 27927 EN.

potential in Turkey as much as possible owing to the fact that Turkey has a great potential for wind energy. Interview Code (IDIN10TRK, M, Turkey, Collective Decision-Making Unit)

The collective decision-making units also connect to consumers, they help consumers to understand the topic of energy *transition and* build consumer trust and acceptance to new technology. As one respondent mentioned:

Austria

In our company, as (large local energy provider), we are, of course, very aware of the topic, but we are also of it in my field of product development. It is then my job to develop the products in such a way that every customer understands them. I also have to act as the interface between the further development and the level of customer acceptance and understanding. The more technical and technically-complex a product is, the more difficult it becomes to explain it to the customer in his or her own language. And I believe that this will be one of the main challenges regarding the energy transitions and innovations in photovoltaic systems, but also one of the continuing challenges. I believe that the great challenge will be to explain things as simply as possible and to make the products as user-friendly as possible. And this is certainly a major challenge, as we'll find out as an energy service provider. It is very important to us that we are able to demonstrate our competence and that the customer has confidence in us, that we can explain these things to him in a comprehensible way. Focus Group Code (FOGR15ATB, Austria, Collective Decision-Making Unit)

Raise awareness on sustainability and the energy transition among industrial actors

As a first step for managers of an enterprise, they need to become acquainted with and understand sustainability management.[90] The awareness stage is a necessary step for the adoption of sustainability and energy transition. There has been a growing awareness on the environmental performance and sustainability concerns among industrial actors, and many other benefits are found by those who engaged in environmental management, such as financial saving on energy and reduced risk of liability.[91] However, despite this increasing awareness, there are also various barriers for industrial actors to implement sustainability ideas, such as high cost of more environmental friendly options, lack of suppliers with environmental sustainable products, lack of attention of sustainability from consumers, and so on. Therefore, the policymakers need to not only focus on raising awareness on sustainability and energy transition among industrial actors, but also provide relevant support scheme, taxation benefit, and raise consumer awareness on sustainability. Based on our interview, we found a growing tendency on awareness and implementation of sustainability, while there are also some difficulties that industrial actors must face with:

Turkey

The Turkish economy is mostly based on the construction sector and the awareness has been significantly raised in this sector with respect to insulation and energy efficient materials. The architects and engineers try to make a difference in the construction of luxurious and large buildings by providing solutions for energy conservation and energy efficiency. Interview Code (IDIN6TRF, M, Turkey, Collective Decision-Making Unit)

Turkey

At this point, a dilemma exists between a cheaper resource and environmental friendly resources. Even if your mentality approves the use of renewable resources, you can encounter with different solutions and arguments in practice. Interview Code (IDIN12TRK, F, Turkey, Collective Decision-Making Unit)

[90] Johnson, M. P. (2015). Sustainability management and small and medium-sized enterprises: Managers' awareness and implementation of innovative tools. *Corporate Social Responsibility and Environmental Management*, 22(5), 271-285.

[91] Perron, G. M., Côté, R. P., & Duffy, J. F. (2006). Improving environmental awareness training in business. *Journal of Cleaner Production*, 14(6-7), 551-562.

4.2.3. Policy choice

Even though some firms that concern about their corporate sustainability responsibility, global competitiveness, and corporate reputation are willing to engage in the energy transition, their energy choices and decisions will be influenced by some contextual factors such as markets, costs, laws, and regulations.[92] In this section, we will discuss the role of policies, regulations, and bureaucracy on firms and other collective decision-making units in terms of their (1) consistency and stability, (2) level of flexibility, (3) level of adequacy, (4) level of ambitiousness.

Policy choice: Consistency and stability of energy policies

Policy consistency and stability is a fundamental requirement of market certainty. As firms make rational energy choices based on budgets, laws, social norms, available information, and other factors, when their decision is influenced by governmental policies, they will consider the government's past performance in maintaining their policies. Therefore, long-term stable policies with minimized uncertainty is a key demand of firms who want to invest in RESs or support such developments for social or environmental reasons.[93,94]

"An unstable policy is worse than no policy at all, as an unstable policy leads business to make investments that may collapse as future support wanes" (p.55). [95] Inconsistent and unstable policies will deter formerly enthusiastic industry participants to engage in a further round, disrupt markets, and discourage investments, so the government needs to have a sustained commitment to engage industrial actors. Mallon cites Germany as a successful case that has benefited from consistent policies in implementing RESs, firms are able to develop projects in a steady stream thanks to the stability of support in Germany. On the other hand, Raven and Gregersen found that the changes in environmental and energy policies are key factors in the setback of biogas plants in Denmark.[96]

Based on our interviews, we find that industrial actors need consistent and stable regulation and policy to implement their long-term investment, as several respondents mentioned that, their interest on investing renewable resources is deterred by the frequent and unpredictable policy and legislation changes:

Spain

With all the problems we have had due to changes in legislation, people are frightened because there were people committed to environment protection, who invested in solar parks and now they are afraid that regulation changes again, and of how this may affect their energy bonus. People are interested in these issues, but they are afraid and it is difficult for them to take a step further, although we are seeing it more and more. Interview Code (IDIN29ESC, F, Spain, Formal Social Unit)

Spain

Another real hazard is that the different legislative changes in Spain create a sense of legal uncertainty with regard to the future in which it is very difficult to promote an investment. Interview Code (IDIN34ESH, M, Spain, Formal Social Unit)

[92] Hauge, Å. L., Thomsen, J., & Löfström, E. (2013). How to get residents/owners in housing cooperatives to agree on sustainable renovation. *Energy Efficiency*, 6(2), 315-328.

[93] Mallon, K. (2006). Ten features of successful renewable markets. *Renewable energy policy and politics: A Handbook for Decision Making.* London, 35-84.

[94] White, W., Lunnan, A., Nybakk, E., & Kulisic, B. (2013). The role of governments in renewable energy: The importance of policy consistency. *Biomass and bioenergy*, 57, 97-105.

[95] Mallon, K. (2006). Ten features of successful renewable markets. *Renewable energy policy and politics: A Handbook for Decision Making.* London, 35-84.

[96] Raven, R. P. J. M., & Gregersen, K. H. (2007). Biogas plants in Denmark: successes and setbacks. *Renewable and sustainable energy reviews*, 11(1), 116-132.

Spain

Regulatory uncertainty is critical for renewables in general and for energy efficiency measures, right? I mean, all the long-term measures, right? Then, of course, it affects a lot that you have to be very specialized to get into this already, as you say, it is a very difficult law, there are people, businessmen, presenting themselves to auctions, those that the Government has called for is this year, who do not fully understand how it works and who have to hire consultants. I have been hired, once, for the January auction to explain how the auction works, if auction winners are going to receive the money from the plants, right? This is truly striking, isn't it? That an entrepreneur needs professional support to understand how much he will earn, right? (…) this normative complexity, what it does in the end is to drive away, drive away the small consumer from being able to invest, to be able to participate in the change of energy model, clearly. Interview Code (IDIN31ESE, M, Spain, Collective Decision-Making Unit)

Turkey

The fact that the legislation is changed when there is a change of government or minister creates a barrier for progress. Therefore, the major problem in Turkey is sustainability. The renewable energy resources mechanism will be available until 2020. In order to utilize from the existing legislation and regulations, the companies should take an immediate decision to make energy investments within the scope of renewable energy resources mechanism. For this reason, in the first quarter of 2018, the decision makers in the public sector are expected to clarify the legislation to be adopted after 2020 so that the existing uncertainty can be eliminated. (...) The State will give the guarantee of purchase for the power plants that are put into operation until the end of 2020. In case that any change is made in the legislation, Turkey might encounter unfavourable conditions. These unfavourable conditions create problems for both domestic and foreign investors. Interview Code (IDIN10TRK, M, Turkey, Collective Decision-Making Unit)

Turkey

The fact that there is no constant policy in Turkey stems from political parties and politicians. The policies can totally change even if there is a slight change within a political party. Interview Code (IDIN12TRK, F, Turkey, Collective Decision-Making Unit)

Austria

Nobody can explain to me why we need nine different sets of building regulations and many more regulations for just nine million people. And, that has led to an unbelievably great amount of loss of efficiency. So, I recently led a working group composed by all provinces, when the OEB Directive was created. Interview Code (IDIN64ATE, M, Austria, Formal Social Unit)

However, our discussion does not imply that policies should not be changed. Policymakers need to revise policies over time because circumstances and requirement change, however, the change need to be as minimal and as infrequent as possible.[97]

Policy choice: Level of flexibility

In the last section, we argue that long-term stable policies with minimized uncertainty is a key demand of firms who want to invest in RES, while such policies also need a certain level of flexibility to fit the changing circumstances. Policymakers need to expect that external circumstances will change overtime, which requires the adaptation of policies. Policymakers need to be aware of that different target groups may evolve differently than they expected or planned for, so related policies must be flexible enough to adapt to new technologies and changing markets.[98]

[97] White, W., Lunnan, A., Nybakk, E., & Kulisic, B. (2013). The role of governments in renewable energy: The importance of policy consistency. *Biomass and bioenergy*, 57, 97-105.

[98] White, W., Lunnan, A., Nybakk, E., & Kulisic, B. (2013). The role of governments in renewable energy: The importance of policy consistency. *Biomass and bioenergy*, 57, 97-105.

Policies with adequate levels of flexibility will allow for progressive integration of available information, include different value judgements and logics, and involve various actors from different backgrounds and levels.[99] To achieve the dynamic adaptation of energy related policies, policymakers need to avoid making policies that are too inflexible to evolve with the development of technology, market, and firms´ production. As one respondent stated:

Norway

Then I think it is important that it is not the politicians or the bureaucrats that choose technologies, as for example to decide that now we are going "have our moon landing" with CO_2 capture, or begin to allocate appropriations to the hydrogen filling stations or for special types of ships that will be charged with a special type of technology, or something like that. But instead create the greatest possible flexibility, without selecting technology, without selecting earmarking. And use both positive and negative instruments, and I think it is important to have good tax systems, where there are added fees on business that emit CO_2 emissions. And when you use big money on support, then you have to use where it seems most effective. Interview Code (IDIN38NOD, M, Norway, Formal Social Unit)

The level of flexibility influences the ease and possibility to apply the policy. For example, the current building sector is heavily regulated, and the steering system is inflexible, which does not encourage testing of novel options, as one respondent stated:

Finland

Probably one thing is on how we increase flexibility in the system as a whole. Starting from the fact that wind power is that cheapest way to produce if we only look at energy. Then there is the thing on how we can get the cheapest energy as much as possible and how do we increase the flexibility, how do we utilise it in heat, transport and utilise our existing assets such as batteries in electric cars or the walls of buildings etc., to make this systemic transformation cost efficiently and steer it in that cost efficient direction. Interview Code (IDIN53FID, F, Finland, Formal Social Unit)

Policy choice: Adequate policy support

Firms and collective decision-making units that are investing and developing renewable energy sources and technologies are relatively vulnerable in the competition with traditional fossil energy firms, because the renewable energy technology is relatively new. Even though these renewable technologies are evolving rapidly, these firms need policymakers to provide adequate policy support. Adequate policy support does not mean asking governments to throw money in developing renewable energy technology; the way to drive the development of renewables is to mobilize private sector finance: "Good policy design will need to consider the investment profile of renewable projects and determine what is required to make the industry attractive to private investment" (p.52).[100]

Adequate policy support also calls for sufficient duration of the support scheme. The manufacturing life cycle of renewable energy is rather long, meaning that it takes long time to pay back the investment. Therefore, it is necessary to have a sustained stream of support scheme over long enough periods for firms to start paying off their investment and deliver decent profits.[101] An example from our interview supports this argument:

Turkey

The most successful implementation in Turkey is the Renewable Energy Law enacted in 2005 owing to the fact that this law paved the way for renewable energy investments in Turkey. Moreover, the Turkish Renewable Energy Law is the most concrete implementation that decreases carbon emission. Unfortunately, Turkey has yet to make further progress in smart grids and storage systems. (...) After the

[99] Van den Hove, S. (2000). Participatory approaches to environmental policy-making: the European Commission Climate Policy Process as a case study. *Ecological Economics*, 33(3), 457-472.

[100] Mallon, K. (2006). Ten features of successful renewable markets. *Renewable energy policy and politics: A Handbook for Decision Making.* London, 35-84.

[101] Mallon, K. (2006). Ten features of successful renewable markets. *Renewable energy policy and politics: A Handbook for Decision Making.* London, 35-84.

Turkey

legislations and renewable energy resources mechanism were started to be implemented properly, the wind energy sector in Turkey gained speed. The latest 6 years before 2015 were the most efficient years in terms of renewable energy projects as no problem was experienced in obtaining finance for these projects. (...) The legislation was necessary to encourage the investors. The transition to renewable energy resources was inevitable due to the fact that improving technology provided an opportunity to compensate the gap caused by fossil fuels. Interview Code (IDIN10TRK, M, Turkey, Collective Decision-Making Unit)

On the other hand, inadequate policy and regulation will lead to a less regulated market, which will endanger the firms who made large investment on energy transition. If a sustained policy support scheme is absent, it may deter firms from invest in renewable energy technology. Based on our interview, we find that inadequate policy and support scheme is very visible in some answers by our respondents:

Turkey

The scope of regulations for solar panels is insufficient. We have a limited infrastructure and we cannot resell the generated electricity to the grid. Interview Code (IDIN13TRM, M, Turkey, Individuals Engaging in Joint Contracts)

Turkey

Thousands of tons of SF6 gas were used in energy sector in Turkey. There should be some regulations over the use of greenhouse gases that give permanent damage to the nature. After the regulation, the support mechanisms should be provided within the scope of implementation to decrease their negative effects. The transition process has a gradual structure. Therefore, the State should give a period of time in order to complete the transition process while providing incentives. Focus Group Code (FOGR1TRA, Turkey, Collective Decision-Making Unit)

Finland

Someone said that Finland has never had a climate- and energy policy, that it has only been jerking back and forth. (..) But no one has a grasp about the whole, the general picture. (...) We don't see where the big thing is and the actions, this is the same with EU … policy, it has been discussed for 15 years. We have the -- (Banket) and the like that have, what has happened in practice then? Where are the big financial instrument and the like that were planned? They were never made. This is the hard part with this. Interview Code (IDIN52FIC, M, Finland, Collective Decision-Making Unit)

Turkey

In case that successful policies based on energy efficiency and energy use are pursued in Turkey, the municipalities can easily conduct proper projects on these issues. Due to the barriers stemming from the regulations and legislation, the municipalities and institutions cannot stay on a common ground with citizens. If the necessary amendments are made in regulations and new laws are introduced, it will be much easier to overcome the obstacles. However, there is not any initiative on this issue under current circumstances. Interview Code (IDIN2TRB, F, Turkey, Formal Social Unit)

Policy choice: Level of ambitiousness

The EU commission has set up an ambitious target to reduce EU GHG emissions by 80% by 2050, which requires the rapid development of new-generation technologies from the industrial sectors.[102] Meanwhile, the EU has aimed to become the world leader in renewable energy, so the SET Plan has set ambitious research and innovation targets for the five renewable energy technologies to help accelerate the pace of renewable technology development, which are photovoltaic energy, concentrating solar power/solar thermal electricity, offshore wind energy, ocean energy, and geothermal energy.

[102] SET plan (2017), The Strategic Energy Technology (SET) Plan, Directorate-General for Research and Innovation (European Commission) , Joint Research Centre (European Commission)

However, at the country specific level, policymakers tend to have different level of ambitiousness when making national energy related policies. For example, Norway has set ambitious climate targets and undertaken measures to reduce global greenhouse gas emissions by the equivalent of 30% of 1990 emissions by 2020. Also, Norway will stop the sale of new fossil-based vehicles by 2025. Meanwhile, there are also countries that have less ambitious policies on promoting energy transition, when this is the case, firms tend to only fulfil the minimum requirement from the policy instead of perusing higher standard. For example, two respondents from Finland have pointed out that the Finnish energy and climate policy tend to lack of high ambitious:

Finland

But the step we are taking now, the standard that is being set is sensible in a cost-efficient sense. You may always do better, but this is the minimum standard. Regrettably, the case in Finland has always been that the minimum is the maximum. When the rules say something, you do that and not an inch better. Interview Code (IDIN52FIC, M, Finland, Collective Decision-Making Unit)

Finland

Finland is specifically good at implementing but not so good at in committing themselves, and specifically not good at pushing new initiatives. I mean, we nicely implement international and EU level policies as they are, but we are not pushing more ambitious climate policy or new climate policy openings - this practically does not happen at all. In that sense, Finland is different from other Nordic countries. Interview Code (IDIN59FIJ, M, Finland, Collective Decision-Making Unit)

Another example of low ambitions was found during an interview from Turkey. One respondent mentioned that the reason he or she establish a coal-fired power plant is that the domestic coal power plant is very profitable because it is subsidized by the government. Subsidizing domestic coal-fired power plants shows the low awareness and ambitions of policymakers on the energy transition. When this is the case, firms will follow the most economic efficient option and establish more coal-fired power plants. Based on the interview with another respondent, we find that not only a domestic coal power plant is supported and subsidized, the development of solar power is facing barriers from restrictions in legal legislation. Relevant quotes are listed below:

Turkey

I: Why did your company establish a coal fired power plant? Is it about the policies of Turkey?

R: As the domestic coal is subsidized and the transportation costs are quite low, the coal fired power plant was established. When the State started to subsidize it, its value increased to a great extent. (...) Coal is more profitable as it is subsidized. Under these circumstances, there is no conscious transition to a low carbon economy as a motivating factor. Interview Code (IDIN7TRG, M, Turkey, Collective Decision-Making Unit)

Turkey

Within the framework of these projects, the energy can be generated from solar power after obtaining the necessary permissions and approvals. The barriers behind the fact that these projects cannot be initiated are driven by the restrictions in legal legislation. The solar farms could be established, or the energy could be generated in our own buildings. However, the legislation restrains the development of these implementations. We attempted to generate our own electricity from solar energy in some of our workplaces. A small amount of electricity has been generated from solar panels in these areas. However, we cannot make further progress due to restrictions. In case the necessary permissions and approvals can be taken, our municipality wants to generate its own electricity. (…) In these conditions, the major barrier is the restriction in legislation. If the municipality and energy generation companies act coordinated, the investments to generate electricity at an affordable price can be made. Interview Code (IDIN9TRI, F, Turkey, Formal Social Unit)

In some cases, business goes ahead of politics in terms of the development and implementation of energy transition, which encourage politicians by showing what is possible. On the level of the collective decision-making

units, energy self-sufficiency in the business community becomes an important motivator.[103] Achieving energy self-sufficiency can increase tax revenues, environmental awareness and the desire for greater independence from private utility companies.[104] For those collective decision-making units, their initiatives aimed at promoting local energy production are also important and usually undertaken by volunteering actors whose backgrounds vary and include political parties, commercial ventures, energy cooperatives, and village working groups.[105] Community energy initiatives have ran ahead of policymakers, and they provides a useful grassroots approach to engage in the transition to a sustainable energy future.[106] As one respondent mentioned:

Norway

Sometimes, the industry or the business world runs ahead, right. Like for example, when E ordered electric trucks, they ran ahead of politics. There were no incentives; they got some support from F. They have received some support from F. But no other instruments. So, they are taking a pretty big risk and costs themselves. But then they also run ahead of existing requirements and regulations. And they show politicians that it is indeed possible and that it is not completely crazy, right, you can calculate the costs with a certain cost over several years, right. And so, it is easier in turn for politicians to implement stronger demands because they see that some actors actually…the technology exists. It's pointless with a tax if there is no technology that can make you not having to pay it exists. Interview Code (IDIN37NOC, M, Norway, Collective Decision-Making Unit)

However, sometimes the policy is considered to be too ambitious, then it is difficult to achieve, which causes frustration. As one respondent mentioned:

Austria

For example, if you look at the mobility sector, in which plans to be fossil-fuel-free by 2035 have been made, this is highly ambitious, and we have hardly any industry or trade that deals with the subject. So, certainly not much has happened in this area. (..) We have done what is possible initially, or, indeed, the politicians have done so, but one could certainly do more. It is always difficult, because it is often the case that such a process starts without the result really being clear, and then it develops in such a way that, for example, you form the goal to be "fossil-fuel-free by 2035 in the area of mobility", and first then consider what you have to do in order to get there. Interview Code (IDIN62ATD, M, Austria, Formal Social Unit)

Low energy prices can also be considered as unambitious policy for firms and collective decision-making units, as it discourages investment in energy efficiency. When the energy price is too low, firms will have limited incentives to invest in improving energy efficiency. As several respondents mentioned:

Finland

I have always said that the energy in Finland is too cheap. From the viewpoint of Euros, there would be almost no profit in investing in energy efficiency. The current standard for apartment buildings and residential buildings and overall the current standard is cost-optimal. Some improvement can be made in schools, kindergartens, and offices, but also there the improvement is made through the building services. It does not happen anymore by adding wool to the wall. That path has been taken already. Interview Code (IDIN52FIC, M, Finland, Collective Decision-Making Unit)

Bulgaria

Since market prices in Bulgaria are artificially low in electricity, and that is a political will, it cannot remain this way forever. This is a system, which operates at the highest level and generally the interests of all

[103] See: https://www.echoes-project.eu/sites/echoes.drupal.pulsartecnalia.com/files/ECHOES_D3.1_literature_report_1.pdf

[104] See: https://www.echoes-project.eu/sites/echoes.drupal.pulsartecnalia.com/files/ECHOES_D3.1_literature_report_1.pdf

[105] Stirling (2014), Stirling, A. (2014). Transforming power: Social science and the politics of energy choices. *Energy Research & Social Science*, *1*, 83-95.

[106] See: https://www.echoes-project.eu/sites/echoes.drupal.pulsartecnalia.com/files/ECHOES_D3.1_literature_report_1.pdf

the players are to maintain the status quo and these interests are of course political. Interview Code (IDIN20BGD, M, Individuals Engaging in Joint Contracts)

Norway

So, with the low energy price in recent years, it moves energy choices far back in the consciousness. So that is sort of a challenge that we see. Focus Group Code (FOGR9NOA, Norway, Individuals Engaging in Joint Contracts)

4.2.4. Policy design

In this section, considering the level of collective decision-making units, six forms of policy design will be discussed: (1) government support schemes consisting of providing the necessary infrastructure for firms to adopt and invest in greener technologies (2) supporting R&D and innovation (3) supporting small actors (4) tax policies (5) international market regulation, and (6) facilitating network and cluster development.

Prioritization and tailoring of infrastructure related support schemes

The adoption of greener technologies is dependent on the availability of adequate infrastructure. Without such infrastructure, adoption is unlikely to happen, as is illustrated by the following two quotes:

Turkey

The major problem of Turkey is the fact that there is no background on these issues in Turkey. The State cannot provide suitable conditions for the cooperatives to improve themselves. When the regulation is revived, it is clear that the LED lightening systems are compulsory to be used in the public sector. However, all these implementations require a serious amount of investment such as investments for cable systems and energy efficiency studies. The government does not make an investment for these implementations, yet it expects the citizens to contribute. (FOGR2TRB, Turkey, Individuals Engaging in Joint Contracts)

Turkey

The insufficient incentives discourage our competitive power in the market as an environmentalist entrepreneur. For instance, (...) due to the inadequate infrastructure, the generated electricity cannot be sold to the system. Accordingly, the electricity generated within 9 months will be in vain. Interview Code (IDIN13TRM, M, Turkey, Individuals Engaging in Joint Contracts)

The policy mix aimed at collective units should therefore include an assessment of these infrastructural requirements.

R&D funding and support for innovation

The energy related policy needs to be a push for innovation and provide R&D funding. The following excerpt from the SET PLAN illustrates this: ´Innovation as key to the Energy Union Europe is well placed to deliver this innovation. The EU energy system is stable and well-managed. Market and technical expertise is considerable. The EU energy sector is highly innovative – Europe is a leader in many technologies and energy systems, and has the potential to be a testing ground for many more innovations. Specialisation at regional level shows a major interest in the energy sector as a driver of innovation-led growth. This is why research and innovation cuts across all elements of the Energy Union strategy. For example, the new electricity market design being developed will allow innovative companies with new business models to emerge and compete on the market. Heating and cooling in homes and workplaces as well as transport – both private and public - will benefit from innovation just as much

as electricity markets. New technologies and innovation entering quickly into the market through new business models are key to achieve the transformation of EU energy system´ (p. 2).[107]

The question remains how to stimulate innovation through policy. The following quote underlines the importance of stimulating innovation through public demand, making it more attractive by means of favourable taxing.

Finland

Using energy policy as a tool for innovation policy. In particular, by changing the regulation, challenging enough to force innovating. This way, these innovation actions are boosted. Instead of trying to push it by money, the approach is in pulling it by demand. ... It could mean, for example, changes in taxation. So, the thing is to use the R&D support more in creating the pull rather than pushing. Interview Code (IDIN54FIE, M, Finland, Collective Decision-Making Unit)

Similarly, the negative effects of not providing ways of funding R&D are illustrated by the following quote from a Finnish informant:

Finland

Perhaps the more prominent phase was in significant cutting of R&D funding [name of a public organisation], some [a number]. The way the cutting was implemented resulted in that large companies could not be funded or supported, consequently, as large companies often work as sort of backbones in ecosystems combining research organisations and SMEs. As funding was allocated more and more on basic funding channelled by [name of a public organisation] and, on the other hand, on SMEs and start-ups, ecosystems were not established. As SMEs, let alone start-ups, are not capable of building up of any ecosystem. They are developing their own product. On the other hand, if you go for purely scientific research funding, the relevance for companies is lost. As a result, the field was divided in silos. Interview Code (IDIN54FIE, M, Finland, Collective Decision-Making Unit)

The above quote also points to the need to have an integrated or holistic approach in order to strengthen entire eco-systems rather than specific categories of actors.

Supporting small actors

Informants from different countries point at a lack of policy instruments for small actors, both in the private and public sector. Some examples, dealing with aspects of regulation, microfinancing and microbusiness development are shown below:

Finland

But there have also not been so much resources for it because [our company] is a limited company, which gets 100% of its funding through projects. Thus, we do not get any direct funding from the government budget with which we could decide to act on if something good or interesting comes along over the year. Instead, we always then have to sell it to somebody, and this is in a way, perhaps, a bit rigid way of operating. Interview Code (IDIN55FIF, M, Finland, Collective Decision-Making Unit)

Bulgaria

This is the biggest vacuum I think - the lack of micro-grants that should be the first step; all the grant schemes resemble a high stairway that lacks the first steps - they are simply broken down and not all people can make that leap in their knowledge and project management or not all organizations have the resources needed for skipping these lacking first steps. Interview Code (IDIN18BGB, M, Bulgaria, Collective Decision-Making Unit)

[107] SET plan (2017), The Strategic Energy Technology (SET) Plan, Directorate-General for Research and Innovation (European Commission), Joint Research Centre (European Commission)

Several big manufacturers came in, they built some big plants, and of course the market was overheated. Electricity distribution companies began to complain that they could not pay. Interview Code (IDIN20BGD, M, Bulgaria, Individuals Engaging in Joint Contracts)

Spain

Spanish legislation is not the most advanced at the moment. Please, write this very clear: Spain needs to change its legislation, we need to be able to do self-consumption, and we need micro-networks. Interview Code (IDIN29ESC, F, Spain, Formal Social Unit)

Turkey

In general, the authorities support large-scale establishments. Owing to the fact that solar energy cooperatives are relatively small-scale formations, they are in lack of governmental support. Not only in the energy sector but also in tourism and agriculture, the large-scale establishments are regarded as more advantageous. The mentality in Turkey is based on providing more opportunities for big businesses and monopolies. The micro-scale businesses are not taken seriously. (...) It is nearly impossible for small municipalities, businesses and cooperatives to survive particularly in the energy sector. There is not any operating cooperative under the current conditions. 14 different energy cooperatives were founded within a year. However, none of them could receive approval. Interview Code (IDIN15TRB, M, Turkey, Formal Social Unit)

It is interesting to note that there seems to be a match between the call for more attention to the role of small actors expressed in these quotes and the focus in the new EU strategy for Public Procurement on making the procurement market more accessible for suppliers from the SME segment (see chapter 3). Furthermore, another relevant element in this strategy is the Commission's objective to stimulate (smaller) contracting authorities to procure together. This may be a way to overcome some of the challenges mentioned in the last quote from the Turkish informant. Finally, the EU strategy speaks of supporting contracting authorities with offering them training on SME friendly policies.

Using taxation as a motivator for energy transition

Taxation may indeed influence behaviour and energy choices, however, the effects may be less fruitful or desirable than intended, as the following quotes show:

Finland

For plug-in hybrids, there are also other factors. That may make sense also economically because the taxing system has a dual basis and through that tax becomes so small that there is also economic motivation. It can be that some don't even ever charge the vehicle. Interview Code (IDIN55FIF, M, Finland, Collective Decision-Making Unit)

In the example above, the vehicle's electrical function merely serves the purpose of cost reduction.

Finland

Compensation system of [costs due to EU] emissions trading for industries and transferring new operations to the lower energy tax tariffs, energy support for agriculture has been increased … and in practice this supports imported fuel oil. Now I forget something, but anyway here are some examples, which shows that we have moved totally in the opposite direction than we should have. Interview Code (IDIN59FIJ, M, Finland, Collective Decision-Making Unit)

The second example shows that the effect can be counterproductive, in the sense of stimulating the demand for fuel oil. The final example, however, shows the potential of taxation on making the installation of rooftop solar panels more attractive.

Turkey

The State can provide certain tax reductions. For instance, the companies establishing rooftop solar panels can be exempted from the tax based on electricity. We do not have any tax or incentive advantage

in solar energy except for generating our own electricity. Interview Code (IDIN8TRH, M, Turkey, Individuals Engaging in Joint Contracts)

Balanced government and market power

The EU is concerned with liberalization of international trade with a view to enabling a free flow of green technologies, as illustrated by the following excerpt from the Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan: "Promote international trade in environmentally friendly goods and services. Liberalisation of trade in environmental goods and services can help disseminate green technology and thus support the adaptation to a low-carbon economy while building on and further developing European competitiveness in environmental sectors. The EU is continuing its efforts to liberalise trade in environmental goods and services in WTO negotiations under the Doha Development Agenda, and in the context of bilateral trade negotiations." (p. 11)[108]

However, some firms argue that the liberalization of the market is beneficial for both firms and consumers, and too much regulation will cause inequality in the market. Boasson discusses this issue (citations taken from the original): *"*The market approach (a) assumes that commercial organizations possess perfect information and are capable of acting strategically on this information (Fligstein 2001:13). Firms are expected to strive to maximize their profits in a medium- to long-term perspective. In this perspective, governments should work to ensure that low-carbon investments are the most profitable option. Measures should be market-based, to encourage market actors to compete in developing the most profitable low-carbon projects (Sims et al. 2007:306). Thereby the 'best' projects will be developed, and actors able to develop the most profitable projects will be rewarded with the greatest profits. Emissions trading systems as well as green certificate schemes for renewable energy are basically designed in line with this logic (see Commission 2005; 2008). This dimension of ambitiousness sees the climate-policy challenge from the business perspective: profit-maximising organizations tend to prefer a combination of negative measures (e.g. a price on CO_2) and positive ones (e.g. state aid) in order to make the transition smoother for companies.*"* (p. 10)[109]

The statements from the informants seem to reflect a nuanced view of liberalisation and the role of government regulation, as the examples below illustrate:

Bulgaria

The liberalization of the market will happen with certainty. The consequences could only be for the benefit of the consumer, in a rather distant future, not in 5, perhaps even 10 years. Interview Code (IDIN20BGD, M, Bulgaria, Individuals Engaging in Joint Contracts)

Finland

I think the best way is through money, it directs fastest and easiest. In a way, people can calculate what makes sense as an investment, and I would say that different guides and regulations and increasing those is not sensible. We have enough regulations to guide building, and these regulations may cause inequality in constructions. Only large municipalities have resources to monitor everything. Small municipalities don't do it. It leads to differentiation of construction processes and differentiation of costs based on in which part of Finland you are building. I say the market should steer the decisions, based on visible factors or through energy prices. I cannot see any other sensible way. Consumers buy what they think is most affordable. That's the main criterion. Interview Code (IDIN51FIB, M, Finland, Collective Decision-Making Unit)

[108] Sustainable Industrial Policy Action Plan (2008), Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan {SEC(2008) 2110} {SEC(2008) 2111}

[109] Boasson (2013), Boasson, E. L. (2013). National Climate Policy Ambitiousness: A Comparative Study of Denmark, France, Germany, Norway, Sweden and the UK. *CICERO Report*.

Finland

…the role of municipalities, especially, or, should I say, more isolated areas could play a very big role in creating this kind of forerunner market. I would not that much talk about public procurement but more of them changing the regulation and their own target setting so that the actors in the area truly must start operating smartly. If I concretise, this [name of the area] is a very great example as we think it becoming self-sufficient in energy and fully running on renewable energy. Then, we nail this target and ask all the actors, well, how you should change your operation to make the fully renewable energy possible. In a way, it creates the demand there rather than being a type of technology push. There, you choose certain technologies and say let's invest in these using public procurement. Instead, we create it through the need. Interview Code (IDIN54FIE, M, Finland, Collective Decision-Making Unit)

Government subsides should help until the technology becomes competitive, and then the government should back off and let the market take over. Furthermore, in the last statement shown, the role of Public Procurement is taken up and the importance of more functional specifications (i.e. "the need") rather than technical specifications (the government choosing a certain technology) is emphasized. This view of Public Procurement is compatible with the EU commission's focus on what is called *strategic* public procurement in the new EU strategy for Public Procurement (see chapter 3), and especially the aspect of supporting the exchange of innovative approaches.

Facilitation of joint networks/clusters/industrial zones (Business, public and academia)

The importance of joint networks and eco-systems is illustrated in the two quotes from Finnish respondents as shown below this text. The shift to greener technologies requires collaboration across sectors, disciplines and larger and smaller firms.

Finland

V: Yeah, I see the [name of organisation] also appeared as one element in the mess but perhaps the more prominent phase was in significant cutting of R&D funding [name of a public organisation], some [a number]. The way the cutting was implemented resulted in that large companies could not be funded or supported, consequently, as large companies often work as sort of backbones in ecosystems combining research organisations and SMEs. As funding was allocated more and more on basic funding channelled by [name of a public organisation] and, on the other hand, on SMEs and start-ups, ecosystems were not established. As SMEs, let alone start-ups, are not capable of building up an ecosystem. They are developing their own product. On the other hand, if you go for purely scientific research funding, the relevance for companies is lost. As a result, the field was divided in silos. I big hole appeared in applied research and so called co-operative research. Well, you know [a name of a research organisation].

K: That is the reality we live in, both sides.

V: I think it was a big pity for Finland, the dividing in silos in a way. Instead, that money should have been allocated in such systemic challenges that force in making co-operation. These challenges cannot be solved without co-operation. Interview Code (IDIN54FIE, M, Finland, Collective Decision-Making Unit)

Finland

However, we do operate a lot through networks. [our company] itself has a fairly wide [network]. We are less than 60 altogether at the moment, so we cannot do everything ourselves. So, for part of them we use sub-contractors and these different networks. To some degree, we also have jointly funded projects, and their share will probably grow but we still consider ourselves as a cooperation / network and find that the most relevant aspect in our operation. So, we are not even aiming to move to pure consulting. For that, there already are other actors. So [our company] was originally created to build a bridge between the public and private sectors. So, this kind of coordination or project management service is actually our role. Interview Code (IDIN55FIF, M, Finland, Collective Decision-Making Unit)

The first of the two statements also again emphasize the role of allocating R&D funding and designing Public Procurement strategies in such a way as to promote the development and strengthening of collaborative networks and eco-systems. Improving the access for SME suppliers to procurement markets and stimulating more collaborative procurement among units, as mentioned, is also relevant in the context of (local) network and eco-system development.

In the central region of Norway, another industrial cluster was recently initiative with a broad range of actors, both from the private business side and the public and academic side. The Renewable cluster, as it is named, is a joint collaboration of actors across the board engaging in the energy transition: As one respondent connected to the cluster explained in one of the Norwegian focus groups:

Norway

The idea is to demonstrate locally and export internationally. So, to test out things within the technology, or testing new business models locally. And the strength is that you sit with the entire value chain in the region. That is, whether its biogas or if it is (a shipping/logistics company) looking at solar and hydrogen. We are looking at several different value chains, and we believe that is a great strength as well. And with that many large actors sitting around the same table that can speak with a common voice, that in itself is a way to affect development. But development does not come without a need, and without a suggestion for a solution. And that is what the purpose of the cluster is, and to suggest how we can develop this further. Focus Group Code (*FOGR10NOB, Norway, Collective Decision-Making Unit)*

Furthermore, that the goal of the cluster is not only to sit around the same table and discuss, but rather to discuss and move quickly with the right partners within the cluster and move quickly to a demonstration, faster than without the cluster:

Norway

Because the idea is that we are able to sit around that table and discuss and get more quickly to a demonstration project that can test something in a small scale. There is a goal for all involved that we will gain something by this. And if it just turns in to a talking club, then there are a lot of those already. So, we must be able to actually demonstrate something and create business around it if we are to continue it. So, it has to be quickly to a business, and that it is faster than without the cluster. That has to be the purpose. Focus Group Code (FOGR10NOB, Norway, Collective Decision-Making Unit)

And that the cluster and its partners have already engaged in joint pilots-projects and collaboration:

Norway

So here they can ask the cluster and discuss these questions with others that might sit on the competence, whether it is (an energy provider) or (a IT company) or others. So, there's an example of something that kick-started something that might happen in the cluster. And there have been some, I think there have been delivered two different pilot e-applications now in October. With participants from the cluster. And by the way, just to clarify: the cluster is not doing any projects, it is the participants that find projects and then might decide to do them together. The cluster is not supposed to own anything, but to be a catalyst. Focus Group Code (FOGR10NOB, Norway, Collective Decision-Making Unit)

Finally, the role of NGOs and international networks are also seen by the respondents as key partners in energy transition-related projects, with their essential work on talking to and persuading people to make changes in their lives:

Spain

And so that is where we come in, me personally and another group of people, we got involved in the NGO because we saw that this international network provided the way to address these issues. And, of course, for me, the key issue is how to achieve, in processes such as the energy transition, where there are always two levels, one is the level of political decisions or global decisions that are being made and another thing is the role of the person, who has to make decisions and also makes a decision to sign up to an electricity retailer or decisions to make their daily energy life more efficient, decisions on issues of mobility, and of course at the NGO we work precisely on that: how to make this process of sociological or psychological change possible for the people and that's where the interest in observing comes in, well as you have been discussing. Because for our NGO it is very useful to observe this process that leads a person to be what we call in our organisation the EARLY ADOPTERS, the first ones to take certain decisions in a different way from what the average [person] does, let's say, but that in the end they are the ones that make the average population change their position. Focus Group Code (FOGR7ESA, Spain, Collective Decision-Making Unit)

4.2.5. Policy implementation and monitoring

In this section we consider four aspects related to policy implementation that emerge from the statements from the informants: (1) the contribution of involving industry experts (2) the importance of involving social partners (3) the role of industry pioneers and leaders and (4) the importance of considering how successful policy implementation depends on the presence of enabling technologies.

The contribution of involving neutral industrial experts

Industrial experts may contribute to policy implementation in several ways. As becomes clear from one of the Finnish informants, industrial experts may contribute to making (more) realistic assessments of future developments and consumption levels:

Finland

It was a great disappointment for me that the Government decided to raise the [2020] estimate on energy and electricity consumption [that was during the time, when the Government made the decision of principle for two new nuclear reactors] despite of expert opinions and followed this way the demands of industrial federations. I think this was very unpleasant if we think about the decision-making process. The way, how strategy documents assessed as high electricity consumption figures as possible, is a sort of a message of "welcome to invest in Finland, because we have such high figures written in the [strategy] document. Well that was more a principal problem than a practical problem because Finland's electricity consumption is not defined in any strategy, but it follows the solutions [or decisions] of stakeholders. However, we saw later that this high estimate was totally unrealistic, like everybody was claiming." Interview Code (IDIN59FIJ, M, Finland, Collective Decision-Making Unit)

Furthermore, related to the previous point, experts may add a degree of neutrality to the process of policy implementation, as is illustrated in the statement below:

Finland

We can hold on to the neutrality, and dissemination of reliable information. Since many people see [our company]'s value or added value in that information coming through [our company] is considered more reliable than the same information given by some industry. If the same message is delivered by car or energy industry there is always the question whether they have some hidden interest. Interview Code (IDIN55FIF, M, Finland, Collective Decision Making)

Still, the role of experts may also be limited in the sense that there may be a gap between the "expert level" and the "decision-making level", implying that it may be difficult to get support from decision-makers to make change in existing systems:

Finland

I would also say here that on the level of experts and other actors the discussion works really well and naturally, and there one cooperates a lot without any problems. The problem comes when one would need to make some change to the existing and get support or decision from the decision-making level. That is quite difficult. Interview Code (IDIN58FII, F, Finland, Collective Decision-Making Unit)

Policymakers need to work with social partners

The need to involve a broad set of stakeholders in policy implementation, although a complex and at times difficult process, is illustrated in the examples shown below.

Austria

We have developed an energy plan or an energy strategy by enlisting the help of a large number of institutions at administrative levels. I've always made and kept contacts in all the social partners,

universities, private research organizations such as [name of organization], but also to others. And as long as I did that, we always had a collaboration among many institutions, which was sometimes hard work but resulted in the achievement of a common goal, which was named the [strategy plan]. (...) It would have only been supported by the politics and certainly not pushed forward. It's not like that everywhere, but that's just how it was. Interview Code (IDIN64ATE, M, Austria, Formal Social Unit)

Austria

In our province, I never had a really awful political constellation, but also never a really good one. So, we maneuvered our way through the minefield somehow. And what we've managed to do quite well, I think, is working together very well with our social partners, despite the fact that we sometimes have very different interests. It's clear that the Federation of Austrian Industry and the Chamber of Commerce want something other than the Chamber of Agriculture. (...) And the Chamber of Labour. Yes, renewable energy is always viewed from four different perspectives, so to speak. But, it was always possible to reach a consensus. Interview code (IDIN64ATE, M, Austria, Formal Social Unit)

Austria

There are two federal provinces that work very closely with the enterprises and these are [province] and [province]. They have many production or other types of companies in the field of biomass, heat pumps and so on and, thus, networks with these companies are created. This is not the case in [city], because this economic structure does not exist. Nevertheless, I still think, and this is also evident internationally, that we need a stronger connection with the business networks. Interview Code (IDIN60ATA, M, Austria, Formal Social Unit)

Bulgaria

Also, to a broader opening of the administration to external experts and NGOs. Last January we organized a meeting with German experts on energy transformation and we invited also experts from both the Ministry of Environment and Waters and the Ministry of Energy. It was a nice meeting with a lot of discussion among representatives of municipalities and agencies – yet nobody from the ministries came. Focus Group Code (FOGR5BGB, Bulgaria, Formal Social Unit)

The role of pioneers and leaders in the energy transition

The empirical data from the study suggest that individual leaders and pioneers may play an important role in policy implementation (at different levels). The statements from Finnish and Bulgarian respondents illustrates this:

Finland

My idea of the big change is that there are always some single persons that take the leadership and they push things and speed-up the development. We can see this from the pioneering countries, cities and regions ... The same happens at the company level, e.g. single visionary CEOs are able to do a lot, if we think about influencing ministries and their Chief Secretaries, so these people still have a big role in Finland. (...) It really matters if the committed person is in the right place. If that person does not exist, it is rare that the structures [of society] and processes support enough [the transition], or then those [structures] should be really strong and well established. Interview Code (IDIN59FIJ, M, Finland, Collective Decision-Making Unit)

Bulgaria

During my consultancy period we implemented some projects, which I would call "icebreakers" in the Bulgarian context. They have been related to the application of small renewable-energy installations, mainly for heat generation in multifamily buildings; small solar collectors working together with the district heating system and additionally heat household water if needed; a photovoltaic plant for, supplying the hemodialysis unit in a large hospital with a generator for back-up of the whole system, which was the first and only one in the country at the time the project was accomplished. Interview Code (IDIN18BGB, M, Bulgaria, Collective Decision-Making Unit)

Finally, a leader's personal behaviour may not be considered consistent with firm-level decision-making, as is suggested in the quote below.

Turkey

Our CEO purchased a Tesla which is an electric car. (…) Representing his social status and image might be an important factor. The CEO purchased the electric car, but we do not have any other electric car in our company. Interview Code (IDIN7TRG, M, Turkey, Collective Decision-Making Unit)

Technology needs to provide sufficient support for the energy transition

Implementation of policies aimed at greener energy choices should be based on an understanding of how shifting to greener choices depends on enabling technologies, as illustrated in the examples below.

Turkey

The transition can be experienced if the technological improvements make electric mobility reasonable. However, electric mobility is not very widespread in fleet leasing as no company can supply 30 electric cars at once. Furthermore, these cars are not practicable in terms of speed and performance. They can only be preferred in case they are designed as more compact, simple, low-cost and smaller. Interview Code (IDIN1TRA, M, Turkey, Collective Decision-Making Unit)

For example, heavy vehicles and heavy equipment still require substantial technological improvement to be widely applied by most firms, as is suggested in the examples from Finland and Turkey below:

Finland

It is acknowledged that it's becoming mainstream soon. But for heavy vehicles there are not so many electric options. Only now, we're having these buses and trucks that are being introduced now. I think its clearly relating to vehicle size, the power source. I don't know what they have discussed regarding buses. ... And by the way, one thing I just remembered, we analysed the city vehicles and how much of them could be electrified, and the result was that for these large vehicles, trucks and vans, there were not many, perhaps under 40%, because of the trips lengths that are driven by them. So the result was that 35-40% of city fleet could be electrified. Interview Code (IDIN57FIH, M, Finland, Formal Social Unit)

Turkey

Our company deals with road construction. As our sector is based on road construction, it requires heavy machines. However, the power demand of these heavy machines cannot be met by only electric vehicles. On the contrary, a logistics company can maintain its normal business flow with electric vehicles. Interview Code (IDIN10TRJ, M, Turkey, Collective Decision-Making Unit)

4.3. Individual consumers engaging in joint contracts

In this project, individual consumers engaging in joint contracts are defined as individuals that engage in group decision-making processes in energy choice behaviour in order to increase their power of negotiation with other more formal bodies. The key variables that influence the energy transition of individual consumers engaging in joint contracts can be social, environmental awareness, economic incentives, individual and demographic factors. However, there are also some contextual factors that play a very important role on those consumers' energy-related decision-making, such as markets, regulations, policy practices, and incentives.[110,111]

[110] See: https://www.echoes-project.eu/sites/echoes.drupal.pulsartecnalia.com/files/ECHOES_D3.1_literature_report_1.pdf

[111] Hauge, Å. L., Thomsen, J., & Löfström, E. (2013). How to get residents/owners in housing cooperatives to agree on sustainable renovation. *Energy Efficiency*, *6*(2), 315-328.

Individual consumers engaging in joint contracts have the characteristics of both individual consumers and organizations. The joint decisions are usually made by a majority voting system, so the individual consumers' information, awareness, and attitude towards energy efficiency play an important role in the decision-making processes. At the same time, by engaging in joint contracts, those consumers generally have better knowledge sources, guided by board leaders, and benefit from better negotiation power with other formal bodies, such as energy providers and service providers.

In this section, we will focus on giving policymakers comprehensive, evidence-based insights for successful policy implementation and factors that need to be taken into account to maximize the potential for citizen engagement as consumers are expected to increase their role in an ever more integrated and advanced energy system. As such, consumers and prosumers alike will be important policy respondents for governmental policy on all levels. Thus, these insights aim to coordinate and harmonize regulation and policy instructions, and other support systems to support energy-related decision-making for individual consumers and individuals engaging in joint contracts.

4.3.1. Policy context

In this section, we introduce the basic assumptions about behaviour and impact of consumers and individuals in joint contracts. The Seventh Environmental Action Programme (General Union Environment Action Programme to 2020 'Living well, within the limits of our planet') stresses the objectives to protect, conserve and enhance the Union's natural capital, to turn the Union into a resource-efficient, green, and competitive low-carbon economy, and to safeguard the Union's citizens from environment-related pressures and risks to health and wellbeing.[112] Therefore, sustainability and energy choices are related to the state, business, but also consumers, and all three level actors are stakeholders for building a better environment and improve energy efficiency.

Consumer-centric approach to energy choices

SET Plan actions 3 & 4 focus on building the future EU energy system, smart cities and placing consumers at the centre.[113] Based on these actions, energy consumers will be better empowered, engage more actively, and end up being key enablers of a decentralised and highly digitalised energy system.[114] The Research and Innovation objectives under this strand aim at creating a more comfortable and healthier living environment at a lower energy cost for energy consumers, which calls for an optimised integration of consumers and prosumers via innovative and attractive demand-response schemes.[115]

In July 2008, the European Commission presented the Sustainable Consumption and Production and Sustainable Industrial Policy (SCP/SIP) Action Plan. The Action Plan aims to improve the energy and environmental performance of products and foster their uptake by consumers.[116] Several approaches are suggested: setting ambitious standards throughout the Internal Market, ensuring that products are improved using a systematic

[112] General Union Environment Action Programme to 2020 'Living well, within the limits of our planet'

[113] SET plan (2017), The Strategic Energy Technology (SET) Plan, Directorate-General for Research and Innovation (European Commission) , Joint Research Centre (European Commission)

[114] SET plan (2017), The Strategic Energy Technology (SET) Plan, Directorate-General for Research and Innovation (European Commission) , Joint Research Centre (European Commission)

[115] SET plan (2017), The Strategic Energy Technology (SET) Plan, Directorate-General for Research and Innovation (European Commission), Joint Research Centre (European Commission)

[116] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan {SEC(2008) 2110} {SEC(2008) 2111}

approach to incentives and procurement, and reinforcing information to consumers through a more coherent and simplified labelling framework, so that demand can underpin this policy.[117]

Consumption is suggested as the central theme in determining sustainability outcomes.[118] The consumption-centric sustainability is defined as 'sustainability outcomes that are personally consequential for customers and result from customer directed business actions' (p.24).[119]

On the one hand, consumption raises environmental concerns. First, the earth has limited resources, which cannot support unlimited consumption growth. Second, significant environmental losses and harms are caused by consumption, such as biodiversity loss, deforestation, soil erosion, water pollution, and so on.[120] On the other hand, consumers with growing environmental awareness can drive companies to provide more sustainable products and services and will also have to acknowledge that consumers might also be interested in aesthetics of new products, as well as their environmental benefits. The statement from a Spanish informant illustrates this, although she does admit to not fully comprehend why some customers care more for the aesthetics of Tesla solar tiles, over their functionality and energy efficiency:

Spain

Well, at present, most new constructions come with an "A" energy efficiency certificate and there are not many passive houses yet. If I bought an old house, I would make a reform taking into account the whole energy issue: insulation and design issues such as not placing the refrigerator next to the oven. Sometimes aesthetics is taken into account more than energy related issues that are much more important to me. For example, regarding the TESLA photovoltaic tiles, it makes me laugh that the only thing that matters seems to be if they are beautiful or not, instead of seeing if they are efficient of not [sarcasm] "you must take into account that if the tiles are beautiful, the house looks much prettier". I think that the objective of these photovoltaic tiles is not that of being aesthetic. Interview Code (IDIN29ESC, F, Spain, Formal Social Unit)

The consumers´ growing environmental awareness can drive the energy transition from the demand side, based on our interviews, we find that the housing cooperatives in Norway are gradually establishing electric car charging infrastructure because of the increasing demand from the residents, as two of the respondents stated:

Norway

Because a few years ago we thought that, no, this electric car is not something we have to bother with. But we see now that more and more [people] want to buy an electric car, so we have to think about it [installing charging point in the housing cooperative] yes. Interview Code (IDIN48NON, F, Norway, Individuals Engaging in Joint Contracts).

[117] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan {SEC(2008) 2110} {SEC(2008) 2111}

[118] Sheth, J. N., Sethia, N. K., & Srinivas, S. (2011). Mindful consumption: a customer-centric approach to sustainability. *Journal of the Academy of Marketing Science*, *39*(1), 21-39.

[119] Sheth, J. N., Sethia, N. K., & Srinivas, S. (2011). Mindful consumption: a customer-centric approach to sustainability. *Journal of the Academy of Marketing Science*, *39*(1), 21-39.

[120] Sheth, J. N., Sethia, N. K., & Srinivas, S. (2011). Mindful consumption: a customer-centric approach to sustainability. *Journal of the Academy of Marketing Science*, *39*(1), 21-39.

Norway

When we install the electric car [charging] stations that's of course nothing that we want to, as it will cost us money, but it's just that electric cars are coming more and more in this area, there is increasing demand from the people living in the area and they want to have electric cars and charging them. So it would be sort of try to provide services for the people living there, give them what they need and want so it's not only the money saving, it's a balanced cost under kind of services speaking. Interview Code (IDIN45NOK, M, Norway, Individuals Engaging in Joint Contracts)

Consumer responses: Environmental and economic dimensions of energy choices

Economic efficiency and environmental concerns are two important criteria for consumers' energy decision. Based on the SET plan, one of the aims of the Energy Union is to 'increase the number of citizens as active players in a decentralized and digitalized energy system – with a direct role in a cleaner energy production and adjusting their consumption patterns to market signals' (p.37).[121]

Economic efficiency is one of the major factors that drive consumers' energy related decisions. Consumers sometimes make choices based on economic criteria rather than environmental ones. Based on our interviews, one housing cooperative in Norway mentioned that they postpone the installation of the charging infrastructure for electric cars in the garage because the cost is too high. Another housing cooperative stated that even though they are highly motivated to establish solar panels on the roof, they found that the price is too high and that it would take a rather long time for them to recoup the investment on solar panels. The respondent from the electric car association mentioned that most of their members will choose economic efficiency over environmental protection, despite members of the electric car association being generally considered to have high awareness on energy efficiency and environmental protection. Respondents from two different housing cooperatives and an electric car association in Norway stated that:

Norway

Because the costs were so high, we have to line new cables (to charge electric car in garage), very big cables to have the capacity to charge a car, so the people said no, we don't disagree, but we don't want to have the costs covered by ourselves today, so we can postpone it or you'd settle down and take it a few years later, perhaps. Interview Code (IDIN49NOO, M, Norway, Individuals Engaging in Joint Contracts)

Norway

We read about it (establishing solar panel on the roof), but it's still too expensive. It takes ten-fifteen years to get the money back, and I think, one day, yes if you can tell me that I can have it back in up to five years, and then it goes to zero after five years, then I think it will happen. Interview Code (IDIN46NOL, M, Norway, Individuals Engaging in Joint Contracts)

We ask [our members in the electric car association]: If you had to choose between economy and the environment, what is the most important? Then well over 70 percent say finances. And it's not so strange. People react to economic incentives, and we know that, in a way ...So, it is the purchasing-incentives, which are the most important. Interview Code (IDIN42NOH, M, Norway, Individuals Engaging in Joint Contracts)

On the other hand, sometimes the objective of achieving economic efficiency can be consistent with sustainability. Improved energy efficiency is one of the benefits of applying sustainable technologies, when it is very expensive to use the energy and resources, consumers will prefer more energy efficient products, which are also economically more efficient. There is one respondent from Spain that mentioned that consumers tend to be very sensitive to the energy bill, therefore, when the energy costs rise, consumers will choose more energy efficient products. Another respondent from Spain also mentioned that the consumers' wish to save energy cost can drive them to be aware of the energy efficiency of the product. Similar statements can also be found in one of the interviews in Turkey,

[121] SET plan (2017), The Strategic Energy Technology (SET) Plan, Directorate-General for Research and Innovation (European Commission), Joint Research Centre (European Commission)

where the respondent discusses how high fuel prices can be a great motivator for purchasing electric cars. Some relevant quotes are listed below:

Spain

If the gasoline costs three times as much, the water costs were twice or triple, or rather, all the basic resources cost three times as much, people would say "hey, this is serious!" People also have no real conscience, what [energy] really costs, for example, the contribution that the system makes to the government, so that they have access to those resources, which they consider a right. I mean, all these costs are not reflected in the [energy] bill. Since the electricity bill, in general, does not hurt anyone's pocket and these costs are assumed [by society], you say "Ok, I go with it". Apart from all the bad things that the system has done, the billing system of electricity, well ... leaving that aside ... but, in summary, I do not see that there is a great concern about energy. Interview Code (IDIN30ESD, M, Spain, Formal Social Unit)

Spain

Among those people who are thinking about moving into a new home, they are looking at the energy certificates because they know that it means saving money on your electricity and gas bills. Regarding cars, some people start to consider buying a hybrid car. Interview Code (IDIN29ESC, F, Spain, Formal Social Unit)

Turkey

The high fuel prices also constitute a motivating factor for the transition to electric mobility. If the prices for electric vehicles decrease, this will be a great motivator for potential buyers, and the electricity will become one of the cheapest energy resources. Interview Code (IDIN3TRC, M, Turkey, Collective Decision-Making Unit)

Turkey

As a country experiencing energy shortage, we need to decrease our energy consumption. Therefore, energy shortage and high energy prices lead people to energy efficiency. Interview Code (IDIN3TRC, M, Turkey, Collective Decision-Making Unit)

Spain

Among those people who are thinking about moving into a new home, they are looking at the energy certificates because they know that it means saving money in your electricity and gas bills. Regarding cars, some people start to consider buying a hybrid car. For example, Pamplona has put in place a plan for a friendly city centre. This means that the vehicle traffic has been restricted in the city centre, and I have heard very mixed opinions about it, from those who think that it is very good initiative so that the city can be less contaminated to those who think that it is a pain in the neck. Interview Code (IDIN29ESC, F, Spain, Formal Social Unit)

When consumers make long-term investments like housing and car purchases, they are usually associated with rational choices and assessments of this long-term investment. However, consumers sometimes are short-term oriented, and do not consider long-term cost efficiency. When facing high upfront cost, they tend to avoid them. As two respondents stated:

Turkey

People always tend to evaluate the conditions in the short run. If people are convinced that the amount of money to be paid for the electricity bill decreases, they give positive feedback for any implementation. Nevertheless, they do not consider it in the long run. Interview Code (IDIN13TRM, M, Turkey, Individuals Engaging in Joint Contracts)

Bulgaria

Yes, but in the end all this energy has a monetary expression. And you put this consumption graphically over time, how much it will cost in first option and in the other, and where the lines cross, there is the payback period. The heat pump is water-water system, we have analysed that this is the cheapest option. It is close to wood as costs, for example. We say how much lv per square meter, in a way you can have this conclusion. It is close to the wood, but the wood is such a product that the price increases in time and varies. Of course, electricity cost is also changing, which is connected with the month of December

... all prices vary over time. But on the other side, the higher the cost of energy for Kwh, the more the measures to move towards more energy-efficient facilities will become more feasible. (IDIN21BGE, M, Bulgaria, Individuals Engaging in Joint Contracts)

On the other hand, individuals in joint contracts tend to be more long-term economic efficiency driven than other individuals. By engaging in joint contracts, individuals have better access to information, and they are better at making rational choices and long-term investment. As one respondent mentioned that the housing cooperative made calculations for different heating options with specific monthly maintenance costs and heating cost, they calculated the payback period of their investment for geothermal heat option, and in end they made rational and long-term oriented energy choices.

Finland

Before that, there was a debate whether the oil burner should be renewed. Well, no one really supported that, but some residents advocated for the cheapest option to just get electric devices for the boiler to heat the water that circulates in the radiators. But then we got the calculation for geothermal heat option, which revealed that the monthly maintenance costs and heating costs together with the payback of the heating pump investment equalled the amount of money that was put to oil bill before renovation. This means of course, that once the investment is paid in seven years' time, the costs will be much less. Focus Group Code (FOGR12FIA, Finland, Individuals Engaging in Joint Contracts)

Joint interest of individuals engaging in joint contracts

The individual consumers engaging in joint contracts tend to have both joint interests and their own self-interest. The joint decisions are usually made by a majority voting system, so the individual consumers' information, awareness, and attitude towards energy efficiency play an important role in the decision-making process. Individuals engaging in joint contracts benefit from better information sources and stronger negotiation power with other formal social units, however, conflicts may also happen inside the joint cooperatives, when (1) individuals have conflicts of interest with other individuals, and (2) when individuals' interest conflict with the joint interest.

The joint decision-making mechanism for individuals in joint contracts may slow down the energy transition process, especially when new technology is involved. Because there are always small amounts of people who are willing to adopt the latest technology and energy choices, and because of the majority voting system, these people's opinions and suggestions may often not be adopted by the majority number of individuals in joint contracts. This phenomenon can be observed in one of the housing cooperatives engaged in our interviews. The respondent mentioned that the suggestion of building electric car charging infrastructure was rejected by the annual general assembly (the annual general assembly is the highest decision-making meeting in the housing cooperatives, and a ⅔ majority voting mechanism is applied). The reason is that the majority of residents did not want to spend their joint budget on installing the electric car charging facility that only benefits a minority of residents.

Another example from interviews in Austria is about that one single resident in the joint contract who is strongly against the joint decision delays the installation of new technology. Both quotes are listed here:

Norway

Because chargers for the cars are just concerning people who have an electric car, so if you have the 210 apartments and perhaps 10 have electric cars, then the rest of the people don't want to pay for... investment in paying for these people having an electric car. I think that was the question. Interview Code (IDIN49NOO, M, Norway, Individuals Engaging in Joint Contracts)

Austria

A concrete example from our city: The existing oil boiler of a residential building with 70 parties has now broken down and has to be replaced. One of 70 owners is now resisting the idea that the whole thing should be connected to the district heating system, and if that owner holds firm, an oil-fired boiler will need to be installed there again. How can we really handle this issue if unanimity is or must be achieved there? All I can say is that it's not going to be like that. I don't even want to talk about why he's doing this. Then there are all the various weird theories about why he is putting up resistance here. You can think up all sorts of things regarding why. But you could say that if one out of 70 people puts a spanner in the works, you would have to put the good of the people above that of the individual if we really want to achieve something. Interview Code (IDIN61ATB, M, Austria, Formal Social Unit)

Joint behaviour of individuals engaging in joint contracts

Individuals' motivation for pro-environmental behaviour is often based on moral and normative judgments, which can go beyond personal immediate interests.[122] People generally see environmentally friendly behaviour as altruistic behaviour; therefore, collective interest can overrule individual interests.[123] By engaging in joint contracts, individuals tend to develop a sense of collectivism and show also more concern about environmental issues. At the same time, since those individuals have stronger negotiation power and a better knowledge background, their joint behaviour tends to be more powerful. One respondent described their joint decision-making process as following:

Bulgaria

Then, in 2012 the EU rehabilitation programme was announced, and I started convincing the residents in our building to take action. At that time the 25% co-funding scheme for owners was still valid. I managed to contact a professor from the Technical University - one night he scanned the building with his thermal camera, he made a preliminary analysis and concluded that if we participated in the programme it would pay off in the next 7-8 years. What we did then was to organize a general meeting of the owners and to make a public presentation on the information, the scanning results and the preliminary estimates in order to convince people as quickly as possible. In our substation, I equipped a room with folding stools for each owner. We sat down, pulled the screen down, turned the multimedia on, and began explaining the project concept - what had to be done and at what price, what could be achieved; photos, graphs, demo, etc. - all these things. Literally for 24 hours, we achieved 100% consent of the residents. Only one was still hesitating as he had already undertaken a lot of rehabilitation work. I explained him that the cost of the accomplished work will be deducted, yet he would pay what was calculated for him with the common parts, of course (FOGR6BGC, Bulgaria, Collective Decision-Making Unit)

Another respondent described how a housing cooperative managed to unite and obtain a grant to cover the spending for insulation and get additional European funding for building solar collectors:

Bulgaria

The most inspiring moment was a building that was not funded under any program. The owners managed to unite, to register a condominium, and to apply for a loan under a program then active and managed by a famous international bank. They won, as far as I remember, a 30% grant on the basis of the whole loan they took. The money for co-funding came from the revenue obtained from the rent of a mobile phone operator's tower. They succeeded in capitalizing and paying back this loan, to cover all the spending for insulation and then to get additional European funding for building solar collectors of their own. The building with 22 apartments is in the same big city. There were a lot of well-educated people in the building and pretty well-educated managers, generally pretty well-educated building managers. Although the housekeepers commented afterwards that things had been going on with great difficulties and required a lot of effort for convincing people apartment by apartment for 6 months. After the end of this initiative funded by the EU project mentioned above, there was a visible change in owners' attitude -

[122] Hauge, Å. L., Thomsen, J., & Löfström, E. (2013). How to get residents/owners in housing cooperatives to agree on sustainable renovation. *Energy Efficiency*, *6*(2), 315-328.

[123] Hauge, Å. L., Thomsen, J., & Löfström, E. (2013). How to get residents/owners in housing cooperatives to agree on sustainable renovation. *Energy Efficiency*, *6*(2), 315-328.

they were coming and asking: "What is the next thing that we will do together?". Interview Code (IDIN18BGB, M, Bulgaria, Collective Decision-Making Unit)

However, the joint behaviour of individuals engaging in joint contracts can also make some energy decisions become more complex and difficult to implement. Because of the different educational background, individual preferences, environmental awareness, and purchasing power among the individuals engaging in joint contracts, the implementation of new energy contracts may be difficult. Moreover, as the highest decision-making meeting is often only held once per year, this leads to long waiting time for major decisions. As one respondent mentioned, the housing cooperatives are not their main customers, because of the difficulties in the joint decision-making process:

Norway

But that's as far as we have seen, when it has been tested out in the housing company area, it has not really worked. (...) That is, an EPC contract with a commercial building owner, the building owner will have a certain control over the energy use. But an energy-saving contract with a housing company, how in the world are you going to train 80 homeowners? And the behaviour of 80 homeowners? Because a number of this energy saving stuff is not only about the technical facility. It's about behaviour as well. So, the financial company that enters must have a high risk premium to put it that way. And this will seriously squeeze profits, I think. Interview Code (IDIN35NOA, M, Norway, Collective Decision-Making Unit)

Norway

And then we tell B, just as an example of interest politics, we say that B have two target groups – private housing owners and office buildings. These [housing company] do not fit in any of the target groups. Private property owners are easily reached through the tax system and through grants/subsidies that more or less finance what they were going to do in any case. And then you have permission-based schemes. Whereas business owners have control of both, some control of their users, and control on their building. But these are of a completely different category, and so you need to make arrangements and guidance frameworks that are geared towards these as a separate target group. And so, the board that makes the decisions in a housing company have limited decision-making authority, and when it comes to major upgrades they cannot make that decision. Which leads us to the annual general assembly. Interview Code (IDIN35NOA, M, Norway, Collective Decision-Making Unit)

4.3.2. Policy objectives

The vision of the 2030 climate & energy framework[124] is that citizens take ownership of the energy transition, benefit from new technologies to reduce their bills, participate actively in the market, and where vulnerable consumers are protected.[125] In order to stimulate the energy transition process on the individual level, the energy related policies can focus on achieving (1) raising consumer awareness on environment and energy related decisions, (2) providing consumer information regarding energy efficiency, and (3) building consumer trust and technology acceptance.

Raising consumer awareness on environment and energy related decisions

The first step to alter consumers' behaviour on energy related decisions is to provide information to increase their awareness of the environmental consequences caused by their behaviour, which could motivate them to change their behaviour.[126] Several ways can be used by policymakers to increase consumers' awareness, such as using legislative mandates to force manufacturers to disclose energy efficient data,

Bulgaria

[124] 2030 climate & energy framework: https://ec.europa.eu/clima/policies/strategies/2030_en#tab-0-0

[125] Please see: ECHOES deliverable D3.3 Policy Potential Analysis

[126] van der Werff, E., & Steg, L. (2015). One model to predict them all: predicting energy behaviours with the norm activation model. *Energy Research & Social Science*, *6*, 8-14.

introducing educational campaigns, and using media to generate more publicity. As two of the respondents stated:

> *People have seen and realized in past years the importance of electric vehicles especially for the protection of the environment. These norms are being introduced at the moment, at least what I hear from the media and from my experience in the RES sector. Interview Code (IDIN20BGD, Bulgaria, M, Individuals Engaging in Joint Contracts)*

Spain

> *More and more customers that request this, certain norms, certain regulations, right, for example, the ISO 50001, is going to be implemented in a few years; almost every customer will request it. Interview Code (IDIN28ESB, M, Spain, Collective Decision-Making Unit)*

As low levels of awareness on environmental consequences and limited knowledge and information would lead the consumer to make decisions based on other criteria or their consumer habits, they will not make their decision based on environmental criteria and energy efficiency, as stated by two respondents:

Norway

> *But when we have redecorated, we haven't been very... we haven't thought of the material, which was stupid… Interview Code (IDIN48NON, F, Norway, Individuals Engaging in Joint Contracts)*

Norway

> *It's that kind of a crown-example from Sweden, which is quite interesting. There was this family that moved into a big, old building, so they threw out the oil boiler which stood in the basement, and then they went over to the geothermal, i.e. much lower temperature - and then they stopped using the chimney. Then the chimney got cold, and then you got mould in the attic, because then it was freezing cold and humid up there. And the chimney got bad. And down in the basement, where the oil-tank had once stood, they had built a laundry room, this family with lots of kids, and it got soaking wet. And also, they didn't get the central heating plant to work, because it was too low temperature. And this with physical damage to the building, it is not to something to laugh at, we write a lot about that here. So it's not only just to move into such a house and quickly fix everything, it's not only just to isolate against the basement and the attic, because then something usually happens in the basement and attic. When you isolate against the basement, then it becomes colder in the basement, then there will be more humidity. And then the water freezes, but you can pack that in and watch over it, but it becomes more humid, so maybe it will mould, and mould even more. Then it is depending on what kind of material you are using. If you add plaster-plates in the ceiling, then you get mould pretty quickly. If it's old, real wood materials – and even better with older – for they have greater quality, then it will hold. If you put in something now, that is bad, then they will eat it up faster. So, it is quite a lot of knowledge that it takes to do it right. So there can you say that when building protection centre for example, where there are specialists in many different artisans and things like that, that can give advice. That is really important to do it right and for it to end up well, and to dare to do things. Interview Code (IDIN39NOE, F, Norway, Formal Social Unit)*

The increasing awareness for the energy transition and environmental protection among the younger generation is very important for the future development on sustainability, as one respondent mentioned:

Spain

> *I believe that society knows more today than it did a long time ago, but it still needs a leap to get to that level of knowledge... A survey was published not long ago that said that among the Millennial Generation, born between 1984 and 2000, eighty-percent do believe that climate change is one of the greatest dangers, which moves somewhat away from the statistical trend, but what is true, is that from understanding it, being aware of it, to taking a leap to doing much more, there is a big difference. The green consumer cooperatives are becoming more widespread, but there is no universal model, so this process is on-going, and it seems that, I believe that, yes, there is a problem, but I do believe that we are better off than we were 20 or 30 years ago. Focus Group Code (FOGR7ESA, Spain, Collective Decision-Making Unit).*

Providing consumer information regarding energy efficiency

Using information as intervention is a way for policymakers to influence consumer behaviour. The information provided from the policymakers can increase the credibility, improve financial stability, legal protection and long-term viability.[127] During the interviews, it was observed that consumers do pay attention to information regarding energy efficiency and make choices based on the information, for example, several respondents mentioned that they tend to choose home appliance with energy label 'A+++'. This indicates that the energy label conveys energy-use information to consumers, which influences consumer behaviour. Therefore, the implication for policy is that providing consumer with information regarding energy efficiency can be an effective way to influence consumer behaviour, as two respondents mentioned:

Finland

If consumers would understand even better what the benefits of a low carbon energy system are, and they would benefit from those advantages, how they could improve their lives, and get economic advantages from it. Interview Code (IDIN58FII, M, Finland, Collective Decision-Making Unit)

Turkey

…people want to see the positive results of any new implementation in any case. If citizens are convinced that a new car consumes less fuel, is relatively faster, and is economic, they are more likely to get accustomed to the related brand. Interview Code (IDIN3TRC, M, Turkey, Collective Decision-Making Unit)

However, simply presenting people with information on the benefits of pro-environmental behaviours is not an effective way to alter consumer behaviour.[128,129] To be effective, the information provided by policymakers and energy providers needs to be easily validated by consumers, such as frequent information on household energy consumption and its financial cost.[130] As one respondent mentioned, their choices for more energy efficient products may be discouraged when companies do not offer clear tariffs and sufficient information on energy saving:

Spain

There is a lack of clarity in the tariffs and the lack of information you get. Companies do not offer clear tariffs and it is up you to actively bother to make those comparisons and you're never quite sure if you're really going to get savings or not, if it's worth the trouble to switch or not to switch and that discourages a little, too. Focus Group Code (FOGR8ESB, Spain, Individuals Engaging in Joint Contracts)

Contradictory information and misleading information may harm the consumers' perception of the energy transition. For example, the UK government has identified that the information sources, such as insufficient or inaccurate information, negative or inaccurate media information, and concerns over the 'unknown' (including imagined sub-optimal performance, potential battery degradation or low residual value) will mislead consumers on their energy choices.[131] One respondent mentioned that the information from different sources can be contradictory, which will confuse the consumers:

Finland

[127] Banerjee, A., & Solomon, B. D. (2003). Eco-labeling for energy efficiency and sustainability: a meta-evaluation of US programs. *Energy policy*, 31(2), 109-123.

[128] Winett, R. A., & Ester, P. (1983). Behavioral science and energy conservation: Conceptualizations, strategies, outcomes, energy policy applications. *Journal of Economic Psychology*, 3(3-4), 203-229.

[129] Stern (1999), Stern, P. C. (1999). Information, incentives, and pro-environmental consumer behavior. *Journal of consumer Policy*, *22*(4), 461-478.

[130] Becker, L. J., Seligman, C., Fazio, R. H., & Darley, J. M. (1981). Relating attitudes to residential energy use. *Environment and Behavior*, *13*(5), 590-609.

[131] Office for low emissions (2013) Driving the Future Today A strategy for ultra low emission vehicles in the UK: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/239317/ultra-low-emission-vehicle-strategy.pdf

In energy issues, there's a lot of information from different sources and if we follow information released by the terrestrial heat pump association or district heat association, it can oftentimes be contradictory. We try to have a dialogue around it, to dig deeper, and then communicate so that we do not overdo it or give faulty information. Interview Code (IDIN51FIB, M, Finland, Collective Decision-Making Unit)

The policymakers not only need to provide sufficient information to the end-customers, but also to sales people. As the sales people have great influence on consumers' decision-making, their knowledge, experience, and awareness of sustainability issues can drive consumers' energy related choices. As one respondent mentioned, the lack of knowledge of sales-people may discourage consumers, and may even mislead the consumers:

Finland

We noticed then that the sales-people of electric cars, they do not necessarily have much information or even interest in selling. Maybe they are afraid of extra trouble or something; these kinds of misunderstandings do exist. That is why we produced a car sales representative's [guide]. The car dealers can print that, and then even have their own copy for the salesperson. Thus, it is definitely needed at that end, too. (…) the downloading rates by car dealers have been quite big so apparently it has been well read. Interview Code (IDIN55FIF, M, Finland, Collective Decision-Making Unit)

Building consumer trust and technology acceptance

In January 2013, the European Commission adopted a European Alternative Fuels Strategy to address the decarbonisation of the transport sector and air quality objectives, and also energy supply security and EU industry competitiveness.[132] One of the four priority fields are addressing consumer acceptance. In order to achieve this target, the European Commission implement several measures, such as (1) setting up a fuel compatibility labelling system together with the CEN/CENELEC to reassure confidence of users when using alternative fuels, (2) developing a methodology of price comparison of alternative fuels and creating a platform to promote the use of this methodology in Member States, and (3) setting up an Alternative Fuels Observatory (EAFO) as a reference website for user information.[133]

The energy transition and smart energy solutions are highly related to emerging new technology, for example, the photovoltaics technology, new ventilation systems, and isolation materials in smart buildings. The consumer acceptance of the new technologies is based on their perception of the technologies' usefulness, security, and comfort. For instance, consumer acceptance is highlighted as an important prerequisite for the success of smart grids, both on the community and on an individual level.[134] However, the current state of consumer acceptance suffers from lack of focus on users, especially in the smart energy measures.[135] The smart energy projects have tended to focus mainly on technology and on economic incentives while ignoring user involvement and the way users and systems interact .[136] As two respondents stated:

Finland

This is the other way around to first installing the smart meters and then start thinking about what we should do with them. So, we create the incentive. However, we have not yet achieved a point of really considering the

[132] Please see: ECHOES deliverable D3.3 Policy Potential Analysis

[133] European Commission (2016), COMMISSION STAFF WORKING DOCUMENT Accompanying the document COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A European Strategy for Low-Emission Mobility

[134] Huijts, N. M., Molin, E. J., & Steg, L. (2012). Psychological factors influencing sustainable energy technology acceptance: A review-based comprehensive framework. *Renewable and Sustainable Energy Reviews*, *16*(1), 525-531.

[135] See: https://www.echoes-project.eu/sites/echoes.drupal.pulsartecnalia.com/files/ECHOES_D3.1_literature_report_1.pdf

[136] Verbong, G. P., Beemsterboer, S., & Sengers, F. (2013). Smart grids or smart users? Involving users in developing a low carbon electricity economy. *Energy Policy*, *52*, 117-125.

acceptance of consumers, what kind of services they should be provided and what kind of incentives created so that they start operating smartly. Interview Code (IDIN54FIE, M, Finland, Collective Decision-Making Unit)

Norway

'I don't believe in modern ventilation systems, because if you ask the same people perhaps after five years, if they want to live in a building without natural air, it's not right to say that the ventilation system is functioning as it should. Because it's rather cold in here, and it's that I don't know if the air is clean. I don't think so, I don't trust this kind of system, but that's my opinion… Interview Code (IDIN49NOO, M, Norway, Individuals Engaging in Joint Contracts)

Another example is about electric cars. The UK government has identified that the 'range anxiety' of the electric vehicle is an important barrier for consumers to purchase electric cars. This is linked to a limited ability to drive long distances, which is further linked to safety and punctuality. Under these circumstances, high levels of knowledge about and trust in the charging point network (which can facilitate longer distances and lower anxiety levels) are therefore critical for drivers of battery electric vehicles.[137]

Turkey

The first and foremost reason is high cost. Secondly, the efficiency of electric cars is low compared to other types. When the electric cars function improperly, the repair costs will be high. Purchasing a hybrid car that will not function improperly will cost much higher. In other words, the high costs constitute the barrier behind the fact that electric and hybrid cars are not common in Turkey. Under these circumstances, the diesel-powered vehicles that consume less are preferred. Interview Code (IDIN1TRA, M, Turkey, Collective Decision-Making Unit)

Another respondent describes his concern about the energy efficiency of electric cars:

Bulgaria

In theory, the electric cars burn 16 kWh of energy. In fact, we have data that they burn 26 kWh. Take a diesel car that is exactly the same. This difference is between 4 and 5 liters / 100. The reality is that with currently available battery technologies, we read some good things on some green sites, but things are not like that. A great amount of energy is lost when charging. It's not like putting 10 liters of petrol and burning 10 liters. It's a little different. It turns out that you're actually loading a lot more than you consume later. There are many other features. I give the harshest example. The difference between electricity and petrol is very small, as a final result for the year. Then you have the motor's own damage insurance. The insurance is based on the value of the car. The value of the electric car is 2.5 times the value of the diesel car (IDIN22BGF, M, Bulgaria, Collective Decision-Making Unit).

These reflections on electric cars and quite contrasted with the perception of EVs in for instance Norway, where the general impression of electric cars is much more positive. And also, the fact that there is a lot of misconceptions and misinformation spreading about electric cars, as one Austrian respondent pointed out:

Austria

B1: You can hear that this Tesla battery is very bad, but why do you hear that? We have a study from a federal environmental agency in which it is clearly stated that an electric car has only 1/7 of the CO_2 emissions of a diesel car. B3: In operation? B1: No, related to its entire lifecycle, including its production, operation and disposal, all together 1/7, but why is that now on Facebook? Why is this appearing now? Because there are losers (in the transition). And those losers produce these stories. Focus Group Code (FOGR14ATA, Austria, Formal Social Unit)

[137] Office for low emissions (2013) Driving the Future Today A strategy for ultra low emission vehicles in the UK: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/239317/ultra-low-emission-vehicle-strategy.pdf

Thus, the first step to build consumer trust and technology acceptance is to help consumers to overcome their fears of the unknown and new technology. Therefore, a certain level of publicity and consumer education is necessary. Public and consumer education is identified as a possible solution to the status quo bias and other hesitance regarding EVs.[138] Public and local policymakers need to be the first target group for raising awareness on sustainability issues, thereafter customers can be influenced by policymakers on relevant issues. Identified policy measures therefore include increased information in general and providing more consumer information about vehicle emissions through car labelling, as well as improving testing of new EVs in order to gain public trust.[139] Two of the respondents stated that their major concern of electric vehicles is distance:

Turkey

The problems in batteries and high prices for electric cars pose an obstacle for electric mobility to become widespread (...) One of the major problems in electric mobility is the fact that electric cars are not appropriate for long distances. Interview Code (IDIN8TRH, M, Turkey, Individuals Engaging in Joint Contracts)

Turkey

The problem in these cars is the fact that they have distance limitations. Interview Code (IDIN16TRP, M, Turkey, Formal Social Unit)

Although these range issues should be considerably lessened with better charging infrastructure and longer range in electric cars in the next decade.

Security concerns of the new technology influence consumers' decision making to large extent. As a Smart Grid relies upon communication technology, each home connected to the grid network is in theory able to communicate with any other entity in it and in the Smart Homes if no protection is implemented, which brings up the concern of data security and privacy.[140] The security concern related to the Smart Grid system is expressed by one respondent in our interviews:

Austria

B: Data security and external access, which we want to prevent. You read every day either offline or online about things that are being hacked, and the smart home – just like the new smart devices – is a wonderful gateway for hackers. Together with the Large Provincial Energy Provider, we want to offer training sessions and information about Smart Home technology for interested consumers at various levels, all the way up to a higher level that would be appropriate... For me, security is always placed in the foreground. We also bring in experts from everywhere, who deal with the security aspects of this technology.

I: I've just wondered if you mean security in the sense of data security or security in the sense of burglary.

B: Both. Interview Code (IDIN64ATE, M, Austria, Formal Social Unit)

[138] Green eMotion Project Results, European Commission (2015). http://www.greenemotion-project.eu/upload/pdf/deliverables/Project-Results-online.pdf

[139] Please see: ECHOES deliverable D3.3 Policy Potential Analysis

[140] Komninos, N., Phillppou, E. & Pitsillides, A. (2014). Survey in Smart Grid and Smart Home Security: Issues, Challenges and Countermeasures. Communications Surveys & Tutorials, PP(99), doi: 10.1109/COMST.2014.2320093

The concern of data security is also raised by an Austrian respondent that mentioned data security as a sensitive issue that have to be focused on in order to build consumer trust and acceptance:

Austria

Over the past two years we have been and over the next two years we will be heavily involved in the field of energy efficiency, during which we will hold online seminars. We are also trying to use new media, and we are collaborating on a bigger project with (large provincial/national energy provider), where we create a homepage called "energy-efficient agriculture" and where we try to portray farms in order to inspire people and give them courage. Of course, it is also understood that you don't warn people about certain things, but you sensitize them. This concerns the area of data security, in particular, because we notice a certain amount of scepticism, and where the people ask where the data is going. I have inverter data, smart meter data, e-mobility data, even if they're not so problematic yet. But especially when it comes to position farming and Smart Farming, people ask where the data is, if they are located on some server in America. These are challenges that we run into and also challenges that we notice and where we try to sensitize people accordingly. Focus Group Code (FOGR15ATB, Austria, Collective Decision-Making Unit)

4.3.3. Policy choice

In addition to an individual's own motivation to make decisions towards more environmental friendly and sustainable choices, some contextual factors play an important role during the decision-making process, such as markets, costs, laws, and regulations.[141] In this section, we will discuss the role of policy, regulations, and bureaucracy on consumers and individuals engaging in joint contracts' energy choices.

Policy choice: Energy prices and costs

As we mentioned above, economic efficiency is one of the major factors that drive consumers' energy related decisions. Consumers sometimes make choices based on economic criteria rather than environmental ones. When the energy price is too low, consumers will have no incentives to invest in improving energy efficiency. In the European Union (EU), household gas prices fell by 6.3% on average in the EU between the first halves of 2016 and 2017 to stand at €5.8 per 100 kWh[142]. Household electricity prices slightly decreased (-0.5%) on average between the first half of 2016 and the first half of 2017 to stand at €20.4 per 100 kWh[143]. The electricity prices for household consumers ranged from 9.6 Euro per 100 kWh in Bulgaria to 30.5 Euro per 100 kWh in Denmark and Germany in 2017[144].

During our interview, one respondent mentioned that the housing cooperative is not willing to upgrade their heating system, because the investment is relatively high, especially comparing to the low electricity price. Another respondent mentioned that people are not willing to make investment of energy efficiency because of the low electricity price. Relevant quotes are listed below:

[141] Hauge, Å. L., Thomsen, J., & Löfström, E. (2013). How to get residents/owners in housing cooperatives to agree on sustainable renovation. *Energy Efficiency*, *6*(2), 315-328.

[142] Source: Eurostat, Energy statistics. Date of extraction: 27.11.2017

[143] Source: Eurostat, Energy statistics. Date of extraction: 27.11.2017

[144] Source: Eurostat, Energy statistics. Date of extraction: 27.11.2017

Norway

It's basically a private or a cost question. Since electricity is kind of relatively cheap for heating. Also, to spend a lot of millions on for instant installing this remote heat systems which they typically have in new buildings...it's not really that feasible. We have to get it to the area and you have to put pipes in every apartment, so it will be a major cost. Interview Code (IDIN45NOK, M, Norway, Individuals Engaging in Joint Contracts)

Bulgaria

The other thing as I said is the low price of electricity in Bulgaria. This does not motivate poorer people and the retired persons for example to think about development, there should be other mechanisms. They see that their bill is OK, so everything is OK then. Interview Code (IDIN23BGG, M, Bulgaria, Collective Decision-Making Unit)

Even though low energy cost may deter consumers´ investment on energy efficiency, the policymaker cannot simply raise the energy price to drive the energy transition. Based on the report about Energy Prices and Costs in Europe, 'a competitive and properly functioning energy market is expected to deliver the energy that households and industry need in the most cost-effective manner' (p.17).[145] Policymakers also need to consider poor households and vulnerable businesses, as reducing the cost burden of energy on those people is one of the policy goals of the European Commission.[146]

Policy choice: Level of flexibility

A more flexible and adjustable decision-making process has been called for with respect to climate policymaking in Europe, allowing for progressive integration of available information, including different value judgements and logics, and involving various actors from different backgrounds and levels.[147] As new technology is constantly merging in the energy transition, the policy needs to fit this complex system and the administration needs to understand those technologies, rather than just be parts themselves. Because emerging technologies can be complex and unstable, relevant policies need to be flexible and adaptable. As one respondent mentioned, the municipality tried to offer funding for building photovoltaics in the housing community, however, this act did not comply with electricity law at that time:

Austria

We offered our funding for community photovoltaics years ago because we said that it makes no sense to offer individual photovoltaic support in the urban area any longer. How many people in this town already have their own family home with a roof? In other words, the majority of the population lives in multi-party houses and, here, there must be a legal opportunity for them to put something on the roof together. We offered this for the first time three or four years ago, but it wasn't possible for electricity law reasons, of course, because it will not be possible to offset this, because they will then become suppliers. Only problems arose. Thank goodness, they did something to address this. This is one of the first rays of hope. There have been changes in the ELWOG. So, the whole thing is now possible. Interview Code (IDIN61ATB, M, Austria, Formal Social Unit)

Based on our interview, we find that the building sector is generally heavily regulated, and the steering system is inflexible, which does not encourage the testing of novel options. Buildings account for 40% of the European Union's total energy consumption. The EU is trying to limit energy demand from buildings by reducing its energy dependency and greenhouse gas emissions. Therefore, EU legislation has specific targets to improve the energy

[145] Energy Commission (2016), REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Energy prices and costs in Europe

[146] Energy Commission (2016), REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Energy prices and costs in Europe

[147] Van den Hove, S. (2000). Participatory approaches to environmental policy-making: the European Commission Climate Policy Process as a case study. *Ecological Economics*, *33*(3), 457-472.

performance of buildings, accounting for energy used for heating and cooling, hot water, ventilation and lighting. The following quote shows, how inflexible legislation needed to be changed.

Finland

The city plan stated that it is obligatory to join the district heating, but a house builder wanted to install geothermal heating and made a complaint first to the Administrative Court and then to the Supreme Administrative Court, and the city of [x] lost the case. It is in a sense quite reasonable that the energy industry wants the constraint away since it isn't really mandatory as the law allows for it. The paragraph of law was referred to also in the decision of the Supreme Administrative Court. It is probably a quite good thing that the property owner is allowed to use the energy form of choice. Especially through the viewpoint of profitability the geothermal heating requires a bigger initial investment, but it usually pays itself back quite fast after the investment. There was also a similar case in Helsinki, did they count ten years payback time? (...) But for one-family houses decentralized energy production is, not otherwise but for one-family houses solar energy is effective especially in new buildings where the energy consumption is clearly lower than in older buildings and has an effect. Interview Code (IDIN52FIC, M, Finland, Collective Decision-Making Unit)

Policy choice: Level of ambitiousness

Policy ambition has been a crucial concept for environmental and energy policy.[148] The ambition of the policy can be determined by comparing policy outcomes with scientific advice, for example level of carbon emissions, however, it is very challenging to use this kind of scientific advice because there is disagreement among the advices given.[149] In Europe, since different countries and different sectors have their distinct challenges in terms of improving energy efficiency and reducing carbon emission, the ambition level of national environmental policy tends to be different.

However, highly ambitious policy needs to have corresponding support schemes to facilitate the implementation of the ambitious policy. To implement highly ambitious environmental policy, strong cross-sectoral instruments, such as emissions trading schemes and taxes on emissions, need to be introduced. Such instruments provide strong incentives for consumers and individuals in joint contracts to reduce their emissions and adopt more energy efficient products. As these two following respondents mentioned, charging points for electric cars will be widely installed in housing cooperatives because of the ambitious policy in Norway that by 2025 the sale of new fossil-based vehicles will be stopped. However, the installation of charging points need investments from the housing cooperatives, which causes big challenges for the housing cooperatives.

Norway

Because the ambition is that by 2025, we should stop the sale of fossil-based vehicles. So, there are things in society that have to be tailored for this to happen and in these apartment blocks most things will be switched out. And then charging points must be installed, and there are several challenges related to this. But perhaps the biggest challenge at the moment is the need for capacity and the need to upgrade the facilities and who should cover the costs for that. It's one of the big questions that we have to find a better answer for than we have today. Interview Code (IDIN35NOA, M, Norway, Collective Decision-Making Unit)

Norway

People are starting to buy electric vehicles, and they do not buy without having a place to charge it. And for a number of housing companies this has created irritation, because when you buy an electric car, this does not come with a decision to provide you with a charging point or a parking lot where you can charge. Thus, it is up to Parliament, and parliament has included as a provision in the, I think it is the, Condominium law, that the board in a joint housing ownership cannot refuse a charging point without just

[148] Boasson (2013), Boasson, E. L. (2013). National Climate Policy Ambitiousness: A Comparative Study of Denmark, France, Germany, Norway, Sweden and the UK. *CICERO Report*.

[149] Boasson (2013), Boasson, E. L. (2013). National Climate Policy Ambitiousness: A Comparative Study of Denmark, France, Germany, Norway, Sweden and the UK. *CICERO Report*.

Norway

cause. But it is a horribly defensive way of attacking a problem, rather than to seek to stimulate the actors to adjust and adapt, one is trying to compensate for small singular obstacles through regulations. And we in A haven't been a strong enough opponent of including a provision [that charging points must be included], but the way it is now it is horribly fuzzy, so here we have opposed the government, along the lines of what constitutes just cause? And it is clear that if the housing company has to invest a million in a new transformer, or someone has to carry that expense, then this constitutes a just cause, so that's where we stand today. Interview Code (IDIN35NOA, M, Norway, Collective Decision-Making Unit)

On the contrary, policy with low ambitions can be discouraging for pursuing the energy transition, especially for those individuals who are highly motivated and committed to environmental protection. Low-ambition policy may create barriers for their actions, like two of respondents mentioned:

Bulgaria

It is difficult, as I hear. Because everything is based on the political will at the moment. My opinion is that the political will in Bulgaria, concerning RES sources, possibly including electric mobility, is not particularly insistent or big. Interview Code (IDIN20BGD, M, Bulgaria, Individuals Engaging in Joint Contracts)

Finland

We now want the state not to have a critical attitude, or attitude that electro mobility will not come, but we expect them to welcome electro mobility. Interview Code (IDIN56FIG, M, Finland, Individuals Engaging in Joint Contracts)

4.3.4. Policy design

In this section, we discuss the suggested policy design to encourage consumers and individuals engaging in joint contracts to engage in energy transition. In order to achieve the objectives that raise consumer awareness, provide consumer relevant information, and build consumer trust and technology acceptance, we suggest the policymakers to consider policy design from the perspective of (1) tailored government support scheme, and (2) taxation as a tool to signal price.

Tailored governmental support schemes

The energy transition cannot rely on energy markets alone, so national support schemes are needed to overcome a possible market failure and spur increased investment in renewable energy. However, the national interventions need to be carefully designed, otherwise they may distort the functioning of the energy market and lead to higher costs for European households and businesses. Based on the guidelines from the European Commission, national support schemes need to be limited to what is necessary, aim to increase the renewable competitiveness, need to be flexible and mature with technology development, and cooperate with other countries.[150] For example, The UK government introduced Plug-in Car grants and Plug-in Van grants which cover 20%-35% of the eligible cars or vans' list price up to a value of 5,000 or 8000 pounds at the point of purchase, this support scheme has been a motivator for electric vehicle purchasing. The government support is also very important for consumer and energy cooperatives to make energy choices towards renewable solutions, as two respondents mentioned:

Turkey

The government pretends to support the energy cooperatives although no support is observed in effect. However, the government will have to give support for these cooperatives because of the fact that Turkey faces an energy deficit of 60 billion dollars. The deficit will reach 106 billion dollars in 2023. Accordingly,

[150] European Commission (2013), European Commission guidance for the design of renewables support schemes Accompanying the document Communication from the Commission Delivering the internal market in electricity and making the most of public intervention

Turkey

the government will have to solve this problem by taking immediate precautions. Focus Group Code (FOGR2TRB, Turkey, Individuals Engaging in Joint Contracts)

It is quite difficult for individual consumers to establish smart energy systems as they are highly expensive and the regulation procedures pose an obstacle for individual consumers. Interview Code (IDIN5TRE, M, Turkey, Individuals Engaging in Joint Contracts)

<u>*Government subsidize system work as a critical promotor*</u>

As electric cars still have comparatively high upfront costs compared to combustion engine vehicles, government subsidies will be a great push for consumers to make purchasing decisions for electric cars. For example, the UK government has identified that higher upfront purchase prices relative to traditionally fuelled vehicles are a big barrier for purchasing electric cars. Even though some consumers compare lifetime running costs with upfront purchase prices, this is only a small fraction of consumers. Therefore, a key area of benefits for ULEVs (ultra-low emission vehicles) – lower running costs – may not be given sufficient weight by the average consumer.[151] Based on our interviews, we find that subsidies from the government can be a big push for investing in renewable energy, as two respondents mentioned:

Norway

We are discussing possibilities to reduce costs so that it's cheaper to buy solar panels, and if the government, the state or the community can subsidize us, it is a very, very good possibility for us to go in and do that. Interview Code (IDIN49NOO, M, Norway, Individuals Engaging in Joint Contracts)

Norway

There is also a housing company here in Oslo that has done it [solar panels], although not without a subsidy. They had a 30% investment subsidy in order to make it profitable. Interview Code (IDIN35NOA, M, Norway, Collective Decision-Making Unit)

However, as the guidance for renewables support schemes[152] mentioned, financial support for renewables should be limited to what is necessary and should aim to make renewables competitive in the market.

Spain

Suppose the subsidies ... the demand for subsidies will always be there. Because the actions are there, in a certain way, the subsidy is also a sales weapon for the respective window seller, in the specific case of windows. Then, the motivation of the windows subsidy is, firstly, because it is a simple reform and the relation of cost of subsidy - energy saving is relatively strong. Well, this has been the reasoning behind it. I think subsidies cannot be issued eternally, right? I won´t say that you are artificially influencing the market, but, well I don´t think that if there are no subsidies anymore, people will stop changing the windows. Interview Code (IDIN30ESD, M, Spain, Formal Social Unit)

Use taxation as a tool to signal price

Using taxation to signal the price is an effective way to drive energy transitions. EU policy clearly identifies tax instruments as being "very effective to incentivise consumer behaviour".[153] The European Commission has introduced a CO_2 element into the tax base of both annual circulation taxes and registration taxes for passenger cars. The overall signal is that it should always be economically beneficial to choose zero or low emission vehicles over high emission ones. However, each country has its specific taxation system to implement the CO_2 associated

[151] Office for low emissions (2013) Driving the Future Today A strategy for ultra low emission vehicles in the UK: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/239317/ultra-low-emission-vehicle-strategy.pdf

[152] European Commission (2013), European Commission guidance for the design of renewables support schemes Accompanying the document Communication from the Commission Delivering the internal market in electricity and making the most of public intervention

[153] European Commission (2013)a, COMMISSION STAFF WORKING DOCUMENT GUIDELINES ON FINANCIAL INCENTIVES FOR CLEAN AND ENERGY EFFICIENT VEHICLES

tax. For example, there are large differences between CO_2 associated tax of passenger cars among Nordic countries.[154]The European commission furthermore criticises EU member states for applying contradictory tax incentives that discourage low-emission mobility, including fossil fuel subsidies and tax schemes for company cars.[155] The national and regional policymakers must ensure positive financial incentives for low-emission vehicles and energy for transport for private citizens. Direct price incentives for EV purchases are also mentioned, as well as indirect financial incentives such as parking advantages.[156] For example, the UK government set out in 1997 the *Statement of Intent on Environmental Taxation*, and in 2001, the government reformed vehicle excise duty (VED) to ensure that the level of tax paid reflects the emissions of the vehicle. Based on our interviews, we find that government support and tax reduction on electric vehicles can be a motivator for purchasing:

Turkey

The government can support the use of electric cars by decreasing taxes. Although it does not seem possible in the short term, the government should take steps regarding the decrease of taxes on electric cars. Interview Code (IDIN5TRE, M, Turkey, Individuals Engaging in Joint Contracts)

Turkey

The ownership cost of the vehicle [hybrid car] is much higher than fuel cost. For instance, the vehicle tax, insurance costs and special consumption tax are quite high in Turkey. Even if tax deductions are provided for these vehicles, they have high insurance costs although they do not have fuel expenditure. Interview Code (IDIN16TRP, M, Turkey, Formal Social Unit)

Electric mobility is an important research and policy issue in Norway. Ambitious goals have been set for the decarbonisation of mobility, and the country is widely considered a frontrunner in electric mobility, having the highest distribution of electric vehicles for personal use per capita in the world.[157] As one of the respondents stated about the current situation of electric vehicles in Norway:

Norway

One thing is that there are many who buy an electric car, as we start to get a high concentration of electric cars, almost 5 percent of personal cars in Norway, on the roads, are electric cars now. And we see that in some urban areas; Bergen, Bærum, Akershus, you have about 10 percent, of the cars on the road that are electric cars. Interview Code (IDIN42NOH, M, Norway, Collective Decision-Making Unit)

In terms of the cost of purchasing and maintaining electric vehicles, Norwegian national directives state that electric vehicles are exempt from a one-time purchase tax and VAT (to be maintained at least until 2020), plus benefit from a 50% off on taxes for company cars. Therefore, as one respondent from Norway stated:

Norway

In Norway, because it's very expensive to buy cars with fossil fuel, they (the government) have subsidized the costs in buying electricity cars. I think that's a very good policy (...)...more and more people in Norway are going over to electric cars, because the politicians have given us, given the people the possibility have reduced the taxes and reduced the costs of buying cars. Interview Code (IDIN49NOO, M, Norway, Individuals Engaging in Joint Contracts)

[154] Duer, H., & Rosenhagen, C. (2011). *A comparative analysis of taxes and CO2 emissions from passenger cars in the Nordic countries.* Nordic Council of Ministers.

[155] Please see: ECHOES deliverable D3.3 Policy Potential Analysis

[156] Green eMotion Project Results, European Commission (2015).

http://www.greenemotion-project.eu/upload/pdf/deliverables/Project-Results-online.pdf

[157] Tietge, U., Mock, P., Lutsey, N., and Campestrini, A. (2016) Comparison of leading electric vehicle policy and development in Europe. White Paper.

Regulation or taxation?

Environmental regulatory instruments usually contain standards, quotas, and product bans. Compared to these instruments, taxation has the advantages of high efficiency, high flexibility, and low administration cost.[158] One respondent mentioned that the energy efficiency regulations are not effective anymore, because people can manage to find a way to deal with these regulations. Taxation can be more efficient to steering the energy transition economically, as the respondent stated:

Finland

V: In old energy efficiency regulations all planners know how to go around it, how to make the e-number smaller. It's too easy. No problem to draw a house and even if it's not the way supposed to be, they can come up with solutions to make it look compliant to requirements. That's not serving anyone. Then we have a building, that supposedly has small emissions, but it is used in a manner causing emissions. Why is this and why to force certain solutions that are not economically reasonable. […] Through taxation it could be done, to have a steering impact more efficient than by writing regulations and coming up with different calculation factors and efficiency factors and so on. I don't think those are sustainable.

I: So through economic steering?

V: Economic steering is what will bring long-term, sustainable solutions. I cannot think of another way. It's always. Interview Code. (IDIN51FIA, M, Finland, Collective Decision-Making Unit)

4.3.5. Policy implementation and monitoring

In this section, we will give suggestions to policymakers on how to implement the designed policies to achieve their policy objectives. In order to drive the energy choices of consumers and individuals engaging in joint contract, the policymakers need to implement the support scheme and taxation to (1) fulfil consumer needs to drive decision making, (2) use price signals to drive consumer needs, (3) introduce incentive program to drive individuals' environment and energy related decisions, and (4) support infrastructure establishment.

Fulfil consumer needs to drive decision making

New clean technology has to provide more or at least an equal level of comfort, as comfort is just as important as the economic savings. People's purchasing is regulated by their needs, this is considered a fundamental assumption in most policy documents. For example, when making a purchase decision for an electric vehicle, consumers will consider the type and lengths of journey they want to make, energy efficiency, and other demand they have of their vehicle, not only price. Very few people are willing to accept reduced convenience relative to a traditionally fuelled vehicle: "Consumers are likely to think hard about what sort of vehicle they need to get around, its cost and local impact"[159]. As two respondents stated that the comfort brought by new technology is very important for consumers to accept the transition to renewable energy:

Turkey

Both the public officials and citizens are pleased with electric buses. The citizens wait for electric buses in bus stations as they are more comfortable and silent. Interview Code (IDIN9TRI, F, Turkey, Formal Social Unit)

Spain

Economic sacrifice means that you have to pay more for the kWh in a cooperative or that you have to invest in insulation. I would like to not put a chemical insulation material, but a natural one. There are two

[158] Konosen, K., & Nicodème, G. (2009). The role of fiscal instruments in environmental policy, *Taxa-tion Paper* (No. 19). Working Paper.

[159] Office for low emissions (2013) Driving the Future Today A strategy for ultra-low emission vehicles in the UK: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/239317/ultra-low-emission-vehicle-strategy.pdf

issues - comfort and economy - and you have to think what you want or can sacrifice. Focus Group Code (FOGR8ESB, Spain, Individuals Engaging in Joint Contracts)

Use price signal to drive consumer needs

Using price signals to drive consumer needs is a very effective way to motivate consumers to purchase products with less environmental impact. For example, one of the options from the European Clean Vehicle Directive for accounting energy and environmental impacts is to use environmental impacts as award criteria.[160] A method of calculating lifetime operational costs for energy consumption, CO_2 emissions, and pollutant emissions of vehicles is defined by the directive, and this monetisation approach internalises external costs of transport, a long-term objective of EU policy.[161] Based on this method, more energy efficient and cleaner vehicles have lower lifetime operational costs, which give them the opportunity to enter the passenger car market. The method of calculating lifetime operational cost provide a monetary encouragement for consumers to transit to electrical passenger cars. As several respondents mentioned, economic efficiency is one of the most important factor on their energy related decision making:

Norway

... I think it will be cheaper for us in the long haul, to set up these solar power panels, and then we could give ourselves the power or the electricity we need to in a building. but today it's rather expensive, and you can have some support from some governmental or state agencies...I don't know, you cannot today, and the politicians, I think, want to subsidize if you want to take the costs yourself. so we are waiting a little bit but we very much agreed on in the board... Interview Code (IDIN49NOO, M, Norway, Individuals Engaging in Joint Contracts)

Finland

Now it is even cheap (to have an electric car) in expenses as there's no extra tax for electricity, so it is attractive, even dangerous, so people who may be used to not want to buy a car, didn't need to, when they think it's expensive, so if it becomes cheap to drive… Interview Code (IDIN56FIG, M, Finland, Individuals Engaging in Joint Contracts)

The other way to use price signal to drive consumer need is to increase the cost of using a traditional fuel car:

Turkey

The high fuel prices also constitute a motivating factor for the transition to electric mobility. If the prices for electric vehicles decrease, this will be a great motivator for potential buyers, and the electricity will become one of the cheapest energy resources. Interview Code (IDIN3TRC, M, Turkey, Collective Decision-Making Unit)

Norway

In Norway, because it's very expensive to buy petroleum cars, and it's equally cheaper to, they have subsidized the costs in buying electric cars. I think that's a very good policy. Interview Code (IDIN49NOO, M, Norway, Individuals Engaging in Joint Contracts)

[160] European Commission (2013)b, REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

[161] European Commission (2013)b, REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

Introduce incentive program to drive individuals' environment and energy related decisions

Financial incentives are a widely used policy support for new technologies development and rapid diffusion.[162] For example, the Norwegian electric vehicle policy has gradually built an incentive structure since 1990[163]. The zero emissions incentives include: No purchase/import taxes (1990); Exemption from 25% VAT on purchase (2001); Low annual road tax (1996); No charges on toll roads or ferries (1997 and 2009); Free municipal parking (1999); Access to bus lanes (2005); 50 % reduced company car tax (2000); Exemption from 25% VAT on leasing (2015). This incentive program achieved a significant effect on the development of electric vehicle market in Norway, electric vehicles (EVs) had a 39.2 % market share in the new car sales in Norway in 2017[164]. The government incentives policy to promote the energy transition can influence consumers energy related decision making by providing sufficient financial incentives, such as tax reduction and subsidize, as a respondent mentioned:

Norway

The most important thing is about the incentives, right. Give people incentives, people, companies, and everyone else incentives to adapt and do the proper and smart things. Incentives that promote solutions towards the goal, and not a lot of other weird stuff. Interview Code (IDIN43NOI, M, Norway, Formal Social Unit)

Support infrastructure establishment

This is especially relevant for the technological focus of electric mobility, which requires sufficient charging station to support the growth of electric vehicles. Because one major barrier for consumers to accept electric vehicles is ´range anxiety´. For example, there have been only few policy incentives to build charging infrastructure in cities to accommodate charging stations in Spain, which makes electrical cars only possible for people who own their own freestanding property with a garage where they can charge it.[165] This is mentioned by several respondents from different countries. Some respondents mentioned this lack of infrastructure as a significant barrier for the consumer.

Turkey

Moreover, there are some problems regarding charging stations in Turkey as the infrastructure is not enough. The number of the charging units for electric cars is quite low. Therefore, you need to find a suitable charging station after buying the car. Interview Code (IDIN12TRK, F, Turkey, Collective Decision-Making Unit)

Moreover, for individuals engaging in joint contracts, if their residential area has ill-equipped electrical facilities, installing charging facilities can be challenging because of high cost as one respondent mentioned:

Norway

Because the costs were so high, have to lay new cables, very big cables to have the capacity to charge a car, so the people said no, we are not, we don't disagree, but we don't want to have the costs ourselves today, so we can postpone it or you'd settle down and take it from some years later perhaps. Interview Code (IDIN49NOO, M, Norway, Individuals Engaging in Joint Contracts)

The cost to build infrastructure needs to be allocated smartly, for example, this may lead to disagreements within the housing cooperatives regarding whether or not they will finance building the charging station. It may cause disagreement because the conflict of interest within the housing cooperatives between electrical car owners and non-electric car owners, when all residents need to share the cost of building the charging station. As two

[162] Jaffe, A. B., Newell, R. G., & Stavins, R. N. (2005). A tale of two market failures: Technology and environmental policy. *Ecological economics*, 54(2-3), 164-174.

[163] See: https://elbil.no/english/norwegian-ev-policy/

[164] See: https://elbil.no/english/norwegian-ev-market/

[165] Please see: ECHOES deliverable D3.3 Policy Potential Analysis

respondents mentioned during interviews that installing charging infrastructure causes disagreement among the residents:

Norway

Because chargers for the cars concern just those people who have an electric car, so if you have 210 apartments and perhaps 10 have electric cars, the rest of the people don't want to pay for... to make the investment paying for these lucky few people having an electric car. I think that was the question. Interview Code (IDIN49NOO, M, Norway, Individuals Engaging in Joint Contracts)

Spain

This (the first electric car) has caused a lot of uncertainty among all the neighbours at the community meeting, because there were people who had some information but there were also people who knew absolutely nothing about the subject. To look for information, especially the legal issue affecting structural elements, who has to take care of the entire installation, if it will harm me or not, since I am the neighbour of the parking lot next door, this created enough discussions and many meetings. (…). But it has been a very complicated issue in a community of 450 neighbours. Focus Group Code (FOGR8ESB, Spain, Individuals Engaging in Joint Contracts)

There is also a request for building charging stations close to the residential area, so the residents can charge their car near to where they live. Residential charging infrastructure is continuously supported by the European Commission, and the Commission has also proposed that electric charging facilities should be built into new residential buildings with over ten parking spaces as of 2025[166]. Being able to charge the electric vehicle close by is one of the most important conditions for consumers to purchase an electric car. Some people may choose to buy their second car as an electric car for their daily commute to work and keep a traditional petrol car for long distance driving to reduce their ´range anxiety´. Also, because the charging time for electric cars are relatively long compared to fossil fuel filling, queuing at the public charging placing will cause negative experiences for consumers. As two respondents mentioned:

Finland

We want a legislation change for condominium and property owners, where people live, like workplaces… so that citizens and residents have the legal right to charge their electric car in the condominium if there's no harm of it or technical barriers. ...The Finnish live in condominiums, if the condominiums do not allow it, people will not buy electric vehicles. Interview Code (IDIN56FIG, M, Finland, Individuals Engaging in Joint Contracts)

Finland

So it has sort of been found that when anyway approximately over 90% of the charging takes place in people's homes, or in the car's "home base" this pretty surely forms a bottle neck when current electric cars can no longer use, or be recommended to use, except temporarily, this regular home electricity socket that can be found in the heating poles meant for pre-heating of the cars. Interview Code (IDIN55FIF, M, Finland, Collective Decision-Making Unit)

Finland

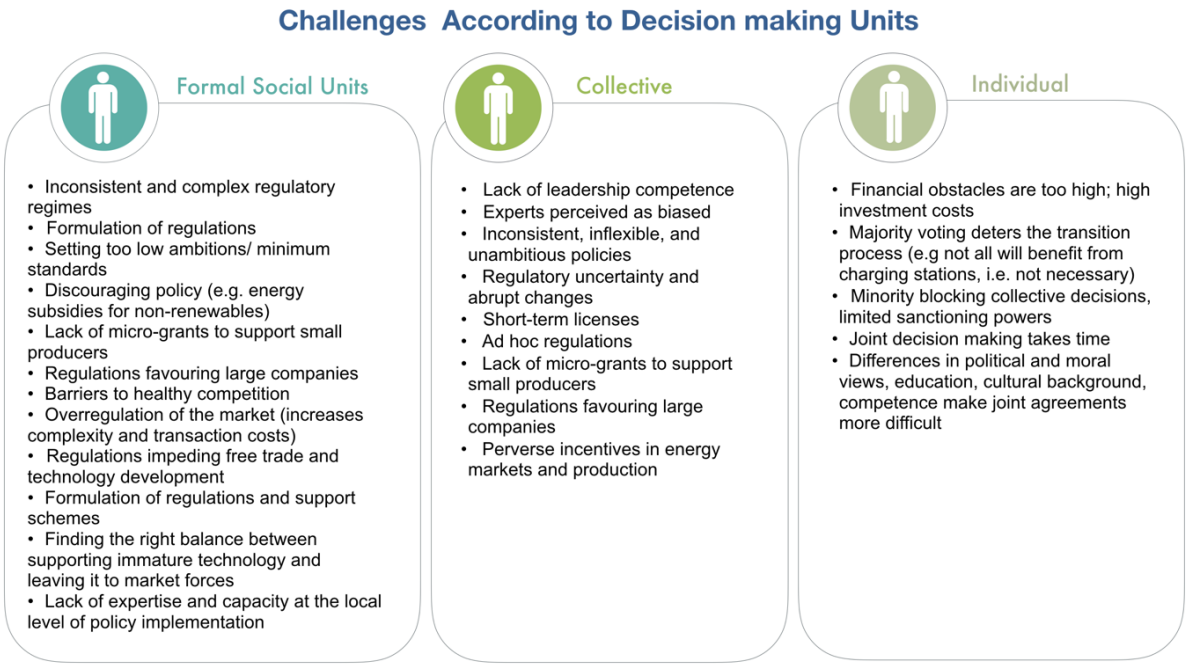
One probably cannot think about charging of electric cars in more than small numbers in public charging stations because there will be huge traffic jams if within one hour two cars get through one charging station when now 20 cars go through [one fuel pump?]. So building private charging stations is probably something one should invest in. Interview Code (IDIN55FIF, M, Finland, Collective Decision-Making Unit)

In sum, chapter 4 providers policy recommendations based on the insight from the in-depth interviews conducted in Austria, Bulgaria, Finland, Norway, and Turkey, and presents comprehensive recommendations for future policies addressing three decision-making levels: formal social units, collective decision-making units, and individual decision-making units. For the formal social units, policy recommendations surrounding regulations and support schemes, cities and local governance, and public procurement are highlighted regarding three

[166] See: https://epthinktank.eu/2017/04/05/charging-infrastructure-for-electric-vehicles/

technological foci: smart energy technology, electric mobility, and buildings. Addressing the collective decision-making units, this chapter provides policy recommendations relating how they can be facilitated and incentivized, and how related policies can be designed and implemented to trigger more such decisions towards a low-carbon economy. For individuals engaging in joint contract, recommendations are addressed regarding how policymakers can maximize the potential for citizen engagement as individuals may be fundamental drivers in energy transition processes.

The following figure summarizes the challenges according to each decision-making unit:



5. CONCLUSIONS AND GENERAL RECOMMENDATIONS

In addressing climate change, a multitude of policies has emerged over the years and many efforts have been made to influence decision-makers at all levels to participate in the pursuit of a low carbon economy. The ECHOES project has investigated the frame conditions influencing decision-making processes at different levels. To this end, various types of decision-makers, or stakeholders, have been distinguished into three broad categories. The first group of stakeholders fall under the category 'Formal social units', consisting of international, national, and local policymakers and -implementers such as the European Union, the various national authorities, local municipalities, and providers of energy and energy-related services. The second group is referred to as 'collective decision-making units' and comprises various business-related associations such as energy producer associations, consumer associations, commerce chambers, industrial chambers and organised industrial zones. The third group is identified as individuals engaging in joint contracts, and includes building management, homeowner associations, small company cooperatives and housing cooperatives, among others. The three decision-making unit categories each operate within their own distinctive context. Despite their differences and contradistinctions however, their actions and goals cannot be treated in isolation. Formal social units, for instance, formulate policies that affect the other groups, and collective decision-making units have the power to affect policy and legislation.

In analysing the decision processes of these stakeholders, and how they interact and communicate, three technological areas central to the transition towards a low carbon society were chosen as examples. These are buildings, electric mobility, and smart energy technology. To shed light on the way in which different decision-making levels deal with these topics, interviews were conducted with representatives from the industry, NGOs, a range of collectives, and public authorities in Austria, Finland, Bulgaria, Turkey, and Norway. The resulting information is condensed below, along with recommendations for future policies that take into account the challenges face by these decision-makers at their respective level.

5.1. Overview of the report

5.1.1. Formal social units

The formal social units clearly have several ways to influence other stakeholders, in order to achieve their predominant goals. Critical frame conditions at this level involve issues such as regulations and support schemes, cities and local governance, and public procurement. There is a strong indication, however, that solely relying on the use of regulations and support schemes to reach the EU's critical climate and energy targets is insufficient. There is a gap between the various policy directives provided on the one hand, and the way individual Member States implement them on the other. The EU's ETS current low price level is problematic for cutting emissions effectively, however higher pricing may conflict with national interests regarding industry competitiveness and national employment. The respondents in our study report that the impact of regulations and schemes may be unpredictable due to the complexity of non-linear phenomena. Expected results, according to the respondents, are not always realized when regulatory differences, diverse sectoral goals and roles, incoherent industry standards (e.g. ISO 50001), conflicts with other international agreements (e.g. Paris Agreement) and diverging technical criteria (e.g. what a passive house means), in addition to less tangible factors such as differences in risk perception (e.g. sense of urgency) and trust of citizens in the government come into play. As some respondents point out, other difficulties with practical implementation include political hazards such as lack of acceptance from opposing political parties and regulatory schemes that become discontinued at the end of a political term.

Support schemes designed to answer directives or goals may encounter the same impediments. Some of the interview respondents emphasize the importance of timing when it comes to phasing out a scheme. Schemes, according to them, should support the adoption of technology (e.g. electric cars in the case of Norway) in its early stages and be phased out when efficient market forces are in place. Moreover, a new scheme's intended results may be counteracted by existing schemes like fossil-fuel subsidies that hinder industries from switching to

renewable energy sources. Since enterprises are subject to financial concerns, environmental challenges are often overshadowed.

In the governance of cities and local communities, the informants indicated that the formal social units are bound by their degree of autonomy, budget constraints, level of competence, and ambition. Varying degrees of autonomy may result in different cities implementing different solutions, implying that the benefit of synergy is lost. Challenges at the local level of a formal social unit may be addressed through the creation of guidelines for local officials or providing information on best practices and courses for building local competence. Networks of cities was also recognised by many respondents as a beneficial strategy for smaller cities that lack capacity and expertise to learn from larger cities. Furthermore, some respondents communicated that there are many cities that have voluntarily initiated programs that encourage energy efficiency at the local levels (e.g. the E5 programme in Austria) and embraced ambitious goals (e.g. Citta Slow initiatives in Turkey, prioritizing investments that reflect environmental awareness and fulfil energy performance criteria). Integrated energy- and climate plans through European Commissions Covenant of Mayors initiative was also highlighted as a successful driver for energy related decision making and planning at the local administrative level.

Public procurement is another issue that has room for improvement. In formulating procuring requirements, price should not be a single deciding factor. One example is to set an eligibility requirement for bidders to comply with, (e.g., a maximum limit of emissions), in order to be allowed to bid. Using competitive tendering, according to the respondents, may be used to underline demand for low carbon or zero-emission solutions in public procurements. Through the creation of such a demand, the suppliers are “nudged” into providing such solutions. Moreover, requiring ambitious demands from bidders provides an opportunity for new, green business to emerge. Another respondent mentioned that positive results can also come from innovative, dialogue-based public procurement. Aspects of the public procurement process that were underlined include efficiency, such as reducing bureaucracy and simplifying processes, and improving purchasing skills and competence of public purchasers and providing good guidelines to ease implementation.

5.1.2. Collective decision-making units

Collective decision-making units in our contexts refers to units such as consumer associations, trade chambers and organized industrial zones. These are often perceived as main drivers for innovative and forward-looking technological change. Our respondents suggest that sustainability measures are readily implemented when sustainability and business targets work in the same direction also on the firm level. However, we observe that individual firms may tend to prioritize cost saving when financial efficiency and sustainability goals are counteracting. When faced with direct regulations, individual firms will often comply only with the minimum standard to which they are obliged, and voluntary measures to increase sustainability are difficult to realize without losing competitiveness. On an industry level, however, organizations may take the lead and set business before politics, both out of ethical and financial motives. Corporate reputation is often a major concern, particularly among larger companies, and may well lead larger firms to take stronger environmental measures than what is desirable from a purely financial perspective. A growing number of multinational corporations have indeed voluntarily adopted codes of conduct for sustainable production. Another interesting observation is that industries and other collective decision-making units often advise politicians to impose strong regulations on industries as a whole, in a way that ensure fair and transparent competition between firms. Such collective decision-making units may also serve as connectors between the private and public sectors, among other things by transferring opinions and information from the private to the public sector. Respondents further report that, even though organizations such as local governments, trade and industrial chambers, labour unions and consumer organizations often have conflicting interests, it is nevertheless often possible to reach a consensus. All these social organizations need to work together with the industry.

The observations gathered in this report indicate, however, that existing policies have major deficiencies. Several respondents from the industries point to the issue of inconsistent and complex regulatory regimes that are prone to change at unpredictable points in time. Regulatory complexity demands specialized competence among firms on the regulatory regime in which they operate, and they often create a need for external juridical competence to handle application processes, auctions, tax adjustment and liability hazards, to name some examples. Regulatory uncertainty, or political risk, where regulations change abruptly and erratically are adding to the already substantial risk of investing in new clean technology. Short-term licenses and ad hoc regulations are transferring risk from the public to individual firms, which is normally a suboptimal policy from society's point of view. Insufficient regulation is, on the other hand, another way of imposing unnecessary risk on firms.

Discouraging policies, or policies that create perverse incentives among agents, seem to be prevalent and takes different forms. Respondents from Norway and Finland point to low energy prices as severe impediments to energy efficiency, and in Bulgaria energy is subsidized to the extent that saving on energy consumption is barely worthwhile, according to one respondent. Respondents from Turkey identify subsidized coal as a major hindrance to a profitable transition towards sustainability. Such perverse subsidies are hampering the transition to sustainable and efficient energy use to a great extent, both on an individual and aggregate level.

The priority between large and small-scale producers, which is a concern among some respondents, is a complex field. A respondent from Bulgaria points to the need for micro-grants, as the current financial support schemes require large scale investments and are thus inaccessible to small and emerging producers. Regulations that favour companies that can make large investments, or spread their risk over many assets, are counterproductive when it comes to securing a diverse market and healthy competition. Respondents from Spain, Bulgaria and Turkey strongly suggest that such regulations are currently favouring large-scale producers. Market regulations designed to prevent the exercise of market power and, for instance, artificially low prices, is by example an important measure to keep of small businesses in the market. Policies directed toward risk reduction are very important to induce smaller firms to implement novel technologies. One the other hand, one Finnish respondent states that R&D funding should be directed more to clusters and industrial and technological ecosystems, as they represent the largest potential for coherent large-scale technological developments. Directing subsidies towards start-ups and smaller firms, that are not part of any technological or industrial ecosystem, might not reap the scale benefits of research.

5.1.3. Individuals engaging in joint contracts

Consumers may be fundamental drivers in technological transition processes as they frequently have idealistic motives for their behaviour rather than mere financial ones. In cases where financial and environmental objectives pull in the same direction, consumers are fast to change behaviour and adopting new sustainable technologies. Respondents from both Spain, Turkey and Norway agree that consumers are sensitive to financial incentives, in particular when those incentives align with their personal values. Examples on such areas include energy efficiency in house building and the transition to electric cars, where consumers can both save on costs and save the environment. However, economic incentives, as well as more direct regulatory measures, still play a major role in affecting consumer behaviour. Consumers are, moreover, sometimes more short-sighted than firms, and may be discouraged from investing in cost efficiency when the up-front payment is high. Financial obstacles may thus deter consumers from making idealistic choices.

Individuals frequently engage in collective decision-making processes to increase their power of negotiation with other more formal bodies. Such decisions may be both financially and idealistically motivated or affected by external factors such as policy or legislative regulations. Engaging in such collective decision-making communities may enhance the exchange of information, or the exercise of financial and political power, and thus enable individuals to take more part in, and drive forward, the transition to a low carbon economy. As individuals' attitudes towards environmentally friendly technologies are often motivated by moral and normative judgements that go beyond pure self-interest, collective decision-making processes can sometimes enforce and benefit from altruistic motives to

speed up costly transitions toward new technologies. Working towards a common goal may raise enthusiasm to an extent that the collective becomes a driving force behind technical change, as demonstrated by an example form a housing community in Bulgaria. Individuals may also be encouraged to take a longer-term view when engaging in collective decision processes, as rational decision-making is promoted by discussion and the sharing of knowledge.

Joint decision-making processes are, on the other hand often slow in nature, and if the collective is to meet once a year to decide on new investments, the transition process may become slow. When individuals engaging in collective decision-making processes consider adopting new technologies, majority voting may sometimes impede the transition process. If a small number of individuals are prone to adopt a new technology, they may be overruled by the majority who considers the new technology too risky. Evidence from housing cooperatives show, for instance, that the community may be reluctant to spend on necessary infrastructure for electric car charging that will not benefit all, as only some residents own electric cars. The opposite problem occurs when a minority blockades the decision of the collective, and the collective has limited sanctioning power. If unanimity is required for decisions to be made, only one opposing individual is needed to prevent change from happening. Moreover, heterogeneity among individuals, such as differences in political and moral views, and differences in education and cultural background can make agreements more difficult to obtain.

5.2. Policy recommendations for industries

The analyses conducted for this report point to the following policy recommendations for the industry sector

- Support schemes, according to them, should support the adoption of technology (e.g. electric cars in the case of Norway) in its early stages and phased out when efficient market forces are in place.
- Formal social units on a local level may be addressed through the creation of guidelines for local officials or providing information on best practices and courses for building local competence.
- Encourage networking between cities, firms and individuals.
- For firms, a high level of flexibility regarding compliance to policy regulations is generally preferred, and it is important that regulations are not unnecessarily restrictive regarding the way firms choose to reduce their carbon footprints. This calls for a high level of precision when policy regulations are formulated, so that restrictions are targeting the goal of the policy instead of distorting behaviour unnecessarily, which is both costly and undermines political credibility.
- Subsidies may help new technology in becoming profitable. This at least holds for large infrastructure types of investments, that are difficult for one firm to undertake alone, and difficult for smaller firms to participate in. Alternatively, major infrastructure investments necessary for industries to adopt new technology may be undertaken by national authorities directly.
- In other cases, subsidies when meant to correct negative externalities are often counterproductive. Financial support for renewable energy production, for instance, will lower the consumer price of electricity and thus lead to increased power consumption.
- Overregulating the market can also be counterproductive, as it adds to bureaucratic complexity, policy risk, and transaction costs such as lawyer expenditures. Once a market has been established, partly because of regulations, it should be regulated in a way that promotes fair competition and efficient solutions where the best technology is also the most profitable.
- Open trade within Europe in environmental goods and services is important for promoting the spread and development of new technologies and should not be impeded by other trade political concerns.
- For all policy measures, a key issue is that they are formulated in a transparent and non-discriminatory way, otherwise they will distort the markets and carry with them unwanted incentives.

- Environmental taxes should be designed to make environmental behaviour profitable for the individual, such as increasing the relative price of fossil fuels.
- Subsidies towards individuals should be used prudently and are perhaps most relevant when they reduce the one-time investment cost in measures such as installing efficiency enhancing heat systems and make the transition to electric vehicles, in order to alleviate consumers' reluctance towards large up-front investments.

5.3. Stakeholders central to the three technological foci

Decision-making units	Electric mobility	Buildings	Smart energy technology
Formal	• EU • National authorities • Counties • Municipalities	• EU • National authorities • Counties • Municipalities	• EU • National authorities, NRAs • Counties • Municipalities • Energy providers • TSOs and PXs
Collective	• Interest groups • Electric car associations • Actors in charging infrastructure • Actors in production of electric mobility related products	• Interest groups • Entrepreneurial actors • Actors involved in materials • Actors involved in construction • Actors involved in planning and • concept development	• Industrial chambers • Interest organisations • Consumer associations • Organised industrial clusters • Energy producers
Individual	• Car sharing collectives • Housing co-operatives • Condominiums	• Housing associations • Housing co-operatives • Condominiums • Small company cooperatives	• Zero-emission neighbourhoods • Housing co-operatives • Condominiums • Small company cooperatives

5.4. Challenges according to decision-making units

Decision-making units	Challenges
Formal	• Inconsistent and complex regulatory regimes • Formulation of regulations • Setting too low ambitions/ minimum standards • Discouraging policy (e.g. energy subsidies for non-renewables) • Lack of micro-grants to support small producers • Regulations favouring large companies • Barriers to healthy competition • Overregulation of the market (increases complexity and transaction costs) • Regulations impeding free trade and technology development • Formulation of regulations and support schemes • Finding the right balance between supporting immature technology and leaving it to market forces • Lack of expertise and capacity at the local level of policy implementation
Collective	• Lack of leadership competence • Experts perceived as biased • Inconsistent, inflexible, and unambitious policies • Regulatory uncertainly and abrupt changes • Short-term licensing • Ad hoc regulations • Lack of micro-grants to support small producers • Regulations favouring large companies • Perverse incentives in energy markets and production
Individual	• Financial obstacles are too high; high investment costs • Majority voting deters transition process (e.g. not all will benefit from charging stations, i.e. not necessary) • Minority blocking collective decision, limited sanctioning powers • Joint decision making takes time • Differences in political and moral views, education, cultural background, competence make joint agreements more difficult

5.5. Recommendations for the three technological foci at different decision-making levels

Decision-making units	Buildings	Electric mobility	Smart energy technology
Formal	• Provide guidelines for building inspections and requirements • Increase competence of public purchasers and inspectors related to buildings • Manage and reduce energy usage during peak demand in public buildings • Requirements on energy performance certificates in sale and rental advertisements. • Facilitate and encourage the use of energy planners in construction projects	• Provide funding for projects focusing on decarbonisation of transport • Setting strict vehicle standards to reduce emissions and air pollution • Support schemes (e.g. tax credits, tax exemptions, reduced fees, toll crossings and free parking) • Plan support scheme phase out in a predictable and transparent manner • Public procurement requirement for low carbon technology in purchasing (buses, ferries and municipal vehicle-fleets) • Building charging infrastructures or provide incentives to encourage suppliers to build charging stations, especially in rural and remote areas • Integrated regulations across sectors to harmonized and facilitate shift to electric mobility	• Provide regulations and schemes for adopting resilient grids and flexibility • Use of effect pricing and effect control • Incentives and subsidies for smart energy technologies and green behaviour • Investment in smart grid projects • Improve market design for consumers selling excess generated energy to the grid (i.e. facilitation of the concept of the prosumer)
Collective	• Act as mediators and influencers toward members of housing cooperatives and other housing entities, and supply chain contractors • Provide information to members • Adopting standards promoting green and energy efficient buildings (e.g. BREEAM and LEED standards in construction projects)	• Electric car associations and interest groups to influence national, regional and local stakeholders in adopting electric mobility and facilitating charging infrastructure build-out • Associations to provide guidelines on charging, range, and user experience to raise awareness and provide information to consumers and other relevant target groups • Communicate with the car industry on consumer demands, needs and experiences	• Cost reduction in renewable energy and smart energy technologies for small-scale and distributed energy generation • Provide revenue stream from new business models • Industrial clusters as hubs for knowledge transfer and collaboration with the public and academia • Engaging in pilot projects and R&D
Individual	• Influence building technology focus, attitudes, and perceptions. • Provide information on energy expenditure and possible savings in buildings	• Building consumer trust and technology acceptance in the electric mobility space • Facilitating car sharing initiatives • Joint decision making around building charging infrastructure in buildings and housing cooperatives to motivate individuals to shift to electric cars • Increase consumer awareness and knowledge around electric mobility	• Increase consumer trust and acceptance for smart energy technologies and the smart grid • Highlight economic benefits of smart energy technologies and the smart grid • Encourage participation and community collaboration around smart energy technologies