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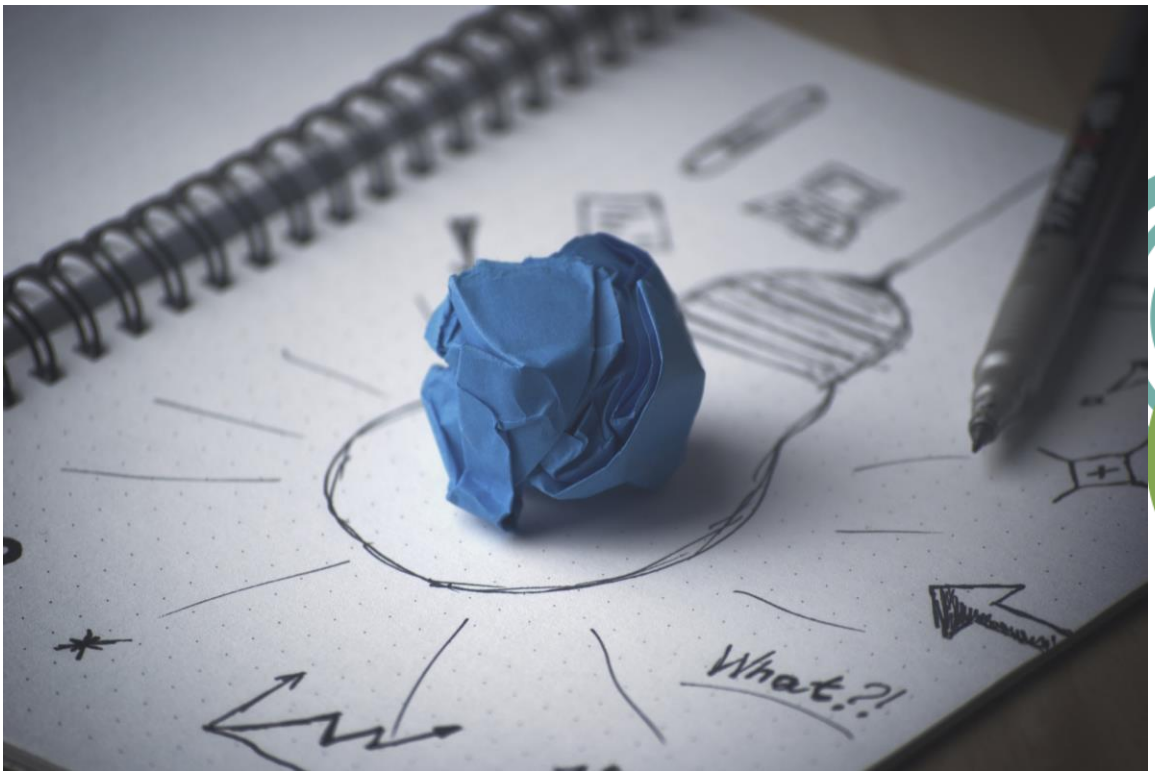
ECHOES Report

Analysis of Enabling Factors for Consumer Action



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ECHOES Report

Analysis of Enabling Factors for Consumer Action

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Abstract

Multi-national case studies assessed what kind of enabling factors for collective action can be pinpointed and to what extent enabling factors influence energy consumer/prosumer behaviour. Enabling factors include, for example, products, technologies, regulations or incentives that are available for the collective and its members.

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1 EXECUTIVE SUMMARY

The present deliverable reports the main achievements of the activities carried out in **Task 5.5 "National assessment: factors enabling collective energy consumer/ prosumer action".** The main aim of Task 5.5 is to assess what kind of enabling factors for collective action in the energy transition domain can be identified, and to what extent these enabling factors have the potential to influence energy consumer/prosumer behaviours. Enabling factors are conceived as those energy relevant framework conditions that can be actively shaped by policy makers in a society that has set itself the goal of an energy transition. In Task 5.5, a number of case studies were conducted in six countries throughout Europe (Italy, Austria, Bulgaria, Norway, Spain and Turkey). The case studies cover technology areas that were defined at the beginning of the ECHOES project: electro mobility, smart energy technologies, and energy in buildings. The present document puts together the results of the case studies analyzed in each country involved in this task. Each country report is composed by a brief summary of the country background conditions and by a more detailed report of the case study results.

On the whole, the different case studies considered here showed that, depending on the country, policy makers face very different and specific challenges in promoting energy transition activities by population groups. On the one hand, legislation, incentives, funding schemes are all factors that can help and drive the sustainable energy transition for both individuals and collectives. However, all these mechanisms have still have room to be improved, clarified, simplified. At the same time, new fields of action for policy makers arise, such as the coordination of newly emerging local actor groups, the promotion of participation, information and management of the numerous emerging players; the management of energy structures, considering the specific needs of different user groups and the promotion of the accessibility of necessary targeted technology (e.g., improving grid management by smart charging structures).

Although the cases are quite different, there are some things most of them share: concerning the **facilitating factors**, the presence of a strong environmental motivation of the key stakeholders involved, the presence of clear external financial incentives, and the presence of a social support system (for example in terms of sharing a common identity and ideas) have all worked as positive driving forces in the case studies presented in this report.

Concerning the **barriers** of establishing collective initiatives, also some common factors could be identified: a general lack of awareness and environmental concerns, a certain lack of community spirit that hinders collective initiatives. Another big issue is the current (sophisticated) legislation and especially legal uncertainty and many bureaucratic burdens individuals and collectives have to face when deciding to start an initiative relevant for sustainable energy transition. Thirdly, technological gaps still have to be closed in the domains considered, for example the stabilization of grid infrastructure.

Some general recommendations can be formulated for policy makers. If policy makers want to support more collective approaches by private citizens, firms, and company, here are some points that are necessary:

- Clear and better legislation: harmonizing different regulatory frames
- Compliance between national, regional and local policies in terms of funding, incentives, regulations
- Active support of individual and collective actions: clear and concise information about existing incentives and funding options, easy access to funding (supported by consulting, clear forms, etc.), have a dialogue with citizens, not hampering initiatives
- Increase of awareness of the need for accelerating the transition to more sustainable energy lifestyles and practices, among single individuals, self-organized informal collectives and representatives of formalized agencies: there is a need for systematic information and action campaigns targeting different public categories
- Clear and better administrative procedures: a fast handling of cases, streamlined and simplify procedures are needed
- Investment in Research and Development: there is a need to do research on different technologies (e.g. on charging technology) and to bring these technologies further
- Increasing awareness of initiatives among individuals and companies: more information at different levels and institutions about e.g. e-car sharing, co-housing, etc. has to be available

2 General Introduction

The ECHOES project aims at understanding how and why we make the energy choices that we presently do across Europe. In doing so, ECHOES focuses on three technology areas: electro mobility, smart energy technologies, and buildings. We are interested to understanding the factors that shapes transitions to more sustainable energy practices, at different levels. For example, it is important to understand the choices of an individual purchasing an electric vehicle, as well as the choices of a political system implementing a new support mechanism for distributed renewable energy production and decarbonizing the transport sector. A key goal across the project is to harness knowledge about such choices, through mobilizing different disciplinary and analytical perspectives in order to produce policy relevant advice for the European Commission and its Member States in its quest to realize the goals of the Energy Union.

Work package five is primarily focused on processes at the meso-level of society, where the question of consumer/prosumer behavior in the energy sector is addressed from a sociological perspective, by exploring: (i) the shaping and performance of so-called "energy lifestyles" across Europe, (ii) innovation and transformation through grass roots organization, and (iii) the impact of *energy memories*. This work package explores the transformation of energy consumption patterns, energy production and innovation in the context of what we can call "Energy Cultures". At its core, this approach recognizes that transforming a society's way of consuming and producing energy cannot be reduced just to a cognitive task, a social task or a technological task. Rather, such transformation requires addressing norms, practices and material aspects in a balanced way. The "Energy Cultures" approach explicitely differentiates between countries (or better cultures). Thus, the energy cultures that we study in ECHOES are situated within specific national and local contexts, and are produced by combinations of material elements, norms and habits. The energy cultures we study are also situated at a particular temporal location.

The present deliverable reports the main achievements of the activities carried out in **Task 5.5 "National assessment: factors enabling collective energy consumer/ prosumer action".** The main aim of Task 5.5 is to assess what kind of enabling factors for collective action in the energy transition domain can be identified, and to what extent these enabling factors have the potential to influence energy consumer/prosumer behaviours. This task has also been designed and implemented in close collaboration with ECHOES WP6, which is focused on the macro level factors, related to formal social units such as municipalities, energy providers, NGOs or formal consumer organizations, that might steer and facilitate decision-making for the transition to more sustainable energy systems across Europe.

By enabling factors we understand those energy relevant framework conditions that can be actively shaped by policy makers in a society that has set itself the goal of an energy transition. These framework conditions directly address consumers/prosumers and their scope for behavior, and include legislation, incentives and barriers, promoting and opening access to innovative technologies and new forms of production. In ECHOES, we want to investigate the extent to which national framework conditions in the three technology fields of electro mobility, smart energy technologies, and buildings contributed to a change in consumer and prosumer behavior in practice. Of particular interest here are framework conditions that address all types of prosumer/consumer associations.

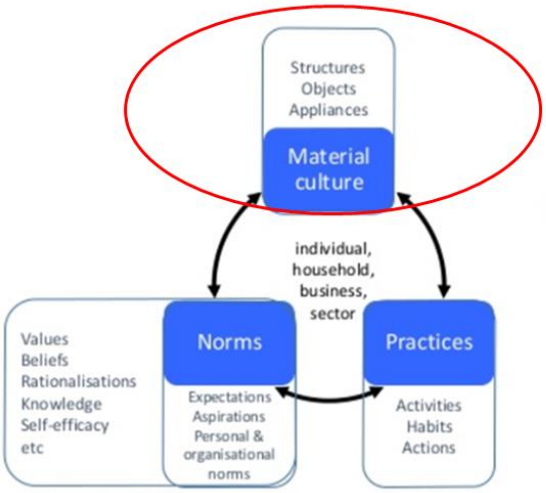

Figure 1 The energy culture framework as developed in Stephenson et al. (2010; 2015), position of “enabling factors” highlighted

These factors may be of high relevance especially in the field of energy related behaviour and consumption, as this field only offers reduced potential for independent action (compared to other fields of consumption).

If we recall here the concept of "Energy Culture" used in WP5 (see also figure 1), the "enabling factors" are key part of the "materials" area of this concept, that brings together prior findings of Practice theory, Systems Theory and Actor-Network Theory. As Stephenson et al. explained (2010), the acknowledgement of the material world is part of the structure that influences behaviors. This insight is reflected in Actor-Network Theory (ANT) (Latour, 1993; Law and Hassard, 1999) where it is stated that technology/access to it can bring about interactions that change or stabilize behavior. In the concept of socio-technical system (STS) (Geels, 2004) or socio-technical regime (Smith, 2007) the dynamics of the complex interplay between “artefacts, institutions and agents” and the “mutually reinforcing and entrenching cognitive, social, economic, institutional and technological processes that sustain existing trajectories of development” (Smith, 2007: 428) are described. Here the important role of governments in shaping the development trajectories directly (e.g. by legislation or incentives) and indirectly (opening access to technologies) shows up. Based on STS theory, the Energy cultures concept adopts the approach to understand the behavior of individuals and groups *in light of* these wider system dynamics/components and, building on this, to analyze in which areas and by which “material” actors the individual behavior can be successfully influenced.

3 METHODOLOGY

In Task 5.5, a number of case studies were conducted in six countries throughout Europe (Italy, Austria, Bulgaria, Norway, Spain, and Turkey). The case studies had to cover one of the technology areas that were defined at the beginning of the project: electro mobility, smart energy technologies and buildings.

Each country selected one to three case studies which will be described in detail in this report. Every case study also included interviews with one or more key stakeholders of the case, be it the CEO, the project manager or other top-level managers, or one of the users/consumers.

In addition, desktop research was done on the background of the chosen technology area and the framework conditions in terms of policies, funding and legislation in the respective countries and in some cases, even additional interviews with decision makers and authorities were conducted. This is important as the case studies are anchored in their specific national and local context and evolved the way they did due to that fact.

A general discussion and conclusion chapter is included in each country section. The report on Task 5.5 is rounded off by an extensive summary of the main results across the different countries and an analysis of the motivating and facilitating as well as hindering factors. It concludes with a summary of recommendations for policy makers.

The methodology followed was based on the main standards of explorative qualitative research with key informants, using thematic content analysis. In all countries, semi-structured interviews were conducted using an ad-hoc interview track, developed to the purposes of the present task. Interviews were audio recorded, after obtaining the informed consent of the participants, and then content-analysed in the original country language by representatives of each country team in order to identify the major thematic trends emerging from the discussion, and main drivers and barriers to sustainable energy transition as perceived by the interviewees. The selection of the case studies in each country was made on the basis of a collective discussion, lead by the task leaders team (Uniroma Tre) and by the WP leaders team (JR), which saw the active involvement and participation of all the research teams involved for each country. The criteria for case study selection and inclusion in the analysis in each country were the coherence with the main ECHOES purposes, the fit to at least one of the three ECHOES technology foci, and the practical feasibility of the field research investigation as well as the accessibility of the information and the availability for collaboration from the main case studies key representatives. A template for case study reporting was also elaborated by the task leaders, shared with the WP leaders, and followed by all the teams involved.

Below we report the main interview track, as elaborated and shared across the teams involved, and used in the data collection process. The single country reports are then presented in the remaining of the present document.

Interview track/guidelines for interviews with key persons in the case studies – ECHOES Task 5.5

Name of case: Name/position of person: Person's link to the case study (project manager, etc.)

- Can you please briefly tell us about the project from your point of view? How was it initiated, when did it start, how did it work, who started it, etc.?
- Who are/were the drivers of the project? What was the motivation behind?
- Why was it done as a collective and not as individuals? Is it still "non-formalized"?
- What (e.g. from the side of public authorities) was **supporting the case study** in terms of regulation, supporting framework, infrastructure, regulation, funding? In which way? What was the most supportive?
- What (e.g. from the side of public authorities) were **hindering factors**? In which way? What was the most hindering?
- What are/were the lessons learned? What would you do differently the next time and why?
- What **could be changed in the frameworks provided by public authorities** to better meet the needs of collectives in terms of energy consumer/prosumer behavior?
- Are there any other people we could/should interview who could provide us with more information, e.g. public authorities, other actors, etc.? (remark: due to the General Data Protection Regulation we should not track names that are provided on our audio files!)

4 Italy

4.1 Background

National framework and state-of the-art

Energy efficiency plays a key role in Italy's energy transition path. During 2017, energy efficiency policies have been strengthened by facilitating the measures that have the best cost-effectiveness ratio in order to achieve 30% energy savings by 2030 compared to the expected consumption at that date.

As reported by the Italian National Agency for New Technologies, Energy and Sustainable Economic Development, ENEA, in its 7th Energy Efficiency Report (ENEA, 2018), Italy has values of primary energy intensity lower than both the average of the 28 European Union countries (EU-28) and the countries belonging to the Euro Zone. Therefore, Italy's good positioning makes it more complex to continue to reduce the energy intensity: in the period 1995-2016 energy intensity decreased by 14.3% in Italy, by 31.3% for the EU-28 and 25.4% for the Euro Zone. Despite these differences in the reduction rate, in 2016 the Italian primary energy intensity was 17% lower than the EU-28 average and 14.1% below the average of the Euro Zone countries.

The energy demand remained fairly stable and Italy's consumption levels are comparable to the first half of the 1990s but with a different mix of energy sources. In 2016, fossil fuels covered about 80% of primary energy demand compared to 94% in 1990, with an increasingly important contribution of natural gas instead of oil. The share of renewable sources is constantly growing: 16.8% in 2016, of which one third was solid biomass, followed by geothermal energy with 20.8% and hydroelectricity with 14.9% (in 1990 both covered over 40% of renewable sources). The contribution of electricity also increased (2.1%).

In 2016, the energy consumption of the *residential sector* was lower than the previous year. Increases in the consumption of natural gas and heat were seen, while there was a decrease in the consumption of electricity and wood. Other renewable sources grew by 5.3%, especially solar thermal, even if at present they only contribute marginally to the mix. The consumption of liquefied petroleum gas has also recorded an increase of 3%, in contrast to the trend of recent years, probably due to the very cold temperatures of that particular year. Natural gas is the main source of energy: in 2016 it met more than 53% of the energy consumption in the sector, followed by wood and electricity.

In 2016, energy consumption of the *transport sector* was lower compared to 2015, continuing the reduction started in 2007 with the exception of 2014. The main mode of transport is road transport (especially for freight), which accounted for about 85% of total sector use. In 2016, energy consumption decreased compared to 2015, confirming the negative trend in recent years. In the period 2000-2016, the sectors that most contributed to the improvement of energy efficiency were the industry and the residential sector. The former achieved the greatest increase, equal to 20.7%. For the transport sector, the National Energy Strategy plan underlines the need to reduce the use of private mobility through measures aimed at encouraging a shift towards smart mobility and local public transport.

The residential sector achieved an energy efficiency gain of 10.7%, lower than the previous decade due to changes associated with living comfort. Finally, the transport sector has experienced the greatest difficulty in achieving energy efficiency gains because freight transport is almost exclusively done on the road: railways, shipping and air navigation have seen significant gains in energy efficiency in recent years, but to date they represent 15% of total transport only.

To stimulate energy efficiency investments and achieve national energy savings targets, Italy adopts energy savings obligations - tradable certificates for energy savings, such as white certificate - and tax reliefs. A white certificate is an official document issued by an authority or an authorised body providing a guarantee that a certain amount of energy savings has been achieved. Each certificate is a unique and traceable commodity that carries a property right over a certain amount of additional savings and guarantees that the benefit of these savings has not been accounted for elsewhere. In Italy, certificates are called Energy Efficiency Titles. According to the 7th ENEA

Energy Efficiency Report, in terms of achieved energy savings, 37% of these savings in Italy derive from the obligation scheme of the White Certificates and over a quarter from tax relief.

For Italy, the specific enabling factors were surveyed and analysed with reference to two particular case studies, in following two different domains:

a) e-mobility (e-car sharing)
b) cohousing activities

The main background situation for these two case study domains will be described in two different sub-chapters, in terms of national framework and state-of-the-art.

Electric sharing mobility

In the current society, which is increasingly active and reflexive in reconsidering its own environmental impact (see for example Carrus et al., 2018 for a discussion of the concept of reflexive modernity in relation to the challenge of facing global environmental problems), electrical mobility seems to have become one of the major sources of the new hope for sustainable development. Electric propulsion can offer an important contribution to the EU objectives of decarbonization, playing a crucial role for a change of direction of mobility towards more sustainable models in environmental, economic and social terms.

Electric car sharing is one of the mobility ideal solutions, because it connects the pursuit of zero emissions vehicles with the outcomes of easing car traffic in densely populated urban settings and consequently reducing air and sound pollution, and thus improving the quality of urban life in general.

Indeed, a recent study by the Berkeley University (2016), carried out on five large North American metropolitan areas, shows that any electric car sharing vehicle allows to “eliminate” up to 11 private cars from the city streets, thus reducing traffic congestion, freeing useful space for parking and improving air quality. Many operators in the car sharing sector are also now introducing electrical vehicles in their fleets, thus contributing to reduce the impact of car use and car traffic on air pollution and quality of life in urban centers (Source: UC Berkeley Transportation Sustainability Research Center and World Bank, 2017).

Despite the growing trend of electric car sharing in many western societies, Italy still has a long way to go in this specific domain. In fact, to speak today of electric car sharing in Italy means to make reference to a niche phenomenon, that has small numbers both in absolute terms as well as when compared to other similar services launched in other European countries (in particular in France). A quite complete snapshot of this sector in Italy comes from a study carried out at the end of 2016 by the National Observatory for Sharing Mobility, promoted by the Ministry of the Environment and by the Foundation for Sustainable Development. The most recent data reported in this study refer to June 2016, and substantially show how electric car sharing is representing still only 12% of the global sharing market in Italy. In particular, it has been highlighted how large operators of Italian car sharing (Car2Go and Enjoy in the first place, the two forerunners in this sector) would have just been based on petrol powered vehicles, and they keep on doing so.

The first electric car sharing experiences in Italy have all been funded and supported by public authorities at the national and/or local level. An example of this is represented by the experience of initiatives such as *ICS* (supported by a convention born in 2010 between Italian local bodies interested in this theme), *E-Vai* (company belonging to the Trenord group owned by the Lombardy Region, in the North of Italy), *Eq-sharing* in Milan and *Ci-rò* in Naples. Their success, moreover, has quite never matched the initial expectations and some of these experiences, like for instance *Eq-sharing*, have gone bankrupt.

However, despite these initial problems, it was just on the “ashes” of this Milan failure that the most interesting Italian experience in this sector was born in September 2015, and which still constitutes so far the most successful one: Share’ngo. This initiative started from the Milan City Hall “digital islands”, equipped with a capillary network of electric recharging points that have been left free from the unsuccessful Eq-sharing experience, and was supported by the investments of Cs Group. Share’ngo is a parent company of the Chinese Geely Motors, owner of Volvo, and

in just a little bit more than one year and a half was able to launch the greatest fleet in sharing electric vehicles in Italy.

This success has allowed the growth of the electrical car sharing sector in Italy, if compared to the data surveyed from the National Observatory Report on Sharing Mobility. Share'ngo, for instance, has expanded its electric car fleet and nowadays has almost 1.500 vehicles of this kind between the cities of Milan, Florence and more recently also Rome. Another initiative called *Aci Global* has launched its car sharing service with cars that are 100% electrically powered in the city of Bari, starting with an initial fleet of 30 cars. Another interesting experience took place in the city of Torino. Here, we can find a project starting with a public notice awarded to the French Group Bollorè, which has launched the initiative "Bluetorino Car sharing". This initiative at the moment boasts 120 electric vehicles and 55 parking areas (these data refer to January 2017), but intends to achieve 1.500 vehicles and 3.000 new charging points in the next years. The latest big actor which has entered the Italian sharing market is represented by DriveNow (operated by BMW). This company has launched in Milano, in January 2017, next to its usual business with traditional fuel cars, 20 electric cars that have been integrated into the existing service.

The reasons of the limited diffusion of electric car sharing in Italy so far can, in the first place, be connected to the poor diffusion of electric mobility in this country, which has been so far not that much supported by specific incentive policies for purchasing. Italy, in fact, is one of the few European countries that has no direct incentives for the purchase of electric vehicles, such as VAT exemption, tax deductions, facilitations when purchasing, except for a vehicle tax exemption for 5 years from the date of registration. This kind of incentive seems indeed not very effective, as it could be perceived by consumers more as a "sweetener", that enables to limit just a small part of the maintenance costs of the car in a relatively long time frame, rather than a clear and immediate attractive monetary incentive in the purchasing process, in a short time frame.

Local administrations have probably done something more concrete in order to facilitate the transition in this sector, for instance granting reductions on parking fees and unlimited access and no charges to the urban limited traffic areas (ZTL in Italian).

A second factor which can be mentioned for being a potential barrier to the diffusion of electric mobility in Italy is the very limited number of charging points, far below the European average.

Finally, the Italian electric car sharing market is based on a different business model if compared to other public administrations in Europe. In France for instance, the e-car sharing service called *Autolib*, by the already mentioned Bollorè group company, was based on a "market competition" model, where through participation in tenders only one party will be selected that will manage such service, and to whom the public sector will grant public subsidies. This will make the investments easier in a sector like electric car sharing that is characterized by technologies and business models that are not yet fully consolidated and mature. In other countries instead, like Italy or Germany, recourse was made to a "market competition" model, where public administrations are establishing some obligations and minimum service standards that are followed by tenders open to all the operators meeting such requirements. Here, resorting to electrical vehicles for car sharing services appears to show the greatest risk, even if in all tenders issued by the Italian Municipalities operational and tax facilitations have been provided for the operators that will use electric car solutions (Grasso, 2017 - www.rienergia.staffettaonline.com). The transition to a more sustainable mobility model also requires important investments in the public sector as well as in the private one and most of all needs partnerships and cooperation between both parties in order to develop the abilities of the infrastructures and systems to procure power as well as fast internet connections. This kind of cooperation is in fact crucial in order to decide what is really paramount between the development of the infrastructural network and the expansion of the electric vehicles market share.

On this issue, the European countries are yet on very different development levels. The European regulatory guidelines impose to any member state to meet by 2020 the target goal of using renewable sources for the 10% of the consumption needs in the mobility sector, and to develop charging infrastructures to use alternative fuels (CE 2009/28/Directive).

In terms of regulatory frameworks, at a national level, the transposition of the European Directives, happened with the approval of proper legislative instruments, aimed to favour the development of sustainable mobility through low emission vehicles (national Law dated 7 august 2012, n.134), along with the definition from the Ministry of the Infrastructures and Transports of the "National infrastructural plan for charging electrically powered vehicles (PNIRE)", which sets the guidelines to ensure the integrated development of charging service for electrically powered vehicles in the national territory. These two regulatory schemes constitute the main regulatory environment for the realization and development of the electrical vehicles charging infrastructures.

Collective energy consumption: co-housing experience in a supporting role

Collective self-organized housing represents a growing strategy that can fulfill the goal of the EU energy policies (e.g., Chatterton 2013; Tummers, 2016). Co-housing is the overall term for groups of households that increasingly take initiatives collectively to create and manage housing projects as living environments (Tummers, 2015). Some of the characteristics attributed to co-housing as identified by McCamant and Durrett (1998, p.38-41) include: participatory process; intentional neighbourhood design; common facilities; complete resident management; together with the encouragement of human interaction, support for disadvantaged members of the society, and the awareness of the environmental concerns (Meltzer, 2005; George 2006; Marckmann, Gram-Hanssen, Christensen, 2012). People choose to live in a residential community in shared services, green spaces, collective areas and low energy buildings. The sharing of goods and services allows a considerable saving of energy and costs, facilitating the management of daily activities and generating a more sustainable lifestyle. Traditionally, the reasons that lead to the co-residency have been identified in the necessity to find lost dimensions of social interaction, mutual support and good neighbourly relations and at the same time a desire to reduce the complexity of life, stress and cost of managing daily activities. An additional reason that might emerge in contemporary European societies is the desire to reduce one's own carbon footprints and energy consumption patterns.

Indeed, one design aspect that can be identified in the planning of many co-housing communities is the tendency to build in clusters. This allows for a smaller footprint of the dwelling on the site, leaving more open space for the community to share. In an era where sustainability and affordability are of major concerns for an increasing share of the population and public opinion, building in clusters makes more sense, as it saves building materials, by sharing walls for example, and reduces energy costs of heating and cooling, which inevitably also relate to affordability of housing investments as well as to the energy performances of buildings and households consumption. The grouping of dwellings together, extensive common facilities and shared amenities, has also been suggested to inherently encourage pro-environmental behaviour (e.g., Marckmann et al., 2012; Seyfang, 2010; Williams 2005; 2008). The adaptation of environmentally sustainable design principles, such as adapt and reuse, water harvesting and treatment, energy savings, passive and active solar considerations, are all part of good design practice. In this respect, the big advantage of co-housing lies in the way it is structured and constructed, which considers and addresses these concerns.

One successful example has be reported in relation to the Murundaka Co-Housing Community in Melbourne, Australia (https://www.murundakacohousing.org.au/about). Consisting of 20 households who are all working together to provide quality affordable housing with minimal impact on the environment, the collective has focused on providing "Energy Freedom" for the community since its inception in 2011. A range of energy efficiency measures have helped cut the energy use of its buildings by 25% and reduced power bills by 50%. Now, 100% of the community's electricity comes from solar power.

In the UK, the Lammas Ecovillage project was the country's first planned ecovillage (http://lammas.org.uk/en/welcome-to-lammas/). Energy generation and use is just one element of this project — the people who live in the village are focused on developing a completely self-sustaining way of life, from growing their own food to generating their own power and building their own homes from local natural or recycled materials. All of the electricity in the village comes from micro solar panels and a hydropower generator.

In Italy, the examples of co-housing are not yet so frequent, if compared to the experiences of other European countries such as France or the Scandinavian countries. It should be noted that this slowness might not be related

to the people distrust but rather might be related to the fact that bureaucracy, local political jurisdictions and administrative systems are perceived to advance slowly in this specific housing domain.

Currently, Italian co-housing experiences has especially benefited from two types of co-housing organizations that have emerged in the last few years, and mass-media marketing. The first are co-housing organizations that are non-profit companies. The second is Cohousing Venture (representative of this case study), which is closer to the U.S. model of a co-housing consultancy firm. Both of them provide resources and guidance to families that wish to take part in creating a residential housing community.

The team of Cohousing Venture is the initiator of the first experiment of co-housing in Italy. Thirty-two families live in a beautiful courtyard called Bovisa Urban Village in Milan. The area is built in an area of a former factory. The courtyard has a central communal garden, homes are attics and lofts with parking space in the underground garage, small private gardens and a further 140 square meters of meeting space (a room with a kitchen, laundry and ironing, hobby room, storage GAS). In the construction of the building, it has been paid great attention to environmental sustainability and energy efficiency developments: solar panels, centralized heating systems in low-power, high-performance insulation.

In terms of Task 5.5, the Cohousing Venture experience looks interesting as a particular example of the potential contribution of self-organized housing to the energy transition, climate change targets and sustainable urban policies.

4.2 Description of case study 1: E-go car sharing at the Roma Tre University

In September 2016, Roma Tre University and Enel Energia collaborated to the activation of an electric car sharing service for students and the academic and administrative staff of the University. Enel (https://www.enel.com) is a multinational energy company and one of the world's leading integrated electricity and gas operators. The company works in 35 countries across 5 continents and it is the largest electricity producer in Italy and the largest integrated utility in Europe. Enel is also one of the user partners of the ECHOES project.

The electric car sharing service has provided thirty electric vehicles. Renault electric vehicles have been used to provide the service (10 ZOE and 20 Twizy). Thirty charging stations to recharge electricity have been installed at four parking lots in the premises of different Departments of Roma Tre University (Rectorate main campus, Humanities, Economics and Engineering). The project started with a trial phase, in which 100 selected users from the University students corpus tested the service and became spokespeople of the service, offering testimonials for sharing and spreading the news about the initiative across the university. These students assumed the role of E-go "Ambassadors". Beginning on October 16th, the electric car sharing service was opened to all students and the entire teaching and administrative staff, both for university trips and for private use, including on weekends. The electric vehicles were also made able to use the charging stations of the network outside the university. The service was offered for free until December 31st, 2016. From January 1st, 2017 a range of tariff options were made available (e.g. rental by the minute, a daily rate). Users can manage the various phases of the service using a web platform. The search and rental of the electric vehicle can be done through the service website or through a specific smartphone app.

Everything is managed by smartphone: the opening and closing of the car, the localization and status of available vehicles, route planning and access to rental and payment data. All the electric vehicles are geolocalized through GPS. The cars can be hired and returned within an operational area visible on the smartphone app. It is therefore not mandatory to return the car to a charging station, but in case the battery is not fully charged this action is strongly recommended. After user registration, students and University staff can request the service's activation to the Telecommunication Offices of the University. The user has to be in possession of a regular ID university number.

4.2.1 Description of the representatives of the case study involved in the interviews

Roma Tre is an active member of the National Mobility Coordination of Mobility Manager University and Research, a work group of 55 mobility managers from Italian universities. Following other national and international universities, Roma Tre has decided to actively participate in the construction of a new development model outlining a path in the organization of structures, actions and available resources to favour the circulation of the ideas and principles of sustainable mobility. The mobility manager office is part of the university services and it encourages actions aimed at improving the quality of the environment, first of all by promoting the use of public transport and encouraging the use of alternative means of transport to the traditional private motorized car vehicle. One of the main initiatives adopted by the office in these years has been the electric car-sharing.

Within the scope of our case study analysis, interviews were carried out with two different representatives who have played an active role in the E-go Car Sharing Electric Mobility Service project, aiming to reflect the differences and similarities regarding the perception and personal experience in the sustainable mobility field research. The first representative is an academic, one of Italy's leading experts on sustainable mobility, transportation systems, and transportation engineering, and was involved in the management and coordination of the E-go car sharing initiative. The second interview was conducted with one of the e-go ambassadors involved in the promotional and informative activities of the car sharing service. The e-go ambassadors were students involved in informative and promotional activities aimed to introduce the e-go car sharing service to other university students, informing them about the operational features as well as about all the benefits of the E-go car sharing initiative. The ambassador was also one of the 100 selected users from the university who was allowed to use E-go service free of charge in the trial phase of the project, in order to offer testimonials disseminating the news about the initiative within the Roma Tre University.

4.2.2 Main outcomes from the interviews

Universities play an important role in society as they produce and apply knowledge to improve the citizens' quality of urban life. Everyday, a flow of people moves around university areas. Consequently, careful analysis considering planning and transport operations are required. Various issues have to be directly addressed, such as the need for sustainable and efficient mobility alternatives for students, faculty members, staff and visitors on a daily basis. As a consequence, one of the challenges is to promote sustainability actions in the mobility operation of all the university players, such as students, teachers, and staff (Miralles and Domene, 2010).

The e-go Car Sharing Electric Mobility Service project was launched in 2016 and was aimed to design and implement a university-based EVCS system reserved for students and employees of Roma Tre University. The fleet is currently composed by 30 electric vehicles, with 56 recharging points that have been installed in several departments of the University for limiting the refloating cost. The service is designed as a free-floating system, allowing for commuting and leisure trips. The trips are not spatially limited, but the rental has to be opened and closed within a delimited area in the city.

The interviews with two of the representatives of the project allowed us to identify some important points in terms of motivators, barriers and strategies that could potentially promote a more sustainable mobility in the university system.

One of the main **motivators** of the project was students and faculty members' strong awareness of sustainable mobility goals, as a shared value to be pursued globally. As reported by our interviewee playing a role in the project management, "*there was a common intention to explore a project focused on electric mobility aimed to guide the students towards a sustainable and electric mobility*".

Likewise, the e-go ambassador identifies the great research interest among PhD students of Roma Tre University as the foremost motivator, as it can be understood from the following interview extract: "*I think that the passion of a number of students has pushed to create a service that could be useful to all the students…we are the only University that then allowed this type of service*". A collective motivation seems to emerge from this extract, as our interviewee clearly makes reference as a sense of membership to the Roma Tre University community, which might be boosted by the participation to the E-car sharing initiative. Here we can see in fact how being "the only University

that allowed this service" is advocated by the participant as a specific distinctiveness feature for a collective "Roma Tre" identity. Indeed, optimal distinctiveness has been identified within social identity theory as one of the main psychological basis for group identification: This is consistent with one of the major theoretical pillars if the ECHOES project, which is related to the individual-collective dimension of energy choices, and how the collective process could be implied in the sustainable transition in Europe.

In addition to that, the ambassador describes his/her own experience as a E-go user, recognizing as main motivator both a subjective interest and a willingness to adopt a more sustainable lifestyle in many life domains, including mobility, and a personal need to have a car available for daily travels: "*I am quite receptive to the topic of sustainability and so I combined two points that are favourable to me, my interest of the sustainability in general and of sustainable mobility even more, because for my personal needs…so it was a possible solution to my daily travels...*"

The interviewees also pointed out to some of the **hindering factors,** which can be identified by a lack of individuals' positive attitudes and commitments towards environmental sustainability, and by the presence of possible technical problems related to managing the electric vehicles' use.

From the point of view of the ambassador, and based on the experience of the promotional and informative activities that were part of his/her participation as a selected user of the E-go project, the refusal to go along with the adoption of an electric vehicle for everyday travels lies in a lack of environmental concern and positive attitude towards environmental and energy-related issues of the people facing the issues of environmental sustainability, which makes it difficult to abandon the mobility "*status quo*", represented by the traditional fuel motorized car transport, to shift toward a more innovative and less carbon-intensive mobility pattern, as can be seen from the two extract reported below:"..*there is scepticism among people who are used to having more than one car in the family and who are not interested in adopting a more sustainable lifestyle"*

Here, we can see that the lack of an active commitment towards environmental issues and the low interest for the adoption of more sustainable lifestyles might represent a strong barrier that prevents users from changing well established unstainable habits in their mobility choices, as also the following extract seem to suggest: *"Undergraduate students, however, declared they do not want to use an e-go car simply because they have a car".*

The project manager that was interviewed for this case study also raised the attention to another point that can be identified as hindering the adoption of sustainable mobility choices, as it represents a difficult challenge for the upscaling of these kind of initiative to the larger public, beyond the small group of our Roma Tre selected students. Our interviewee in fact expressed a complaint about the lack of young users' sensitivity highlighting the failure of an awareness-raising campaign that was not very effective and not completely supported by other companies, as it can be seen from the following extract: "*Unfortunately, we have not been good enough to pass this message to other organizations, or perhaps companies are not interested to marketing messages that are communicated by public institutions; maybe there is not yet enough trust in public administrations".*

The respondents also mentioned how further barriers lie in the technical problems related to the limited drive range of the electric car vehicles, which could indeed represent a problem in a wide metropolitan setting like the city of Rome, as can be seen from the following extract: "…*the electric car only to get a short drive* " (project manager's answer). Other technological barriers that were mentioned referred to charging infrastructures, number of vehicles available, wi-fi network failures in the parking areas of the university, limited circulation and car parking areas.

In addition to that, from the respondents' point of view, young consumers are particularly sensitive to the price of car sharing service. This factor affects significantly person's choice to use an electric car *"..if I decide to use a car sharing service instead of another one, the only aspect important for a student is related to the fee of the service*…" (project manager's answer). "*I know different car sharing services…for example one of the competitor of E-go car sharing has proposed the solution to create the custom rate… you enter your data and based on your age, gender or if you are student or not you can have your profile and your personal fee for payment..."* (Ambassador's answer).

The role of public authorities has been marginal and it is not possible to clearly identify it as either a barrier or a facilitator "*let's say that the facilitators and the barriers are more or less always the same actors*" for the reason that "*...we did not ask for funding to national Ministries or European projects or nothing else, and therefore we have always had approval from the authorities, because we did not ask anyone for money*".

In fact, the E-go car sharing has been a project promoted and carried out only with the University's staff strength and on a fruitful initial collaboration with the Italian electricity company ENEL. Indeed, without the active involvement and contribution of ENEL, according to the interviewees opinion, it would probably have been otherwise very difficult or very unlikely, if not impossible, to even start up the project, as one could argue from the following extract: "*In general, public authorities have not placed any impediment... just because rightly there was no kind of request for funding support to them ...*" (project manager's answer). This has meant that the common problems related to regulations and procedures were somehow limited and irrelevant to the development of this project, and this might be a positive point, but at the same time, it might suggest a strong reluctance from public authorities in Italy to actively engage in and support this kind of projects with substantial financial and organizational contributions.

Finally, the ambassador argues that the public authorities could also intervene to ensure greater safeguard of the service in terms of vehicles' safety and maintenance "*the Public Authority could help user ensuring better safety of the service and an enhanced availability, also in terms of efficiency and functionality of vehicles*".

4.3 Description of Case Study 2: an Italian leading company in the development of cohousing projects

NewCoh is one of the main Italian companies promoting real estate household dwelling projects in the national territory, in partnership with private and cooperative real estate operators. NewCoh's activity was born following a cooperation with Milan Polytechnic University, in order to understand social changes under way and to fulfil the new emerging housing needs, with a view to guarantee social innovation. The outcome of a complete research in the Italian and International sectors, including the elaboration of the ABITOMILANO survey-event in 2006 gave the green light to the Cohousing.it community, the first Italian community for those that live or want to live in collaborative dwelling units, with shared services. About 3.000 people subscribed to the community in a few months and since then the interest increased further and spread all over Italy. The first project, which was born following the desire to fulfil the housing needs that emerged from the community understanding, was the Urban Village Bovisa (Milano), the first cohousing project in Italy, inhabited since 2009.

In the context of this general national situation, the NewCoh company organized a wide range of professional commitments required to carry out co-housing projects, by founding a professional network, where the professional figures and partners engaged in the development process of co-housing projects can exchange skills and contribute, each according to their own peculiarities, in order to attain the common end of innovating the housing models. A feature that distinguishes NewCoh activity is that all projects grow "from the bottom up", that is from co-planning with people that decide to live in co-housing, thanks to the cooperation with the co-housing network community.

The main activity of the NewCoh company is to organize the supply, that is to locate urban areas that are suitable to implement co-housing settlements, well served and connected to the capital city. NewCoh offers thus a professional assistance to all the co-housing network community members that had already created a household dwelling group, consisting of at least 10 families that live or want to live in the same area. Among the services offered are the location of the building area or total volume, the town planning checks, the settlement of the relationship with the builders, the project management and the set up plans of the project, up to its final inspection and delivery.

NewCoh activity is based upon some guidelines that characterize all the co-housing projects:

- The recovery and restoration of degraded or disposed real estate assets;
- A careful assessment of the location of operations in terms of quantity and quality of services, of green areas, of road networks and transport systems available in the surrounding territory;

- A process strongly oriented to the overall sustainability of the project, in terms of environmental sustainability (buildings in the highest efficiency energy categories in order to limit energy consumption to the minimum necessary, or even produce energy in excess to the housing needs), social sustainability (a path aimed at generating spaces and services that would increase quality of life for all the residents) and economic sustainability (inspired by the good sharing practices, by energy conservation and by an extremely challenging value for money of the housing development investments).

Finally, the principle of participatory participation is the pillar on which the company's activity is based. A cohousing project can in fact only start with the prior participation of all the future residents, who organize themselves into a promoting group becoming at the same time recipients and promoters of the project itself, and which, by doing so, take an active role in all the decisions that concern their future life (private dwelling units, common spaces and services), as well as in the required investment to arrange for carrying out the development of the whole project.

4.3.1 Description of the representatives of the case study

We have interviewed two high level management representatives of the co-housing firm. The first representative (R1), after having accumulated experiences in international agencies and companies, approaches sociological matters having worked for three years in the Milan University. At the beginning of 2008, he started to be interested in co-housing issues, at first as a managerial resource and now as partner and administrator of the company, responsible for the marketing and communication areas. The second representative (R2) worked for leading companies in the real estate field, taking care of real estate development and finance. As an entrepreneur, he continued to be interested in the development of primary operations and since 2008 has founded a co-housing community network, managing it first as administrator, and currently as general manager responsible for the business model sector.

4.3.2 Main outcomes from the interview

As expressed in the following extract, the interest for staring a co-housing firm, that constitutes the initiative that we have decided to select as case study in this task, stems from a study conducted by one of the interviewees about ten years ago with the Milan Polytechnic University, which had the aim of bringing in the Italian territory some foreign experiences of social innovation and environmental impact innovations: "*we studied the realities that existed abroad, we understood those that we thought could be the elements to be corrected or to be proposed differently in Italy, because the Italian market has its peculiarities, and because we wanted a sustainable model*" (R1). Subsequently, "*we launched an online questionnaire, and we immediately gathered, within a few months, 3,500 families, or households that responded positively to the idea of a collaborative living, of sustainable living and we thought that this was enough to start and to propose the first project"* (R1).

During the interviews, the main **motivators** driving the NewCoh company's activities are immediately highlighted. The need to create a collaborative and sustainable community based on cooperation between people emerged as "founding principle" of the co-housing project, and a central motivator that lead people to choose a housing experience such as co-housing. Core values are identified by the community members, and through a participatory development process where these values are implemented in the community structure, as it is shown in the following extracts of the interviews to both the R1 and the R2: "*a community that had values [...] collaboration, sharing aimed at a better lifestyle, that respects the environment*" (R1); "*The desire to be part of building something together*" (R2).

The need to create a collaborative and sustainable community represents also a resource for the projects' planning phase. Both representatives emphasize the important role of people involvement in the design and planning process. Residents participate in the planning and design of the development of the community so that it directly responds to their needs "*in co-housing projects we make these participatory planning paths in which clearly we involve the future residents in the co-design of their spaces and their services. "[...]" The effort to co-design with people brings out the most intelligent solutions that no one would have thought, of great common sense if we want but also of great creativity and innovation* "(R1)

Moreover, a concern for the conservation of energy resources and reducing the environment impact of households activities is a value with a high priority for co-housing projects, as it emerges from the following extract: "*For us to be innovative, forerunners of innovations that meet energy sustainability, environmental sustainability is a fact [...] because we work this way*" (R2).

A cohousing project represents an environmentally and economically and environmentally sustainable housing form. The economic side also seems to have importance for the co-housers, because they save money when they buy the house, and also in the following phases, thanks to the sharing of choices, spaces and services with the rest of the community: "*The idea of making common choices, sharing spaces and services, and doing it in an intelligent way, certainly helps to save money, and to save in a conscious way. [...] choices that are close to the environment, which are sustainable and that also help to save* (R1)

The interviews also revealed the **hindering factors** of the projects. A first problematic factor is the waiting time of the Italian administrations: "*when you present a request you never know when they will answer you and because [...] we are now waiting four years because of administrative procedures*" (R1). What emerges from the interviews is that public administrations might not explicitly and directly hinder the co-housing projects; however, neither they explicitly commit themselves to actively and concretely facilitate and support the projects, thus ending up to act more as an obstacle rather than as a facilitator, as it could be argued by interpreting the following extract of interview: "*The public administration supports, in words, but then hinders at the moment when it should give evidence of having supported*" (R2).

Another example that is reported is the equating of cohousing to social housing, which on one hand encourages and facilitates cohousing projects, while on the other presents some critical issues, for example because they don't take into consideration the different target of the people to whom the projects are addressed, and all the values behind the co-housing, that is described as "*a collaborative way of life that has a whole series of ideals*" (R1).

The cohousing is aimed at "*a market that makes a free choice regardless of the economic capacity, the average market, and therefore what the city of Milan has done to facilitate co-housing in Milan, in reality, has not given any benefit and facilitation to us. Our philosophy is that the access to the cohousing projects should be given to those who have in mind the idea of a collaborative way of living, and do not just have the economic aspects has the only priority*". (R1)

From this point of view, the real support needed from public authorities could be even beyond the economic incentives, and rather be related to the simplifying of administrative procedures, as we can see from the following extracts: "*The public administration should rethink about how the procedures should be slender, fast, certain... so, certain times, certain answers, speed in giving the answers to then give effective follow-up to what has been thought* "(R1); "*The public administration should give answers to citizens, [...] with precise deadlines, with legislation that is somehow simplified. It must be certain."* (R2); "*The only thing that the administration must do is be available to dialogue*" (R2).

What both the interviewees propose as a solution to the barriers that they encounter when approaching the public administration is to streamline and simplify the procedures. Furthermore, a lack of clarity and dialogue is perceived by both, besides the waiting time for answers: Of course, economic incentive are also important, because a real benefit that emerged in an interview is that, in Milan, the common spaces and services are not considered chargeable, and this helped to not increase the costs for the participants too much. In this way "*one can realize the common part without having a great economic cost that risks becoming anti-economic in the purchase of one's own home*" (R1). An advantage, however that might not be present in other Italian cities.

4.4 General discussion and conclusion

Taken together, the results of the analyses conducted in both case studies considered in Italy show some interesting aspects, related to facilitating factors and motivators as well as to barriers for collective actions in the sustainable energy transition.

Among the main motivating factors there is certainly the strong environmental concern and the personal enthusiasm of individual initiators, as well as the desire for a substantial lifestyle change in the direction of sustainability. A second, but also important factor is related to the financial advantages that could be perceived by people deciding to take sustainable energy decisions in the case study considered. Social connectedness and group identity have also emerged as a third, very important, positive factor. People seem to benefit from the positive outcomes deriving from being engaged in a sustainable energy action, also because of the feeling of belonging to positively-valued group, and to a shared way of life and worldview.

Speaking about the barriers emerging from the case study analyses in Italy, a common point that that was identified in both the electric car-sharing initiative and in the co-housing project is related to the difficulty of the transition for upscaling the initiatives from an individual (or small group) action level to a more systematic collective level, which would likely result in a more systematic adoption of sustainable energy opportunities across larger strata of the population in the Italian society. The reasons for this difficulty are mainly related to bureaucratic barriers existing in the complex regulatory framework in Italy, both at the national and at the local governance level, which seems to potentially limit the individual willingness to undertake and implement more systematic actions in the domain of sustainable mobility or sustainable housing. A second critical aspect might be identified in an unstable system of incentive and fundings, which might make it very difficult to transform short-term demonstration projects and initiative into more long-term stable actions and opportunities for large scale adoption of innovative solutions in mobility, housing and smart technology development.

5 Norway

5.1 Background

The Norwegian context for the ongoing energy transition differs substantially from most other European countries. Total electricity production in 2015 was 145 TWh, 95.8% of which was hydroelectric power. Hence, electricity has historically been relatively cheap and abundant, resulting in what some have called a comfort oriented energy culture amongst Norwegian citizens (e.g. Aune 2007). Thermal power and wind generation represents 2.5% and 1.7% of production respectively (Throndsen et al 2017). The share of solar power in installed Norwegian power generation capacity was below 0.1% in 2016. Still, there was a remarkable increase in the grid connected solar power capacity that year relative to before. The Norwegian Solar Energy Society estimates that this growth continues into 2017 and 2018 (Wolfgang et al 2018).

Hence, the Norwegian electricity system is already close to 100% renewable, including energy for space heating. This means that to achieve its emission reductions as promised under the EU renewable energy directive and the Paris climate agreement, a key focus has been on the transport sector and on increasing the share of electric mobility. Norway is one of the frontrunners in this field, with ambitious policies for increasing the share of EVs. These policies have been successful to the degree that today, close to 50% of all new vehicles sold in Norway are electric (Ryghaug and Skjølsvold 2018).

This development has implications for transport and mobility, and has been a significant element in the re-configuration of what we can call the Norwegian mobility culture (see Øsbye 2004; Ryghaug and Toftaker 2016). However, the development also has significant potential implications for local electricity distribution grids. On the one hand, recent studies indicate that amongst some groups of Norwegians there is a strong link between electric vehicle ownership and the desire to become a prosumer, because many find the independence of being able to fuel their vehicles with "their own" electricity appealing (Ryghaug, Skjølsvold and Heidenreich 2018; Winther, Westskog and Sæle 2018). This might also be part of a broader social and cultural shift, in which some Norwegians construct new lifestyles anchored in combinations of new 'green' technologies, or what some have called an engineering oriented habitus (Throndsen et al 2017), where interest in and enthusiasm for new technology serves as a basis for new modes of energy transition participation (see also Ryghaug, Skjølsvold and Heidenreich 2018). Hence, energy choices within the realm of electro mobility and electricity production are related, in the sense the acquisition of these technologies are often coupled. More concretely, the charging of electric vehicles is a power intensive activity with consequences for the grid. Hence, while there is a need to roll out new charging infrastructure to advance the electro mobility transition further, there is also a significant need for collective coordination of charging to help alleviate constraints on weak electricity grids and avoid local grid collapse. In this ECHOES case study we will focus on two local community initiatives which seek to expand on EV charging infrastructure, through implementing (smart) charging in cooperative housing. In terms of ECHOES technology focus, this means that we illuminate the intersection of electric mobility and buildings. We also cover smart technologies, because a key energy choice in our cases is if one should implement smart charging or not. Our case also points to the complexity of choice-making with respect to electro mobility, as it introduces the question of when and how to charge the vehicle as a key choice with respect to balancing supply and demand of electricity in the grid, and through this advancing the conditions for a broader energy transition.

The Norwegian electric vehicle transition

There has been a strong political drive to reduce greenhouse gas emissions from the Norwegian transport sector. On the one hand, this has been visible in a comprehensive package of national and local incentives. Some of these incentives have been economic, while others have been of a more practical character. As an example, EVs have been allowed to drive in bus lanes. Further, the electro mobility transition has been promoted through the establishment of a state-owned enterprise called Transnova[1], which provides financial support for charging facilities. Scholars have pointed to these developments as key to understanding the rapidly expanding Norwegian

[1] Transnova recently merged with Enova, the public company with the prime responsibility of promoting the energy transition more broadly.

EV sales over the last years (Figenbaum and Kolbeinstvedt, 2013; Ryghaug and Toftaker, 2014). Concrete examples of incentives to promote EVs in Norway include exemptions from sales tax, vehicle registration, and value-added tax (VAT). Furthermore, electric cars are exempt from road tolls and tunnel-use charges, they are often granted reduced fares on ferries, they can use bus lanes, benefit from public parking (sometimes with free charging), and access to a dispersed network of charging stations throughout the country.

The results of this package on the prices of EVs have been substantial. Electric cars in Norway are typically priced in the same range as a gas-driven car in the same class (i.e., the electric version of a VW Golf costs roughly the same as its petrol counterpart, benefitting from tax reductions, in the range of €7,000 to €8,000). Further, EV operational costs are quite low, due to effective engines fuelled by cheap hydroelectric hydropower. The total savings of driving EVs depends on many factors (e.g. driving style, use of toll roads and ferries), but the fuel costs (electricity) are about one-fourth to one-fifth of the cost for petrol. For instance, driving a Nissan Leaf, with an annual mileage of 15,000 km, costs about €2,800 less annually than a comparable gas-driven car (see Ryghaug and Skjølsvold 2018).

In sum, this appears to be a solid package to stimulate EV demand, which is echoed in the Norwegian EV association (2018a) annual statistical overview over the market share of EVs in Norway. The recent version shows an estimated 26 % total market share for electric vehicles in 2018. They expect 45% of all new vehicles sold to be battery electric at the end of 2018 (EV association 2018b).

The EV transition and the emergence of new energy choices

In Norwegian urban areas, a large share of apartment buildings and neighborhoods (and in some instances also stand-alone houses) are organized as co-ownerships[2] or as housing cooperatives[3]. This is an actor group which significantly shapes many Norwegian energy choices. As a group of 'middle actors' (Parag and Janda 2014) working at the intersection of individual tenants, local authorities and national legislation, such cooperatives are an important, but neglected actor group in the scholarly literature on energy transitions. Housing cooperatives are organizations or companies that are owned by those who live in the cooperative. Co-ownerships are usually not a commercial company, but an association of owners. Such housing organizations are typically managed in similar ways, through an elected board of representatives, elected by the dwellers. Thus, these entities are formal social organizations and they need to act in accordance with the country's housing laws, as well as what is typically a set of local regulations produced by the association or the housing cooperative.

In discussions about the Norwegian EV transition, a key difference between co-ownership and housing cooperatives has been the mandate of the elected board. In cooperative housing, this board has until recently been able to refuse the implementation of EV vehicle charging, through making the case that EV chargers increases the risk of fires. Several news stories have emerged over the last years, about conflicts between individual dwellers who own an EV and the housing cooperative they live in.

Recently, however, co-ownership (and soon housing cooperatives also) have become subjects to a new act on ownership sections § 25. (LOV-2018.06-22-74), which form 1st January 2018 states:

> *"A section owner may, with the consent of the board, provide charging points for electric cars and rechargeable hybrids in connection with a parking space available to the section or elsewhere indicated by the board. The board can only refuse to consent if there is a reasonable objection»*

The new law is good news for prospective EV buyers, and can be considered yet another addition to Norway's EV policy package, specifically targeting a very common Norwegian form of local communities. In practice, the legislation gives the communities of flat owners the right to decide which charging possibilities the EV owners will have, while making it more difficult to refuse installation. However, deciding on how to organize EV charging infrastructure roll-outs, which technologies to choose and how to coordinate vehicle charging is up to the individual

[2] Norwegian term: «sameie»
[3] Norwegian term: «borettslag»

cooperatives, housing units and their elected boards. This means that understanding the practices and strategies of such boards are an important part of the puzzle to understand the Norwegian EV transition.

In this case study we examine two examples of how processes of EV charging implementation in such a setting unfold. We explore the relationship between individual electric vehicle owners in need of EV chargers, and housing cooperatives and shared ownership. Thus, we explore the movement from individual to group action, and the relationship between groups of individuals and such very local bodies of formal social organization. An important point here is that the influx of EVs are producing substantial local power grid capacity challenges, resulting from escalating peak loads associated with EVs.

With the goal of instigating more flexible consumption, and thereby alleviating peak load issues, Norway will roll out so-called smart electricity meters in all households before the end of 2019 (see Skjølsvold 2014 for an analysis of the rationale behind the policy). Smart meters will enable power tariffs, which makes peak hour electricity consumption expensive. This is potentially of special importance to actors such as co-ownerships and housing cooperatives, who typically also share expenses for electricity amongst tenants (Johannssen, 2018). In Norwegian areas with a weak distribution grid (e.g. in the island Hvaler), peak hour EV charging is already creating challenges for transformers and cables. Thus, while EVs are generally quite energy efficient compared to other vehicles, (Skotland, Eggum, & Spilde, 2016), the challenge of coordinating charging is a new type of individual and collective energy choice.

The challenge is increasingly recognized by key actors in the Norwegian energy and mobility regime. The Norwegian Automobile Association (NAF) gives advice to boards of housing co-ownership and cooperative boards, urging them to use their potential agency as governance actors, and implement long-term solutions. In the eyes of NAF, all such actors should implement smart charging with load management features (Johannessen, 2018). The goal is to avoid transformer substation problems without having to invest heavily in additional production and distribution capacity (Valle, 2016).

Other relevant policy mechanisms

Transnova (now Enova) has been a key actor in advancing the Norwegian EV transition. Enova is a state enterprise funded through the ministry of petroleum and energy. ENOVA aims to reduce greenhouse gas emissions, accelerating innovation in energy and climate technology, and to boost Norwegian security of energy supply through promoting flexible and efficient power and energy use (Enova.no). ENOVA describes their own role as being to remove transition barriers through financial and practical support for private households, public and commercial actors.

Municipalities can apply to Enova for financing fast charging stations. In some instances, local municipalities will provide financial support. This is the case in the host municipality of our cases, Trondheim municipality. Here, housing co-ownerships and cooperatives can apply for grants to install charging infrastructure. This support can be up to 20 % of total cost, but maximum 100 000 Norwegian kroner, i.e. approximately 10 000 € (Trondheim municipality, 2018). Such grants are provided to stimulate boards to choose load management and smart charging solutions.

Research Methods

We have used an exploratory research design, where EV charging in shared garage facilities have been the object for research. Our first case study began with an initial interest to study how a small car sharing company (Stakeholder C) worked with neighbourhoods and housing cooperatives to introduce EVs into their car sharing services, which sometimes make use of shared garage facilities. Through this initial exploration we became more interested in the role of the boards of housing cooperatives in general, and the relationship between these boards and the individual tenants. We conducted in-depth interviews with one selected chairman in a co-ownership (stakeholder B) and one in a housing cooperative (Stakeholder A). In the latter case we also interviewed the technical management from an umbrella organization of housing co-operatives (Stakeholder D). This organization builds housing cooperatives and provides managerial assistance if needed.

Case two is a standalone housing cooperative in Norway (hence, it is not part of a broader organization of co-operatives). This housing cooperative has an elected board of share owners, as well as a professionally employed technical management group. We have interviewed the manager of the professional group (Stakeholder E), the technical management (stakeholder F) and the elected board management (stakeholder G). We have also interviewed 3 EV owners in this housing cooperative and 2 tenants who were planning to buy EVs, but who have postponed the plans because they lacked sufficient charging stations. Further, we have conducted participant observation (Tjora, 2017) of the annual general meeting of the housing cooperative.

5.2 Description of Case study 1: Installation of EV charging in housing cooperatives and car sharing

Our first case is a residential area with 198 apartments. These apartments are located in four different and neighbouring apartment buildings (organized as one housing cooperative and three co-ownerships). These buildings share an underground garage, located beneath the four blocks. In this garage, a local car sharing initiative have four dedicated parking places. One of these is an EV. The parking spaces for the car sharing initiative have been reserved by the building developers from early in the planning process. In part, this was done to comply with the municipality`s regulatory plan. In 2004 when the apartments were built, this area followed parking requirements stating that 1,5 parking spaces for units larger than 40 m^2, and 0,6 parking spaces for units under 40m^2 were required. In the same regulation (455, 2004) it is highlighted that building developers can depart from this norm: «*By documenting the establishment of car sharing with a minimum participation of 25% of the apartments, reduced parking coverage can be considered».* In other words, if a building developer have parking lots with car sharing, they can build fewer parking spaces, reducing construction costs and space needs. In the case we study here, every apartment has one parking lot, in addition to 20 spaces for guests and the four parking lots reserved for car sharing service. One of these four cars is regulated by contract to be an EV.

The image below depicts the basement floor plan of the garage for our case study. The green line illustrates the outline of each different block of flats. The area labelled “54” is organized as a housing cooperative with 54 apartment. The areas labelled “53”, “49” and “49” are three different co-ownerships. In other words, this shared garage is governed by four different elected boards, they have four main electricity metering points, but they share the guest parking (marked blue, 20), the car sharing (marked red, 4), as well as the entrance and exit. This social and organizational complexity within a small space is illustrative of the challenges for local transition governance. We study the process of implementing an EV charging infrastructure in the garage.

Figure 2: Schematic drawing of four underground garages. The two contrasted in the current analysis are number “54” and “53”.

5.2.1 Description of the representatives of the case study

In this case study we have interviewed the following stakeholders:

- Stakeholder A: High level representative of the housing cooperative with 54 flats, and 54 parking lots. This representative had been searching for information about different possibilities with regards to charging units. He was aware of the problem of the capacity of the grid that was likely to arise if each apartment owner requested to install individual EV charging. He had contacted an electrical engineer to suggest solutions for the part of the garage that he and his board manages. The outcome was the establishment of a shared infrastructure for 15 spaces with smart charging.
- Stakeholder B: High level representative of the neighbouring Co-ownership with 53 flats, and 53 parking lots. This representative did see his own limits in this field and made one member of his board that was an electrician responsible for finding the best possible solution to meet the challenge of how to deal with EV chargers. The chosen solution was to restrict the charging station to 16 Ampere per unit, and to leave decisions about investments to individuals. Individuals would also need to invest in metering infrastructure, which would be connected to the electrical system of their own apartments. Apart from that, it was up to the apartment owner to decide which charging solutions they wanted. Thus, a key aspect of this case study is that in garage "54" collective action was enabled, while this type of energy choice remained an individual responsibility in number "53". The implementation of large shares of electric vehicles creates conditions that require some collective action or coordination to avoid collapse. A key question then, is how this move from individual to group is achieved.
- Stakeholder C: Representative of a local car sharing initiative. The initiative was started in 1996 by students on the computer science education at National technical university (NTH, which later became what is today NTNU). These students produced a software program to manage the car sharing. The car sharing system had existed for about 20 years, but he noted that it was only the last ten years it was starting to grow in popularity. The implementation of some electric vehicles in the service is also a recent development.
- Stakeholder D: Technical representative of an umbrella organization of co-operative housing. This organization manages around 820 houses with a total of 32-33 000 apartments. The representative has both a consultative function for the co-ownerships and housing cooperatives and can carry out rehabilitation and upgrading of the buildings. The role often has the goal of helping elected boards make what they consider the best choices based on their expertise in rehabilitation projects, technical solutions etc.

5.2.2 Main outcomes from the interviews

This shared garage is organized in four units where we have interviewed two of four board leaders. Garage "54" had installed smart charging, which we consider an important energy choice for advancing the EV transition further. The leader of the board in "54" stressed that the board had the authority to decide that people living in the building had to change parking's lots when they installed smart charges. Therefore, resident's with EVs were allocated parking lots in the descent of the garage (in case of fire), and next to each other.

This re-organization of parking spaces meant that the board had the possibility to connect the EVs to a smart charging system, which means that charging can be automatically scheduled to avoid peak load problems. The board of the housing cooperative had the right to manage the parking spaces and make the residents change places. Hence, our case here illustrates the importance of the relationship between the board leader and the other occupants. In this case the board leader interpreted his right to act on their collective behalf as self-evident, but in reality, this is not always the case. Some occupants objected to having to change their parking space. As the board leader noted:

> "[you need to] *Just take control of it and do it. Put management prerogative on those places. There were some who protested. There were some of our association rules that were a little incomplete. Not unclear, but incomplete. So we at the last* ***general assembly we put in some extra*** *sentences, which states that the board has the right to control parking. You may have someone that needs a handicap space. And some have electric car needs, and then we only make some internal rearranging. Someone claiming that*

they are unable to park in the new spots, but that is just nonsense. They need to learn to drive" (Stakeholder A)."

The possibility of changing parking lots gave the board of the housing cooperative leeway to organize an infrastructure for the charging stations. An infrastructure that is easiest to set up when EV parking spaces are spatially located next to each other. Where residents who want to connect an EV on this infrastructure need to swap places to get a parking lot with the infrastructure for charging. The EV owner pays for the individual charging unit and a monthly fee of 520 NOK (Roughly 45€) that covers the electrical expenses for charging and rent for the parking space. They now have infrastructure for charging about 15 EVs, and at the moment six of these are in use:

"We asked around a little bit. And after that we decided that we do not need a general meeting resolution [to do this]. We will do this within the sum that the board can use without a general meeting. And we thought it was within what the board could do with the building. In terms of the building structure, nothing changes, just some wires (…) [The residents were] Not manipulated, but we ruled that way. For my part, I think this is so important, you have to keep up with the future by […] organizing it. Because you cannot have ***anarchy out there*** *(Stakeholder A)."*

Stakeholder A imagined a future where EVs were the dominant cars for everyone and was of the opinion that the housing cooperative needed to adapt to that. The board of the housing cooperative have leeway to decide based on the costs. Installing EV charging infrastructure is within that amount, but the board can decide to bring the issue to a general tenants meeting to make sure they have 2/3 of the resident's support. The technical manager of the umbrella organization (stakeholder D) had worked with many different elected boards. Through this he had identified a multitude of governance strategies, each with their strengths and weaknesses. In instances where the board brought the decision to general meetings of tenants for taking a decision up on general meeting they can risk that the residents are voting the proposal down. They need to have a good process to get proposal that cost money through, or they could just decide it like stakeholder A did.

The apartments in number "53" were organized as a co-ownership. The board of this co-ownership also managed the garage parking spaces. They, however, did not see how they could decide that the individual residents needed to change parking spaces. The reason was that in this form of ownership, individual parking spaces belonged to specific apartments. The board leader reflected:

"But it's much easier to force people to do things (...) So my understanding is that it is much easier to force people to change parking in a housing cooperative than in a co-ownership. (Stakeholder B)"

"Now for us, you get a parking space when you buy the apartment. So it's yours, so nobody can force you to move the car to another, possibly worse parking space (Stakeholder B)"

Thus, while the technological challenge is the same, this case illustrates how social and organizational issues at a very local level, as well as the personal engagement and interest of board leadership affects the possibility of installing shared smart charging solutions. Number "54" decided on a collective smart charging, whereas the neighboring co-ownership has decided on an individual solution where each flat owner decides what charging system to install. These will be individually metered and billed with the electricity from individual apartments. Hence, responsibility for coordination of charging is left with individuals.

The result is a situation where the board has made calculations stating that all tenants can install a 16 ampere charging system without exhausting the grid capacity. However, recent developments create new problems. One of the flat owners with a space in this garage, had recently decided on purchasing a Tesla. This car needs a 25 ampere charger, and without coordination further vehicles and chargers of this type will be problematic. In extension to this, the chairman (stakeholder B) reflected:

"We have 52 apartments in my community. But if all 52 come with a Tesla that is going to be heavy, the powerline *will not tolerate it… That's what he found out through my electrician. (Stakeholder B)"*

Stakeholder B has become aware of the capacity problem and acknowledges that because of this they need to coordinate charging to limit power outtake. Stakeholder A highlighted that this is a potentially critical situation for many housing cooperatives, and that the choices made now are critical for the future:

> *"There has been chaos in all these housing companies with respect to EV chargers. And other boards has allowed the individual owners to build charging stations in their own spaces. And thus, there will be a wireline of another world. By connecting your own charger and all that. Giant problems and great warnings from our electrician who says no-no! Here, we can get capacity problems. (Stakeholder A)"*

Hence, our case here also illustrates key links between different types of energy choices. On the one hand, the individual dweller has arguably made a green energy choice by purchasing a Tesla rather than a diesel fuelled SUV. On the other hand, the effectiveness of this individual choice depends on a more collective choice on charging infrastructure implementation in the long run. The individual acquisition of this vehicle also served as a material re-configuration of the very local energy culture of this garage and apartment, forcing the board members to 'read up' and learn more about different systems for handling electric vehicles in shared garages. Hence, the EV-transition is not only a mobility transition in this case, but it is a transition which renders the electricity grid actionable in new ways, opening for new energy choices by collectives at the intersection of being individuals and formal social groups. Individuals are important here, but so are the managers of housing boards, electricians and other actors.

5.3 Description of Case Study 2: A large housing cooperative process for installing smart electric vehicle charging points.

Our second case study focuses on an independent housing cooperatives in Norway.. It was established at the beginning of the '70s. It consists of 1113 housing units with different types of apartments in different kinds of buildings. This housing cooperative is organized with one board elected by the dwellers. In addition to that they have more than 10 employees who are responsible for daily operation and maintenance.

The housing cooperative has 55 EV charging points today, but they have a growing waiting list of 60 dwellers that will purchase an EV once charging facilities become better. This demand for new EV chargers was instrumental to increasing the awareness of the technical employees of the housing cooperative, who now realized that the local grid infrastructure could not handle more EVs. Thus, this is another instance of the problem discussed in our first case: individuals are making green purchasing choices, but to avoid grid collapse the coordination of action by groups of individuals is necessary. In this case, the dynamics of the unfolding situation is clearly bottom-up as the push for chargers comes from dwellers or groups of dwellers.

On their annual general meeting in spring 2018, the meeting gave its consent to the establishment of infrastructure for charging of electric cars in the housing cooperatives shared garages. The cost will be roughly 4 mill NOK or 400 000 € (minutes from annual meeting, 2018). These funds will be spent on new and smart infrastructure for about 764 new charging points for EVs that will be spread out into 24 shared garages and constructed over the next three years.

In the same general meeting, one of the resident proposed a resolution suggesting that each dwelling unit should be able to charge their EVs through cables from their own apartments. Again, this proposal illustrates the problematic dynamics of the relationship between individual choice and collective good (in this case: a functioning grid) (see Wolsink 2018 for a discussion of common pool resource dynamics in electricity grids). This suggestion was important, however, because it forced the board to engage publicly with matters relating to grid capacity, and the need for a more collective solution with smart charging. Hence, this case illustrates the dynamics between individual dwellers who make green energy choices by purchasing EVs, and how they enter into a group dynamic of charging infrastructure development, and in this case a publicly enacted democratic process.

5.3.1 Description of the representatives of the case study

Stakeholder E: Representative of the the housing cooperative management, with a legal education background. This role is employed and hired by the elected leader.

Stakeholder F: Technical representative, with a construction engineering studies and administration education background, and professional experience of managing housing cooperatives. This person was aware of and interested in alleviating peak load problems in the cooperative. The cooperative has an energy load management tool which could later support the charging system.

Stakeholder G: An elected leader of the board. This person is a bookkeeper and has been elected in the board management for more than 10 years.

Stakeholders EV1, EV2, EV3: Dwellers who live in the housing cooperative who own an EV.

Stakeholders EV4, EV5: Dwellers who live in the cooperative who are planning to buy an EV but have postponed the decision due to the lack of charging infrastructure in the garages.

5.3.2 Main outcomes from the interview

This housing cooperative has been working on facilitating electric car implementation for several years, since the first request from dwellers to charge a vehicle arose. In their mandate, the board had the opportunity to make the decision to install new infrastructure without consent of the general meeting. However, the board believed that in order to preserve the best possible peace in the housing cooperative, and to make a legitimate decision, they needed to make the decision collectively though a vote amongst all dwellers. The administrative and technical representatives had prepared a proposal in detail before presenting it at the meeting.

Representatives from a local electricity provider and district system operator, and a representative from a company delivering energy efficient building management systems were present and presented the solutions they recommended. They also answered questions from dwellers at the meeting. The answers were elaborative and detailed. The electricity provider explained the peak load problems associated with electric vehicles charging, and the need for a smart charging solution to coordinate charging.

Stakeholder F was pointing out that the smart charging system was compatible with an existing system of energy monitoring which today focused on district heating, but which in the future could be used to calculate individual power consumption from EV charging points. This system would give the technical management the possibility to adjust the local grid power consumption during peak hours:

> *"Then you get a peak there. And throughout the year. And therefore, this system we can really decide when to charge. In some housing cooperatives, there is a maximum peak load, that you cannot surpass. So, if everyone charges at the same time, they will not get more out of the system than we actually decide. And that keeps the total power cost down (Stakeholder F)"*

Providing relevant information and knowledge about the electricity system and the effects of charging was important for the outcome. Arguments were also made concerning the cost of not having a smart charging system. The board had further worked to enroll the 60 dwellers who were already waiting for new charging points through writing a letter to them, urging them to vote for their solution.

> *"Because we sent letters to everyone on our EV charging point waiting list and requested that they too came to the general meeting. I sent an e-mail. They knew that this was one of the voting propositions (Stakeholder E)."*

Hence, the proposal had many advocates amongst the tenants. Many of those who were present at the annual meeting stood up to speak and argue for the proposed smart charging solution. Some also asked why implementation would have to take three years and not only one. The dwellers, the board of the housing cooperative and their employees were driving this process forward together. The involvement of the residents is on one hand important to preserve the democracy in the cooperative. On the other hand, it might complicate implementation, because the board needed two-thirds majority to win. The solution to the EV charging demand was to implement one infrastructure that was accessible from all indoor parking lots. Thus, the housing cooperative did not need to force anyone to change parking spaces, or to reserve a special area for electric vehicles.

Interviewer: "Regarding parking spaces. Can they be swapped between dwellers?"
Stakeholder F: "No. We cannot. Because there is someone who has a better parking space than others, and who can just easily drive in. Others have the narrow space in the corner. He would love to change, but he who drives straight into his parking lot will not change. So, it's not easy to swap parking spaces. By pulling the cable around the whole building every parking space gets the possibility to link up [to the smart charging system]."

In some instances, the need to re-arrange parking spaces, as seen in our first case, is a key challenge to the implementation of smart EV charging because it challenges ownership and established practice. In this case, the solution was organized in a way that made the infrastructure available to everyone with a parking space. Further, the stakeholders in this case also saw the infrastructure for charging points as an investment that could raise the value of the housing cooperative and area:

"You even have charging points in your parking space. There is no doubt that the tenants will get their money back when they sell their apartment. There is no doubt about that. (Stakeholder F)"

Thus, the stakeholders believe that the investment in the infrastructure will raise the value of the residences, but also make it easier for the inhabitants to choose an EV as their next car.

"Demand for charging will increase. When the infrastructure is in place. Imagine that you live in the housing cooperative and have infrastructure on the wall. And you need to change a car. I think that most people will then considering electric cars. (Stakeholder F)"

Both the hired and the elected manger were pointing out that the younger residents were engaged in the environment and that they will want to choose environmentally oriented energy solutions. Stakeholder G, the elected manger highlighted that their strategy was to be an innovation and future-oriented housing cooperative.

"We have had a target and strategy plan that says that we will […] be a leader, a leading housing company (Stakeholder G)"

Hence, implementing EV charging infrastructure is also considered part of a 'choice infrastructure', where material elements help individuals make green decision. Hence, this case illustrates how energy choices are a co-produced phenomenon (Jasanoff 2004). Grass-roots push for charging points based on EV demand has produced a new sensitivity to grid issues, and a smart charging infrastructure initiative by the technical leaders is hoped to increase this EV demand further. Some voices promoted alternative solutions for the future capacity problem of the grid, namely to expand electricity production and grid transmission capacity:

"*No, we need more power then, produce more power and build the network* (EV4)."

Hence, there are different narratives amongst the dwellers concerning what the capacity problem is, and how it can be solved. Another tenant who was considering to acquire an EV, an engineer, reflected in the following way:

"The smart system is, nevertheless, best suited, […] the best solution for this co housing. You must minimize the cost of the community (EV1)."

Thus, there were two opposing views: expanding the grid vs. installing a smart charging system. Both choices would arguably help enable green choices in the future, but the cheaper and more effective choice of implementing smart charging would require collective coordination.

5.4 General discussion and conclusion

Buying an EV is an individual decision. In Norway this choice is stimulated through a solid package of **economic incentives.** The annual fee is about ¾ cheaper than for fossil fuel cars, EVs can drive for free through toll rings. Many places they can park for free. Hydroelectric electricity is much cheaper than petrol. When buying an EV you

do not pay the value added tax that is 25 % or the import duty that is high in Norway. Hence, EVs have become attractive, and are quickly taking market shares from fossil fuelled cars. This results in increasing numbers of EVs, and a related demand for a solid infrastructure of charging. The increase in charging creates a need for coordination to help alleviate constraint on weak electricity grids. Through our case studies, we focused on the relationship between individuals pushing for charging infrastructure, and the boards who manage cooperative housing. Through this exercise, we have seen how different local solutions might emerge, illustrating the importance of these processes in advancing further the Norwegian EV transition.

Our discussions illustrate that the EV transition creates a series of new public issues at the intersection of mobility, electricity and everyday practice, fuelled by the introduction of a set of new material elements. Hence, one way to conceptualize this, is through the notion of local material politics (e.g. Marres and Lezaun 2011). Our case studies illustrate that one potential outcome of the EV transition is that new actor groups, such as boards of housing cooperatives become sensitized to issues that have previously been the domain of highly specialist expert groups such as electricians. Hence, we see the emergence of a new kind of **grid sensitivity** amongst new groups. This sensitivity, however, seems relationally co-produced, which means that it is not an inevitable outcome of introducing new technology. As we have seen, management boards can remain disinterested in grid issues, and the result might be what some described as regulatory anarchy, with subsequent escalating problems of peak load charging. Hence, the EV transition in the end makes the grid much more an acute issue to be dealt with by managing boards (Valle, 2017). Local strategies and pathways for dealing with this will be key over the coming years.

When the managing boards become **sensitized and aware** of the power and capacity issues related to EV charging, smart charging is increasingly seen as a solution to meet the escalating charging demand of EV owners. Hence, the mediate coordination through the implementation of a technology, which increases the chance of avoiding problems.

Board leaders and members **knowledge** about the electricity grid and possible peak load problems associated with charging is essential as the Norwegian EV-transition becomes wider, deeper and more fully integrated in society. Knowledge, however, must be coupled with strategies of translation and enrollment, which makes this knowledge tangible and actionable also for tenants and individual citizens. Further, being a board member is typically a voluntary assignment that is done in addition to a regular job and family life, which means that producing the level of knowledge needed should be considered a collective responsibility. In practice, this means that other actors such as grid operators, municipalities, and R&D actors and electricity producers should work strategically to enable and empower this group of actors, because of their potential centrality in local transition activities.

Finally, the **push from citizens** who purchase EVs and demand charging is key to this unfolding development of EV charging infrastructure roll out in Norway. Our case studies illustrate that this is not simply a passive group who responds to policies and market signals. Rather, they can serve as a key actor group, both in terms of advocating and pushing for new solutions. Hence, our cases also illustrates the potential of neighbourhoods and collective housing as sites of democratic participation and deliberation around energy transition activities (see e.g. Chilver, Pallett and Hargreaves 2018). Strategies of inclusion and deliberation here can be learned from and in other kinds of cases.

6 Austria

6.1 Background

For Austria, the enabling factors especially for the cases of e-mobility (e-car sharing) and co-housing activities were surveyed and analysed. The two areas will be described in two different sub-chapters, as the national framework and state-of-the-art conditions vary a lot.

First of all, it has to be said that (non-institutionalized) collectives as beneficiaries are very seldom and a niche, at least in Austria. They have a strong ideological background and approach and their approach is also a question of local culture. In most cases, a corporate body is mandatory to be eligible to apply for funding.

Enabling factors are in most cases, no matter if in co-housing or e-car sharing initiatives, funding but also consulting services. In general, there are mainly two different levels in Austria where funding or consulting services can be applied for: i) the national and ii) the regional (province) level. The local level is negligible for this kind of initiatives.

Car sharing initiatives

On the **regional level**, there is funding available for communities, associations/clubs and companies and it is therefore the most important level in Austria. For the province of Styria, Austria, where the two case studies in e-car sharing are located, the federal government offers special funding for stakeholders to support joint mobility solutions, especially on implementing e-car sharing solutions that are designed for a time span of more than three years. Funding includes the provision of the necessary infrastructure (e.g. charging stations, booking platforms, support-hotlines) as well as the purchase of e-cars for sharing initiatives. New purchases can be purely electrically powered passenger cars or utility vehicles, which are then provided to e-car sharing pools. Eligible for funding are the "whole package for leasing or renting" as well as individual solutions for certain products or parts of e-car sharing. So far, 23 out of 33 submitted project ideas have been funded, with 53 communities and 18 companies participating and 20 internet-based booking platforms, 92 e-cars and 114 publicly accessible charging stations. More information can be found at: www.ich-tus.steiermark.at.

All these actions are supported by a strategy on e-mobility of the province of Styria ("Landesstrategie Elektromobilität" provincial e-mobility strategy Styria 2030) that is based on the Climate and Energy Strategy 2030 which was adopted in January 2018. The related action plan will be adopted in 2019. In order to achieve the Province of Styria's targets regarding the reduction of greenhouse gas emissions there is a direct need for action in the mobility sector (http://www.ich-tus.steiermark.at/cms/dokumente/12530160_72442079/d519b59b/FAEW-Elektromobilit%C3%A4tsstrategie_4C.pdf).

A certain support might be the good example that is set by the public authority in this province: in all departments of the province, fossil powered vehicles are step-by-step replaced by e-cars and in parallel, the necessary infrastructure is being established at as many departments as possible. Regulatory framework is given on the basis of the Styrian building law, which is especially fostering the build-up (or subsequent addition) of e-charging stations in all new buildings and in publicly accessible parking facilities. For infrastructure measures, it is planned to especially support feasible target groups (e.g. young people, communities, taxis, driving school, commuters). In addition to that, e-mobility offers should be available with all public transport interfaces. Awareness raising and interconnectedness is done through the platform „Ich tu´s", an initiative of the province of Styria for energy and climate protection, to give a positive image to e-mobility among citizens, in companies and to multiplicators in general. Knowledge and competences of actors are strengthened and shared learning processes are enabled. Technology and market trends are recognized and adaptation measures can be identified and new project ideas generated.

But also in the other Austrian provinces, funding of all different kinds is available for municipalities: in one province funding is only provided if there funding is already approved on the national level. If so, up to 1.000€ will be granted for the purchase of e-cars and 800€ will be provided for e-charging infrastructure for municipalities and associations/clubs, in combination with the purchase of the car. In another province, consulting on the topic of being

"climate-friendly with car-sharing in cities, municipalities and regions" will be funded up to 20 hours with a refund of 50% of the costs.

A certain support is also available for individuals for private car sharing like nationwide platforms for connecting car-owners and car-users, e.g. www.carsharing247.com and www.carusocarsharing.com.

A consulting program for cities, municipalities and regions in all provinces in Austria is provided by https://www.klimaaktiv.at/. It is part of the priority program „klima:aktiv mobil für Klimaschutzmaßnahmen im Verkehrsbereich" (meaning "mobile for climate protection measures in mobility"), initiated by the Federal Ministry for Sustainability and Tourism with the aim to support as many cities, municipalities and regions as possible in their efforts of designing and implementing a mobility management to foster not only environmentally friendly e-cars, but also biking, walking and public transport. Another option for individual suppliers and users of e-car sharing can be found at: https://www.emobil-magazin.at/gemeinden/2810-so-geht-e-carsharing-in-den-bundeslaendern.

Some of the providers are associations/clubs, where membership is mandatory, but members get some hours as credit with their membership fee and the fee is normally lower. Some clubs offer a special option for people who drive seldom, they do not have to pay a membership fee but the hourly fee is then slightly higher.
Other funding opportunities are given as examples:

- ÖKOFONDS call for proposals for e-mobility, with over 20 applicants: http://www.energie.steiermark.at/cms/beitrag/12341652/124073768. There are some good case studies with different organizations/bodies responsible for the implementation (e.g. municipalities, energy agencies, regional management organizations). For collectives that are not institutionalized it is almost impossible to implement e.g. car-sharing.
- Modellregion e-mobility: http://www.energie.steiermark.at/cms/beitrag/11227233/50051671 - they have their own management.
- Energie Steiermark, as the fourth-biggest energy and service provider in Austria, is majority-owned by the province of Styria. They see themselves as dynamic innovators and promoters for e-mobility, providing different packages for all kinds of clients: https://www.e-steiermark.com/privat/.

From the side of the authorities, a lot of information is being provided on social media and at events (e.g. e-mobility play days at the Formula 1 in Spielberg). Information is provided for citizens, they can get more information on e-mobility, the different options, they get better tariffs to try out e-cars, etc. This is to get people interested in e-mobility and to lower the barrier of the new technology. The county of Styria has a big marketing platform http://www.ich-tus.steiermark.at/, where a lot of information is available for everyone.

On the **national level**, the promotion of e-mobility, especially e-car sharing is a central topic in the 91 climate and energy model regions. Every year, a funding program is issued by the climate and energy fund, together with the Federal Ministry for Sustainability and Tourism and the Austrian Ministry for Transport, Innovation and Technology: https://www.klimaaktiv.at/mobilitaet/carsharing.html.

In 2018, funding is provided for e-vehicles for communitites and associations/clubs up to 1.500€ if the car is fuelled with eco-fuels (https://www.klimaaktiv.at/foerderungen/kam_forderungen.html). Additional benefits or incentives on national level are:

- lower tax for electric or electric-hybrid vehicles
- no insurance tax (up to 864€ per year)
- lower or no parking fee in many cities

Building activities

On the one side there is the housing subsidy ("Wohnbauförderung") for housing associations and on the other side, there is funding for single-family houses, where there are several different funding schemes for different topics like

the exchange of old boilers. A third scheme is the individual funding, which is outside all other funding schemes. There, individuals or collectives can apply and the decision if something gets funded will be taken individually.
The basic underlying principle is always the building legislation ("Baurecht"): http://www.technik.steiermark.at/cms/dokumente/11549819_58813874/d043920c/2018-05-07%20Baugesetz%20verlinktrevneu.pdf, which also differs from province to province. This is the lowest level of compliance. The aim is to raise the motivation through financial incentives. This is possible to a certain level, from which on only marginal improvements can be reached. The province also wants to cap this funding at a certain level: it should be an instrument for initial funding, to foster new products or ideas and after a certain period be stopped (http://www.technik.steiermark.at/cms/ziel/58813874/DE/). The aim would be not to give only (an too many) financial incentives, but to create clear general requirements, which are clearly verifiable.

The authorities see consulting as an important leverage (see above, at trade fairs). They also try to be present at regional events to have direct contact to people all over the country.

1. Regional level

Also in the building sector, regional funding is the most important part. There are different funding schemes on the regional level, as an example, ÖKOFONDS is described briefly: ÖKOFONDS offers targeted funding for the increase of energy efficiency and an increase of the use of renewable energy in private, public and business areas, with focus on innovation and integrated approaches, also in the building sector: e.g. funding for photovoltaics on buildings for an increase in installation capacities. Positive incentives could be set and the lessons learned flow into the development of new funding schemes.

Hindering factors in the building sector:

- sometimes the funding is also hindering as the funding is too low but the requirements are too high (higher standards are requested as in the building law to get funding)
- global trends: if the prices for energy are very low the interest in renewable and alternative energy provision is rather low; if the prices are on the rise, the run to alternatives is increasing

2. National level

On the national level, for the sake of completeness, two funding schemes, resp. bodies are mentioned:

- KLIEN: https://www.klimafonds.gv.at/
- Klima:aktiv: https://www.klimaaktiv.at/

Austrian society and culture has often been described as being very conservative: if people have to exchange/renew a system and they had good experiences with the old one (e.g. oil heating) they will stick to the same technology. The few that are interested in changing the system are those who are in general more interested in ecological alternatives.

People rely a lot on information that is provided by the different companies who offer certain technologies. So authorities try to be present at different trade fairs and similar events to provide product independent information on energy and mobility topics.

On the other hand, people do not hesitate to apply for funding as far as the funding is not linked to the income. As for the energy consulting service, people have to allow experts to go into their homes and do a first check on site, which makes it more difficult for people to apply. The initial counselling is free (and also the energy consulting against energy poverty). The building check itself costs 150€ (see link: http://www.technik.steiermark.at/cms/dokumente/12475094_82233481/a6746891/EBS_Leistungsangebot%202018.pdf).

6.2 Description of Case study 1: 2 E-car Sharing initiatives in Graz, Austria

In this chapter, two different case studies dealing with e-car sharing in Graz, Austria are described.

6.2.1 Case study 1a: Description of the representatives of the case study

Case study 1a started in 2014, when it was time for one individual person to purchase a new car and driving a fossil-fuelled vehicle was out of question. Also the financing of e-cars was quite hard to manage (at least 30.000€ would have been necessary). So, the interviewee in this case study started to talk to some friends about sharing a car, and the interest was quite good, and so this individual person started to talk to even more and other people and a first plan was designed: how could that be done, as a company, as an association, a club? Enough people showed interested and the case study started. It was surprising how quickly it picked up speed. So the primary and central areas of activity were (and still are) based on car sharing with e-cars. The main activities are to get people used to this alternative form of mobility. Therefore, the main task of the organiser was to motivate as many people as possible.

Originally, crowdfunding was seen as an option but then other options became more attractive: an association was founded, the first phase of the project was entirely privately financed, the cars were always booked and the case devolved quickly. The aim was also to make the sharing model affordable for all people, also students, people with small income, etc.

6.2.2 Case study 1a: Main outcomes from the interview of the case study

A great promotion, which unfortunately has not been available for the last two years, was the "car sharing fleet promotion", which was supported by the federal government. This was attractive as one could get up to 6.000 Euro in funding for the purchase of a vehicle if one offered to enter it in a car sharing program. With this money, the interviewee initiated the project by himself, therefore it was possible to avoid extra costs. This money also gave the advantage that the start was relatively safe: he invested money, but at least knew that he would get it back. This was certainly a big incentive without which the project probably would not have been implemented in that form.

> *"We are also represented at events, of course. But, first and foremost, it is a matter of simply getting people used to this alternative form of mobility. How many people can (or, somehow, not yet) imagine using something like this. Because relatively frequently, in the countryside at least, we hear the statement: "Doesn't it bother you that someone else drives your car and that you can't leave your things in it?" But no, that's just something different. And this hasn't yet been fully understood by many. And that's why it's important to talk to people at events and, in general, to other people who don't have anything to do with it. Because they also have to see how it can work and that it works."*

Hindering factors were that the public decision-makers nevertheless prioritize central initiatives and have committed themselves to keeping it that way for the next few years.

One driver of the project definitely was to have the feeling to be able to provide something good to society, what can also contribute to a change in mobility habits, the initiator says. A certain "*out of the box thinking is necessary, to question one's own behaviour, one's own habits and routines from time to time*".

6.2.3 Case study 1b: Description of the representatives of the case study

The second case study started when one individual person, owner of a consulting office for energy and energy efficiency and European energy manager saw that many projects and studies were developed in the field of mobility for municipalities, cities and companies but failed because various parameters had not been met or the targets or expectations had been too high. However, he was convinced that things could be done differently and that was the

point when he decided that he would put up a project in electric car sharing by himself, also as he was convinced that if run properly, it would work.

He then developed a special mobility contracting for municipalities together with his wife. This means that municipalities can make use of mobility and pass it on to their citizens in the same way as with any other contracting (e.g. energy contracting). A municipality can use the “end product”, but the whole run-up, the back office, maintenance etc. is not its business. The municipalities tell the company what they would like to have, which and how many vehicles, and then the company takes care of all the rest and are the contact persons also for the users, the citizens. The municipalities simply claim the benefit and pay a monthly fee for this service and refinance themselves through user revenues or through sponsoring and subsidies, which are also reeled by the service provider. The vehicle can be branded with the community logo. The providers are at no time visible, everything is done in the background and the community can benefit from the project. As a support there is a company that does the Back-Office, including the booking platform. The service runs for 24 hours a day without manpower.

6.2.4 Case study 1b: Main outcomes from the interview of the case

The start of the project was with a community of 1.600 inhabitants. A big kick-off event was set up and folders sent to all 600 households, whereupon seven people came to the starting event. After three months they already had 20 members and after one year 40 or 50 members. In the first year 30,000 km were driven. At the beginning, there were a lot of fears, but the company gave presentations in 50 or 60 municipalities to eliminate these fears. The main problems (still) are two unknown fields: the first is e-mobility itself and the second is car sharing, something many people have never done before. And there are questions like what happens when someone cuts the cable at the charging station? They took the fears seriously and it worked out quite well.

With their concept of e-car sharing, they were not the first ones, there were associations and communities that bought electric cars themselves: the car is parked at the community office and one can get the key for the car there during opening hours and sign onto a list. But they also saw that it did not work well that way. This is simply not matching with the spirit of the times. A car-sharing service must be fast and work 24 hours a day, otherwise it is not appealing and will not be accepted. There were then attempts by various organizations to try a “key box system” and other approaches but these as well did not work.

The key issue is to pick up the user where he or she is at that certain moment: maybe someone who has never driven an electric car before and has never shared his car.

> *“I think you always have to put yourself in the user's shoes. That's the point. You can make up a lot of things, but I have to pick him (note: the user) up where he's standing.”*

And if he or she then has to compare all kinds of different tariffs with a mixture of kilometres and hours, and he or she has to pick up the key somewhere and bring it back, this will not be accepted by most people, because it could be too difficult and too inconvenient.

The providers in this case study never applied for any kind of funding for any of the electric vehicles, there are no grants, as they just never wanted that. They wanted to put their thoughts and ideas into practice, to show them to others and to learn that it works if you do it properly. A lot is planned in the corresponding energy departments of the municipalities and a lot of EU subsidies for e-mobility are used, a lot of paper is produced and at the end of the day things fail because they are simply unattractive and not tailored to the use. The key message is that everything has been attempted, but the citizen is not yet ready for such a sophisticated system. The providers in this case wanted to set a counterpoint to this by showing, that if it is done with heart and brain, things work out great. Personal conviction was a big topic and a big asset from the beginning.

On the positive side, there was a lot of good feedback that it works so well and that people are satisfied with the performance. There were very few de-registrations but only from people who moved away or who bought their own car (electric).

What was felt negative were the framework conditions, that politics simply claims ownership of the topic and actually does not allow any competitors. The operators were (and are) blocked and hindered: they did not get any parking spaces in cities, no chance to implement something as a private or small business, as the municipalities reassign themselves to the topic and want to benefit themselves.

But on the other side, being so small is the reason why it works: if they had 200 vehicles, they might not be able to offer the service anymore; they know most of the 200 users personally, there is a 24-hour call center, where someone is permanently answering the phone, things that a big corporation probably just can not offer.

6.3 Description of Case Study 2: Cohousing project in Vienna, Austria

Case study 2 is a co-housing project in the eastern part of the inner city of Vienna, Austria. . In this area, until 2028 a new district will be developed where 20.000 people will live and work, 10.500 apartments will be built and 15.000 work stations in offices and 5.000 in trade, research and education will be developed. The first part of the development will be finished in 2020.

The development and exploitation plan is taking place together with the responsible departments of the city of Vienna and the „Wien Linien“, the public transport operator.

6.3.1 Description of the representatives of the case study

The representatives involved in our case studies were two persons: a person who developed the project idea (R1), and a person who worked at the plans and building supervision (R2). The idea of a co-housing project has been around for some time, and the R1 is a specialist in this area.

> *“The project idea was developed by myself and I had a partner who did the project management. Framework conditions back in 2012 were favourable as the city of Vienna dedicated on whole block only for co-housing initiatives, which enabled a realistic project development.”*

The first interviewee (R1) initiated and built the co-housing group up, operated the group discussion and was part of the group and still lives in the co-housing. This person also developed first concepts for the floor plans, for the billing, etc. In this person’s opinion it was “socially romantic“ to leave that up to the people, who are all laymen and therefore have no or only little knowledge of what is important and how these things (e.g. billing, floor plans) work. It was given by the “Development AG”, that in the co-housing there were mainly apartments and some spaces for trade foreseen. The specification that this special housing project should be a passive house project was given by the interviewee. This person developed the concept and then looked for people who were interested in such a concept. These people had to “pass” a kind of assessment center with all the other candidates to be able to find people who are alike and where the probability of matching with each other was high. This always worked out well, all families and people who moved in together at the beginning are still living there, except one family who inherited a house and moved there. This family still owns the apartment but rented it out, after consultation with all the other owners. The project was characterized by many (good!) discussions and the R1 was always available for questions.

The framework conditions in 2012, when the project started were favourable as a whole block in the area was dedicated to co-housing projects. This enabled a realistic project development. The co-housing project is characterized by being totally privately initiated, financed and implemented by its residents. The co-housing group is its own developer and needs an organization, which manages and governs the process. This role was taken by the R1. A core group of three people developed a tailor-made project for 18 families with different backgrounds in terms of age, origin and profession and was the interface between planners and residents.

The R1 enabled the group to build without any external developer and self-dependently.
The second interviewee, an architect, took the responsibility for the overall planning and building supervision (R2). This person brought in long-term experience and knowledge in sustainably buildings and was supported by a pool

of consultants specialized in sustainable building. This person is also teaching users in how to use their apartments "properly" in terms of ventilation, heating, shading, etc. In a group like this, small and very personal, this worked out perfectly. A Facebook group was established where residents could ask all kinds of questions or exchange experiences with other residents. For the initiator, the main reason why initiating this project was to be part of it.

> *"To participate and be part of it myself made me realize that the main thing in co-housing is the social effect. Aiming together at the same goals and to dare something together had a very special energy, not measurable for the city or the neighbourhood but very well noticeable."*

Most of the residents had very little knowledge of energy efficiency. The project was designed so that everything could be built as long as the money was there with the one precondition that to build worse than passive house standard was a no-go. The residents have not been asked about that, but it was clear to them, when they decided to be part of the project, it was done this way.

6.3.2 Main outcomes from the interview

The interviews with two of the initiators of the co-housing project showed that important points for the residents are that there is a contract for the ownership of the apartment (issued by a solicitor) as well as a user contract (issued by a lawyer), in which it is precisely defined how the common areas (roof-top terrace, elevated flower beds, garden areas) are being used and how the billing will be done. It was clear for everyone from the beginning that the project had to have a solid basis. This cannot be done by laymen, it was necessary to be informed and become a specialist, as the R1 did over the years of development.

The R1 and the R2 had a personal interest in co-housing projects for quite some time, as for them it is the future of living. Building developers are more conservative and try to find reason why new things cannot work and that it is much too expensive. Ecological topics were part of the project from the beginning. Building was not cheap but calculated over the whole life cycle; a project like this pays off.

Very important and helpful was the fact that the land was reserved for co-housing projects exclusively from the beginning, but no other favourable parameters were decisive for the project. The reason, therefore, could be that a co-housing project does not necessarily need to be energy efficient. In the case of this co-housing project this was part of the concept, in other co-housing projects it is not. From the beginning, the overall budget was clearly defined.

A hindrance was that requirement of the housing department of the city of Vienna, that 1/3 of the apartments had to be allocated to the housing service (meaning: for social housing) which delayed the inhabitation by 6 months. In addition, these people had no idea of co-housing and had to be told what the group had developed and designed for more than 2 years. They had the claim for an apartment but had to fit to the group - this was not an easy task and has to be solved differently in the future.

Co-housing projects are very special and are all different from "standardized products" of developers and therefore, every project has to be developed specifically according to the respective framework conditions. Some details might be taken over and modified, but no general statement can be made.

No changes would be necessary for the co-housing project. Moreover, the two main initiators would go even one step further and try something new the next time: in another project, they made the apartments smaller and enlarged the common spaces. Some more "features" have been included in that new project from the beginning, which needed a lot of discussion in the co-housing project, as for example a user advisory board or the purchase option for the group, when apartments are sold.

Another thing is that already for school children the topic of efficient building should be tackled, as well as how to inhabit such an apartment "appropriately". There should be training and teaching materials (combined with all different subjects in school, e.g. physics) available, which have to be developed by professionals, like the architect in the co-housing project.

As a general statement, it can be said that it is necessary to provide the land for co-housing projects, if such projects are desired by cities or communities. These should be already dedicated to such a project, before the groups constitute, as co-housing groups develop differently: they first look for co-residents and afterwards search for land to build on which can take a lot of time. Alternative concepts should be available and so, also housing associations could be interested in the long run. In general, it might be a good idea to specify by law that renewable energies should be part of the concept and maybe also the energy should be produced on the premises itself. Another issue might be to direct to move cars out of the premise.

6.4 General discussion and conclusion

The three case studies (two in e-car sharing and one in co-housing) from Austria that were presented in this chapter show that, at least in Austria, it is very hard to implement projects which aim at changing the energy consumption behaviour of people as an individual or a non-formalized collective. Very quickly one reaches a status where it is legally necessary to form or build a kind of collective, be it an association, a club or something similar. This is mainly to save the initiators from legal consequences in the case something goes wrong in the project. But in most cases, it even needs a corporate body to apply for funding. Nevertheless, the e-car sharing case study 1b showed that also a private initiative (without becoming an association) can work, but in this case, without getting any funding.

The interviews with public authorities and desktop research showed that many funding opportunities are available but it also became obvious in the interviews with initiators of more or less private projects, that these funding schemes are often not tailor-made for specific approaches and ideas. From the authorities' side, also consulting services are offered, which are quite good accepted by the people, mostly to get a first overview what is available in terms of funding but also which technologies are out there on the market.

Sometimes the funding is hampering new ideas in their implementation: the funding might be too low but with too high requirements to be fulfilled (higher standards are requested as in the building law to get funding). In general, there are these global trends where, if the prices for energy are very low the interest in renewable and alternative energy provision is rather low; if the prices are on the rise, the run to alternatives (and to funding) is increasing.

One outcome of the Austrian case studies is, that it would be quite helpful, besides funding and consulting, if public decision-makers would not only favour central initiatives (often developed and implemented by companies) but also small and often private initiatives that would bring new incentives into the market.

7 Bulgaria

7.1 Background

In the case of Bulgaria, the explicit focus on buildings was determined by the share of the population in the country inhabiting multifamily residential houses, and prefab panel housing in particular, and the high percentage of private ownership of the dwellings. Most of these buildings were designed and constructed in the period 1960s-1980s and are currently in urgent need for refurbishment and for the implementation of energy saving measures. The effort requires, on one hand, considerable investment, which is in most cases not easily accessible for the owners themselves, and, on the other hand, collective decision-making with numerous stakeholders involved, often with a diversity of social and economic status. The two national case studies present two alternative approaches to solving the problem – the first searching to benefit from the national energy market peculiarities, and the second – taking the opportunities provided by various European and national grant schemes introduced in the country.

Striving to achieve overall higher energy efficiency in the country, several consecutive national governments adopted laws and regulations after the year 2000. The Act on Energy and Energy Efficiency enabled the establishment of a State Agency of Energy and Energy Resources in 2002, which was later transformed into Energy Efficiency Agency at the Ministry of Energy and Energy Resources (renamed to Ministry of Energy in 2014). Several programs were adopted - a national long-term programme accompanied by short-term programmes for the implementation of energy efficiency policy. The practices of energy auditing, certification of buildings and issuing energy passports were introduced in the country. A funding institution was established to deal with all activities aimed at energy efficiency. Yet, the Energy Efficiency Act (2004-2008) was the first to explicitly address energy efficiency policy and measures; it introduced the term 'energy savings' and envisaged the energy auditing of engineering infrastructure and industrial systems. A number of projects managed by national level institutions were initiated in order to demonstrate the benefits of undertaking complex renovation in the housing sector. That was particularly important for Bulgaria because of the high percentage of the privately-owned dwellings and hence the enormous number of stakeholders who should be involved in the decision-making process concerning the common parts of the buildings. In order to enable effective action in that field, the Bulgarian Parliament adopted in 2009 the so-called Condominium Ownership Management Act, which provided the opportunity for registering formal homeowners' associations. The associations were supposed to represent the owners' collectives and to put into action the management of the common property. By the time of these first steps undertaken in the field of energy efficiency policy, all the instruments for leading the process were managed by the national level of governance, except for the assessment of the applications and the distribution of funding. The local level took the responsibility for working with the owners on issues of information, training, sociological surveys on attitudes and readiness for joining in national project based on collective decision-making, mediation, registering of actors willing to enter the national programmes and projects. Some options were also introduced for getting low-interest loans in cases when high energy efficiency results were expected in a project, yet they were not very popular. The national funding institution (named Energy Efficiency Fund in the Energy Efficiency Act of 2004-2008 and Energy Efficiency and Renewable Sources Fund in the next Act (2008-2015) enabled grant and credit schemes for investments in energy efficiency measures; the second law also envisaged funding of investments in renewable energy sources according to the active policy officially adopted. The new Act envisaged an enhanced role of the local governance level in regulating relationships and undertaking practical action, which initiated a major change in the national policy on energy efficiency and on reducing energy consumption.

The cases of collectively taken decisions concerning the renovation of multifamily residential houses were motivated in the period 2007-2011 by the development of internationally funded initial demonstration projects, aimed at interventions for improving the energy efficiency of residential while raising citizens' awareness about the topic and building the administrative capacity of the local governance level, which was supposed take responsibility for the process in future.

According to the official website of the Ministry of Regional Development and Public Works (MRDPW), the project entitled "Demonstration renovation of multifamily residential buildings" is a joint initiative of the Ministry of Regional Development and the UN Development Programme (UNDP) started in 2007. The aim of the project is to develop a renewal scheme for multifamily residential buildings to be broadly applied, which comprised three main

components: renewal targeted subsidies to condominium associations; facilitated access to credits; technical assistance for the voluntary cooperation of flat owners in whole building units in order to organize the renovation process. Many inhabitants of multifamily residential buildings in settlements of different type, size and location in the country (Sofia, Varna, Burgas, Blagoevgrad, Smolyan, Gotse Delchev, etc.) received the opportunity to benefit from the Demonstration Project for the Renovation of Multifamily Residential Buildings (briefly addressed hereafter as the Demonstration Project). Yet, for that purpose they had to achieve consensus in advance on their own engagement in the implementation measures. (https://goo.gl/P8EZjf)

The owners with successful outcome of that project were later on able to benefit from next projects as well. The Staccato project (started in 2009) was one of these next projects; it was funded under the 6th Framework Programme of the EC and aimed at the implementation of innovative technologies in the renovation process. It was coordinated by a Dutch partner institution and focused on activities in three European cities – Sofia, Amsterdam and Budapest (https://smartcities-infosystem.eu/sites-projects/projects/staccato). Upon Bulgaria's accession to the European Union, the country is also committed to achieving the 16% share of renewable energy consumption by 2020. In 2007, the Act on Renewable and Alternative Energy Sources and Biofuels was adopted, which was in force from 2007 to 2011 and was later replaced by the Renewable Energy Act, valid from 2011 until now. The first Act was also linked to the Investment Promotion Act (IPA), introducing the rule for investment projects related to the construction, expansion or modernization of the capacity for electricity and heat generation power from renewable and alternative energy sources, and the associated publicly owned or municipal property infrastructure to comply with the IPA provisions. This rule alleviated and facilitates the administrative procedures for using municipal and state property for the purpose, and the technical and financial assistance in building the necessary infrastructure. In addition, it envisaged mandatory joining of renewable energy producers to the national electricity grid and the setting of a preferential price for the purchase of energy produced from renewable or alternative energy sources. This obliged the energy supply companies operating with end-users to connect each producer to the electricity grid and to sign long-term contracts at the preferential prices fixed by the State Energy and Water Regulatory Commission (http://www.dker.bg/en/home) on a yearly basis. Under the established rules, the contracts had a duration of 25 and 15 years respectively, for geothermal and solar electricity, and for electricity produced from hydropower plants with installed capacity of up to 10 MW, as well as electricity produced by other types of renewable energy sources. With the Renewable Energy Act entering into force, the terms of the contracts were changed and reduced as follows: 20 years for electricity produced from geothermal and solar energy, as well as for electricity produced from biomass; 12 years for electricity produced from wind power; 15 years for electricity produced by hydropower plants with installed capacity of up to 10 MW, as well as for electricity produced from other types of renewable sources.

The gradual reduction of the purchase price of renewable energy was another tangible change. For the period July 2018 - July 2019 a fixed price of 205.99 BGN (about 105 euro)/MWh is attributed to the electricity produced by photovoltaic installations to be installed on building roofs ad facades in urbanized territories and connected to the electricity distribution network (http://www.dker.bg/uploads/reshenia/2018/res-c9-2018.pdf). For comparison, the price of MWh electricity produced by Kozloduy Nuclear Power Plant is 54.92 BGN (about 28 euro)/MWh, by hydropower plants -70.03 BGN (36 euro)/MWh and by thermal power plants - 75.08 BGN (about 38 euro)/MWh. Despite the high purchase price of renewable energy, the large share of electricity produced by the nuclear power plant and the national electricity price regulation policy provides for having much lower electricity prices in Bulgaria than in other EU countries. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Electricity_prices_for_household_consumers,_second_half_2016_(EUR_per_kWh)_YB17.png

7.2 Description of Case Study 1: A Homeowners' Energy Cooperative

One of the currently active practices in the country is undertaking the construction of multifamily residential buildings jointly funded by the owners themselves (with building site, development plan and architectural project preliminary approved); that requires multi-step preliminary collection of the money due for different construction stages among the future owners. Sometimes due to changing prices the amount of money collected exceeds the initially planned expenditures for constructing the building and setting it into operation. The case study provides an insight on such a situation in a 15-storey residential building with two entrances and a total of 120 apartments located in a dynamically developing neighbourhood of Sofia. After the construction of the building, the owners had to decide on

how to manage the surplus of the collected money. Two possible scenarios were discussed by the owners' assembly – distributing the money back to each of the flat owners or jointly investing it in some way for the common benefit. In both cases, the established rules require full (100%) consent of the 120 homeowners from the two entrances of the building.

7.2.1 Description of the representatives of the case study

Two interviews were held - one with a leader of the owners' association in one of the housing units, who was also the main initiator and driver in the realization of the idea; the second - with an expert from the Energy Agency.

The idea for the investment came from one of the owners, who was a member of the Bulgarian Solar Association and had expertise in the renewable energy field. *"It was decided to invest in this system, which would help the condominium in paying the common bills - with the money coming to the account from the electricity we have been selling for 5 years now"* (R1). The main drivers in the further process were representatives of the homeowners' association of the building, who initially acted as a volunteering team and were later authorized by the homeowners' association to take all the responsibilities in the process.

The information and explanatory campaign was followed by lengthy negotiations and facing numerous challenges in finding out the missing homeowners as all the owners had to sign the formal agreement. Some dwellings appeared to be uninhabited with their owners being abroad, others were leased, and the owners were also difficult to contact personally. Some owners had authorized their representatives, yet others had left no message on how to find them. The considerable variety of owners' profiles - social and economic status, mode of flat use and attitude to their own dwellings and to the common parts of the building, made it extremely difficult to take and even more difficult to implement the collective decisions. The management board of the owners' association had the major contribution for overcoming the barriers.

After long and heated debate, many clarifications and proofs on possible benefits and risks, it was decided to invest the money in installing a photovoltaic system for electricity generation on the roof of the building. For the moment, there was no technological solution available in the country for storing the generated energy from the time of production to the time of peak consumption. Yet, such an investment was expected not only to contribute to lower energy-related expenditures of the households over time but would also at a future moment to bring profits to be distributed among the owners as the excess of the energy produced could be sold back to the energy supplying company. The money was invested in a 28-kW installation with an estimated output of 35.00 MWh/year. An owner with the specific technical competence in the energy field took the responsibility for choosing the particular installation. Needed steps were undertaken for acquiring the installation, obtaining the permission for placing in on the roof and preparing all the necessary documents for connecting it to the national electricity grid.

After the photovoltaic installation was successfully set into operation, the project was broadly promoted in media and gained considerable publicity. The interest in realizing that kind of projects in the urban environment was growing and there were many inquiries about the requirements accompanying the implementation of such a project. Yet, the story about the challenges faced had quite a demotivating effect. *"Then people phoned and asked: "How could we do the same thing?"; and after coming to know the real situation, they used to give up. They expected we had taken the money through a bank loan as the sum is not a small one" (R1).* In that particular case the amount of money needed for the initial investment was already available; it other cases additional complications could be expected from possible delays in the communication with banks and other credit institutions on taking loans. These were indicated as the main factors for the lack of next projects of that kind, even when the other conditions were available.

The process of linking the building to the energy supply system was considerably delayed in the last stage of signing the contract with the company operating on the territory of Sofia. The delay coincided with a change in the national regulatory framework on the conditions for generating energy from renewable sources and, thus, with the reduction of the purchase price per MWh. The installation was put into operation in 2013, yet the contract was finally signed at the new price, over 40% lower; thus, the period for the investment return was extended by 10 years. That was a highly disappointing circumstance with a considerable negative effect on the relations between the owners and the association's team. There were also broader indirect negative impacts on the operating energy company, the

municipality and the national institutions responsible for energy policy implementation, who were not considered trustful partners by the homeowners anymore because of the inconsistent signals sent and the lack of information transparency in the process. The experience thus diminished confidence in the transition to renewable energy sources and in the practical applicability of small projects in the urban environment.

The photovoltaic modules already in operation for 5 years are currently bringing revenue to the owners' association from the excess electricity sold to the energy supply company; after a collective decision the money was invested in changing the window panes of the staircases of the two entrances with energy saving ones. The owners realized that the benefits of an investment that will deliver sustainable and guaranteed revenue in future would be far higher than the ones of distributing among themselves small amounts of already devaluated money collected within the latest 15 years.

7.2.2 Main outcomes from the interview

Theme 1: The importance of the context under which decisions are taken

There were important favourable conditions in the particular case, which enabled the initiative: the sum of money already available as a result of a previous jointly undertaken initiative (the construction of the building); the active national legislation and regulations supportive to small projects in the energy field; an expert with relevant technical knowledge among the homeowners; the legislation enabling the establishment of a formal entity representing the homeowners.

Under the current Bulgarian context, the availability of "own" funding that does not generate loans-related risks is a key starting point when considering an investment intention. *"It's nice that we operated within our own means. There are no credits, banks or some other institutions to press us. With the first prices we calculated the payback period to be between 8 and 10 years; it then grew to 15" (R1)*. The availability of an expert among the owners was another key factor - the information and knowledge on project opportunities and profitability in the energy field is neither widespread nor easily accessible. The owners' association provided for formalizing informal relationships and legally communicating with all the institutions involved.

Theme 2: The path of collective decision making and decision implementation

The key issues here are related to the 'birth' of the initiative and the leader's role in promoting it among the community of homeowners and in persuading the members of the collective who have doubts about the success of the venture, and to the role of the team realizing the idea. *"It was an initiative only of people from the block. The person who is in this Solar Association and our neighbour… we started the whole thing. In the sense he gave us the idea, then we organized a meeting, we explained it to the people. Then there were more explanations…" (R1)*

In this particular case of collective decision-making, there was a prominent leader, who was the engine of the process from the idea to its realization. Typically, this requires a lot of effort and time that cannot be rewarded. Very often, the leaders also suffer negatives from unrealized expectations, imposed coercion and change of attitude towards the common parts of the building and the adjoining territory. The belief in benefits, including common ones, is among the main motivating factors for leaders. The path is easier when there is a formed team of initiators who take different roles in the process of implementing the collective decision. This condition is particularly important for buildings with many dwellings and, respectively, many property owners.

Theme 3: Internal barriers

The encountered inner barriers were related to the large number of stakeholders with different social and economic profile, the doubts among the inhabitants, the uncertainty and lack of community spirit caused by the frequent change of homeowners, and the uninhabited dwellings in the building with missing owners' contacts. "*With 120 apartments and around 3 people in each of them we have the capacity of a large village. Now, such villages are now very large. It is impossible for 2 or 3 people to manage that without any help*". *"Apartments are continuously sold and rented in these blocks we do not even know half of the people there. We do not know who is coming and going. Well, here, many people come from other places; they have no idea how living in the city is organized, what the rules are." (R1).*

An important challenge outlined was taking a collective decision for a building with many dwellings and population in a relatively short time period. Homeowners were the stakeholders when deciding issues related to the residential building and the property on which the building is located. Due to the relatively recent restoration of private land property in the country, providing the conditions for a property market and the rather recent establishment of owners' associations, the condominium management relations and the knowledge of the rights and obligations arising from it are still absent. There are some exceptions relying on different approaches (well-organized small communities with a developed set of rules, teams that have decided to take advantage of the services of professional managers, and gated residential complexes). The option of introducing management rules for multi-family residential buildings, which - once established by the collective - will be binding to all owners, is gradually gaining popularity as such a mechanism would help in coping with the changes of owners, their diverse profile and experience, as well as the absence of some owners. In other words, the rules for managing a residential building, with rights and obligations, should be an integral part of the sale or lease agreement.

Theme 4: External barriers

Encountered external barriers stemmed from the changing regulatory provisions leading to uncertainty about future energy-related conditions and negatively influencing investment intentions at an advanced stage; the non-finalized liberalization in the energy sector in the country has resulted in monopoly on electricity supply and purchase until 2017.

A positive outcome would require that the reforms in the energy field, communicated over long time, should be conducted in a coherent and transparent manner, requiring an extremely responsible study of their short, medium, and long-term effects on all stakeholders.

7.3 Description of Case Study 2: Grant-based complex renovation of residential buildings

The Demonstration Project for the Renovation of Multifamily Residential Buildings initiated in 2007 resulted in 50 renovated multifamily residential buildings with 1093 benefitting households, 8 488 575 kWh (40-60%) expected annual energy savings and reduction of 6 672 tons of CO_2 emissions annually; it was also considered successful in several other aspects: testing the model of voluntary cooperation of homeowners aimed at the renewal and maintenance of the common parts of the buildings; testing of the mechanism for technical and funding support; testing the model for the development and implementation of small-scale renewal programmes; positively impacting attitudes and overcoming psychological barriers.

The Staccato project was an international project funded under the 6th EU Framework Program and launched in 2008 with a leading Dutch partner. The project was focused on the use of innovative technologies to implement energy efficiency measures in the renovation process. Activities were held in three European cities: Sofia, Amsterdam and Budapest. The project developed in three phases in the search for relevant approaches and solutions under the particular Bulgarian context.

In 2010, MRDPW signed a Memorandum with the Staccato project consortium on reconciling the activities of the Demonstration Renovation Project and the Staccato Project. As a result of the agreement, the owners' associations of three residential buildings in the Oborishte District in Sofia, renovated under the Demonstration Project, could be involved in the new Staccato project.

During the first project phase a conceptual design was developed for installing solar systems to provide hot water in the buildings. The provision of the installations was competition-based; coordination and reconciliation of the construction and assembly works with the activities of the Demonstration Project were requested. As of September 2011, the three buildings of the Oborishte District were renovated according to the rules of the Demonstration Project for Renovation of Residential Buildings and solar collectors were installed for the provision of hot water in the buildings. The included owner associations received complete renovation projects and technical assistance for undertaking technical and energy audits of the building, organizing and conducting competitions for suppliers and contractors; control over the implementation of the measures, preparation of technical passports of the buildings and the opportunity of energy certification. The project provided a subsidy for covering 20% of the value of the

construction works for each dwelling, while 100% of the value of the construction works for the renovation of the common parts of the building had to be funded by the owners themselves. The municipal authorities took the responsibility for upgrading of the adjacent territories for free. The construction and installation activities funded under the project included: replacement of waterproofing and repair of roof drainage; execution of external thermal insulation on walls, roof and slab above the basement; replacement of window panes; processing the joints of the facade panels; replacement of the vertical pipes of the water supply and sewerage systems; revision and replacement of compromised parts and painting of all installations in the common parts of the buildings.

The second project phase was mainly focused on the dissemination of the good practice and the results of the first phase, monitoring and taking action for raising the awareness of the owner associations meeting the requirements of the Staccato project for inclusion in the next phases. During the second stage a solar collector was also installed on the roof of a kindergarten located in the neighbourhood.

The third phase of the project included analyzes and assessments of the operation of the installations, their potential defects and needed precise adjustment to improve operational efficiency. Work continued with the owners' associations to raise the awareness and commitment of their members, trainings were conducted, and household guidance was provided for everyday activities and rules were introduced for reducing energy and resource consumption. A fourth building from the neighbourhood joined in the project as well during the third phase of the project. The owners' association of that building applied for a solar installation after having already renovated their entire building with money collected from a mobile operator's cell rental and an energy loan taken by the association. A family of elderly engineers with relevant expertise in the energy field had taken the leadership in the process.

The particular building focused on by the case study in more detail, is a 5-storey one with 10 apartments, most of the owners being the initial ones (or their children). The decision for joining into the Demonstration Project was based on the owners' estimation of the low energy efficiency characteristics of the building but also its overall bad state. The initiator of the project was one of the owners, a lady who came to know about the Demonstration Project during an information campaign and was able to estimate its potential benefits; yet, the real driving factor later on was the head of the owners' association (elected by the homeowners according to the active regulations). He enabled the collective decision of the owners for joining the project; he worked all the time for contacting all the owners and helping them throughout the process; and he took the responsibility for communicating with the local and central administration engaged with the project. Other neighbours with specific expertise also joined in the preparation and submission of the application documents to the project. In the interviews, organized by the ECHOES team, the owners mentioned the very long-time interval between the submission of the application documentation and the approval of the beneficiaries; the same situation occurred between signing the contract and the beginning of the refurbishment activities. No information about the application status and the schedule of expected activities was accessible during these long periods of waiting, which was pointed out as a strongly demotivating factor for all the applicants.

7.3.1 Description of the representatives of the case study

Five interviews were undertaken with individuals involved in the two consecutive projects – one with a person that had an administrative role on the past, (R1), one with an energy agency expert (R2) and three with flat owners (R3, R4 and R5) in two different buildings included in the project. All the interviewed owners estimated that knowing each other for many years was a favourable condition for taking the collective decision for joining in the project. Thanks to that and due to the persistent efforts of the association's head they were able to collect all the signatures for the contract in a brief time span and to provide the financial contribution requested from the owners in time. It proved to be a case of real solidarity as the people lacking financial resources at the moment of signing the contract got the money from their neighbours and thus was that barrier easily overcome.

The head of the owners' association kept his leading role during the construction process as well, which was according to the rules of the Demonstration project to cover not only energy efficiency measures but also full refurbishment of the building (including the upgrading of the building installations, the underground parts and the roof structure). Throughout the whole process he provided a kind of investor's control and was also the mediator between the construction company and the flat owners.

When the construction activities within the Demonstration project were almost accomplished, the owners were already aware of a next opportunity for enhancing the energy efficiency measures by joining in the Staccato Project. Through that project they could receive a solar installation for water heating and at the end of the two projects the building was certified as belonging to energy class A+.

The integral approach to the overall refurbishment of the building and the high quality of the materials used by the Demonstration project, as well as the benefits from the solar system were all highly motivating factors for the owners of other buildings with similar needs to join in next projects.

The owners' satisfaction with the results of the two projects continued, however, until the end of the first heating period when the heating bills came and the owners had to enter a prolonged difficult debate with the local company responsible for the central distribution of heating in the city of Sofia on the methodology of calculating the prices of the energy used by a building of A+ energy class. The head of the owners' association, who had initiated the negotiations with the company, also tried to involve other responsible institutions, e.g. the district administration. Yet, up to the time of the interview, the sole success reported was the acknowledgement that no payment for water heating is due in summer when the temperature of the water heated by the solar installation reaches certain degree. A similar problem and unwillingness of the company to change the calculation methodology was also reported by the other owners' associations involved in Staccato project and by the local energy agency.

Despite the emerging problems with the heating company and pushed forward by the house manager, the owners undertook a next investment initiative for replacing the old valves of the heating installation with new, smart ones, with distance reporting of the actual energy consumption. Regretfully, that did not solve the problem with the energy distributing company, which remained a major demotivating factor in the process.

There was also a failure of the water heating system at the end of the first operating year because of poor maintenance and resulting improper operation of the installation, which caused additional disappointment. The money needed for rectify the damage was collected among the owners and the installation was restored. Yet, that was the moment for raising the question about the installation maintenance and for discussing needed efforts for guaranteeing the long-term proper operation of the installation. It became obvious that the owners should either try to acquire additional knowledge and skills or hire a specialized company to take care of the installation. The first option was expected to place additional burden on the house manager or some of the neighbours, which was not considered acceptable; the second option questioned the economic feasibility of the installation as the savings made through the solar heating would be considerably undermined by the payments of the external maintenance company.

The project was expected to contribute to the achievement of multilateral development factors in terms of preventing social exclusion by improving the health and living conditions of the target population through housing renovation; protecting the environment by reducing greenhouse gas emissions through energy efficiency; promoting good governance and building urban social capital by supporting voluntary associations among citizens.

The accumulated experience, the lessons learned, and the recommendations developed by the Project were further used for the implementation of the National Energy Efficiency Program for Multifamily Buildings financed by the State budget and the Energy Renovation of Bulgarian Homes Project (2012-2015) funded under the Operational Program "Regional Development" by the European Structural Funds.

7.3.2 Main outcomes from the interview

Theme 1: Enabling opportunities for funding under grant schemes to introduce energy efficiency measures.
The impoverishment of the population in the country during the transition period after 1990 had resulted for the majority of the inhabitants in the lack of personal capacity for funding the renewal of the privately-owned dwellings with no supporting financial mechanisms available (preferential loans and subsidies). All respondents pointed out that the major factor in deciding on the inclusion of their building in the Demonstration Project was the availability of full financing of the measures in the common parts of the building and the opportunity for receiving the larger share of the needed funding for the measures through the project.

Theme 2: The homeowners' motivation for turning the process into a collective and continual one.
The homeowners' motivation was related to two major factors:
- Realizing that the implementation of various measures in each of the dwellings would result in a smaller effect than the measures applied to the whole building;
- Realizing that the possible complex effect of the undertaken action for reducing the expenses and increasing the benefits of the inhabitants would be much greater if all the measures are fully applied in the building.

Theme 3: The leader's role throughout the whole lifecycle of an energy related project in a residential building
The case study convincingly outlined the key importance of leadership in the process. Moreover, experts who had self-identified themselves with the cause of energy efficiency were estimated as the major initiators of all activities and were taking continuous care of all the systems and installations introduced. Such actors responded to all the invitations to meetings and interviews and were eager to fully provide all the information requested by ECHOES team.

Theme 4: The importance of continuity in all the announced and initiated policies and actions
Guaranteeing continuity was also related to the importance of:
- Synchronizing messages, active regulations and the efforts of all institutions with a role in the process of energy consumption and in energy efficiency. . "*When the National Program started, there was a lot of interest. I've been to many meetings - the halls were crowded. People were very interested. To me, the problem is that there is no capacity of the state authorities to work individually with people, with owners' associations, etc. There should be centers where people could receive information from experts on the spot*" (R1)
- Coordinating the action of the administrative bodies involved in the energy transformation process
- Guaranteeing transparency and predictability of the all the administration's activities
- Building upon the already accumulated experience, which could be either stimulating or hampering factor depending on the process, results and outcomes of previous steps undertaken by the participants in the process;
- Building mutual trust on the basis of well-done work. "*The most terrible thing is to discourage people; and they are discouraged by institutions' neglect, negligence, and failure to perform even basic duties*" (R5)

Theme 5: The commitment and the roles taken by public authorities in the process
Local authorities played a key role in training, information distributing and mediating; they acted as mediators from reaching homeowners represented through owners' associations, to promoting the opportunities for financing energy efficiency measures. The role of the regional administration was of key importance in the preparatory stage of the process and in the organization of the information campaigns. The visibility and easy accessibility of public experts and employees was commented as very important for building and maintaining trust throughout all the stages of the process. Attracting expert and non-governmental organizations working in the field of energy consumption and energy efficiency could be considered a strong positive factor in the process.

The further empowerment of local authorities and the real governance decentralization could be expected to provide better conditions for collective solutions related to the energy efficiency of residential buildings. The process has been initiated and it is already acknowledged that a number of proactive municipalities with a good knowledge of their rights and obligations have much better results in the implementation of energy efficiency measures in residential buildings based on collectively decided owners of dwellings. Regretfully, these good examples are limited to several municipalities out of overall 265 in the country.

Theme 6: The empowerment of homeowners' collectives

The provided legislation framework enabling the registration of owners' associations to represent the owners was an important step at the national level. Yet, it proved to be effectively working in cases where there was long-term personal commitment and responsibilities voluntarily taken by owners with relevant technical expertise and self-identification with the idea. *"The building is from early 1930s; there are 10 apartments and a large number of owners; in fact, they all have inherited their dwellings; they have known each other for years, and it is easy to mobilize such people for a common cause. There was a case in which, simply, there was no opportunity for some people could not provide the money, and the neighbours helped through the fund accumulated among themselves" (R3).*

The further empowerment of homeowners' collectives through clearly defining their rights and obligations in the process aimed at increasing the energy efficiency of their property (financing, contracting, selecting contractors for the construction works, selecting materials and controlling the interventions) could be extremely helpful.

Theme 7: Barriers encountered and overcome by the project

The testing of a complex model for overall energy renewal of three residential buildings in Sofia alongside the introduction of renewable energy sources was mentioned as an explicit positive result of the integrated approach applied by the two projects. It was also an excellent chance for identifying barriers and challenges in the process and for accumulating practical experience in addressing them.

There was no previously existing tradition in joint management of the common property through owners' associations; yet, a renewal of relevant scale requested the participation of all the owners as an entity. The professional management of residential buildings was almost unknown practice, but the renewal requested the implementation of complex technical measures, the application of technical norms and high building standards. *"None of the three buildings was ready to sign a maintenance contract. And companies that might agree would ask at least 100 leva per month for maintenance, which includes one visit, then 12 months at 100 leva, would mean 1200 leva annually... it goes to maintenance and if something goes wrong, they have to pay additionally"* (R2).

There was a high deficit of awareness and understanding about currently active funding schemes for energy efficiency measures and for reducing energy consumption other than grant programs at national level. Going beyond the narrow expertise on the nature of these tools and the opportunities they provide is a task of the service providers themselves but should be also considered a national imperative. Activating the private investment resources and expertise in this area could provide for motivating small well-educated communities of relatively high-income to take collective decisions for increasing the energy efficiency of their homes.

In parallel, the currently active market-based financial mechanisms for the implementation of EE measures, although limited in terms of action and content, have encountered considerable implementation difficulties, e.g. concerning contracts with energy service companies (ESCO). Synchronizing all rules and actors' practices in the implementation of EE measures but also during the long-term functioning and management of the buildings and the installations would result in more positive attitudes among the owners implementing their own collective decisions. "*The district heating company dealing with the distribution of energy had a problem with the methodology after the buildings were refurbished. It turned out that with these big savings in the buildings, the bills are still calculated based on the old formula. And we told to the company they have to change their formula" (R2)*

The simplification of the administrative procedures, e.g. the issuance of building permits, when installing solar collectors for water heating and reducing the share of owners required in collective decision-making on the implementation of EE measures in residential buildings should be also considered.

The lack of clarity during the intervention process and after that concerning the proper exploitation and maintenance of the installations were among the major barriers in the process. Through the improper exploitation and the expenses generated as a result of that quite often all the initial effort for achieving higher energy efficiency turns to be useless as either the saved money is used to cover the expenses for repairs (if the owners agree upon that) or the installations are abandoned.

The level of trust to the professional organizations providing services related to the maintenance of the common parts of the building infrastructure is still quite low. During the brief period of their operation the owners have accumulated rather negative than positive experience and are often reluctant to using their services for installation maintenance.

7.4 Description of Case Study 3: Municipal Energy Efficiency Network EcoEnergy

After the political changes in 1989, steps were taken in the country aimed at governance decentralization. Yet, transferring a broad range of responsibilities from the national to the local level was not accompanied by fiscal decentralization and the institutional capacity of municipalities was far from enough to cope with emerging challenges. The situation was particularly complicated in the energy management field at the municipal level where the lack of adequate legislation and the insufficiency of information on energy consumption patterns were largely hampering effective action. Under the context of economic difficulties and political tensions, yet encouraged by the positive results of an internationally supported project led by the non-governmental organization Centre for Energy Efficiency EnEffect, the mayors of 23 Bulgarian municipalities initiated an informal network called EcoEnergy in 1997 with the goal to overachieve the national energy efficiency (EE) targets and to promote sustainable energy policies at local level despite the centralized governance system. The network aimed at sharing experience, identifying common energy-related priorities and barriers, and coordinating joint action for legislation changes and capacity building. That started a long-term partnership, which was further on formalized in 2004 by registering the Municipal Energy Network EcoEnergy as a non-profit NGO, with EnEffect acting as the secretariat of the network. By early 2003, EcoEnergy had 54-member municipalities and 6 regional associations of municipalities - a total of 156 municipalities, accounting for about half the country population. Municipal EE offices were set up in the member municipalities and EE officers were nominated. Thus, an institutional network was gradually set up in the country, which acted as the organizational backbone of EE activities at the local level. In the long term the network proved to be effective in spreading innovation and encouraging local action; it was active and successful in establishing international contacts, developing EU projects and initiating regional networks in SEE. Until present, it is an important factor in building institutional culture of partnership for innovation at the local level (Dimitrova, Nakova 2012). Building on the experience of EcoEnergy and with the financial support by the USAID, a Municipal Energy Efficiency Network Project (MUNEE) was implemented with the participation of almost all countries from Central and Eastern Europe and the former Soviet Union. A Regional Network for Efficient Use of Energy and Water Resources (RENEUER) has been set up in Southeast Europe.

7.4.1 Description of the representatives of the case study

There was a considerable effort at all levels in the country in the period after 1997 aimed at improving energy efficiency (EE), and most notably, in the EU pre-accession period. The case study traces the self-organization of the municipalities for developing of local strategic frameworks and enabling conditions for introduction of energy efficiency policies in a multilevel governance level perspective in a traditionally centralized governance system, whereas the initiative of the local authorities often plays the role of a grassroots movement influencing the establishing of the national institutional and legislative framework. In order to study the factors influencing the transformation from individual actions of local leaders to collective action as exemplified by the formal network organization, interviews with three of the major representatives of EnEffect at the point of formation of the network, and with an energy expert actively participating in the network development in the period 1997-2017.

7.4.2 Main outcomes from the interview

Theme 1: Lack of policy and institutional framework as motivation for collective action. Initial building of local capacities

The political concept of early 1990s for shifting governance responsibilities from the national to the regional and local level was hampered by the lack of institutional and expert capacity in the energy field at these levels. At the micro level there was no significant evidence of entrepreneurship for introducing and spreading innovations due to

many constraints at the political and administrative level. Some initial efforts for addressing energy management at the municipal level were undertaken in late 1990s through the partnership of a newly established specialized national NGO with national and international organizations and with a Bulgarian municipality; that was motivated by the extremely difficult living conditions in the housing estates and the lack of financial resource in the municipalities for covering the energy bills of the public buildings (kindergartens, schools, hospitals, administrative buildings, etc.). As one of the representatives describes the situation, *"Bulgaria was not a member of the EU (it happened only 10 years later), and there was an acute need for training, clarification, good examples (mainly from abroad) and demonstration projects to present the essence and benefits of energy efficiency. These conditions determined the mission, objectives, tasks and forms of networking - to promote the development of consistent energy efficiency policies both locally and nationally."* National and local capacity building in the field of energy efficiency started in Bulgaria in 1996 through a successful Bulgarian application to the Global Environmental Facility (GEF) for a funding grant of US$ 2.5 million. The project Energy Efficiency Strategy to Mitigate GHG Emissions, Energy Efficiency Demonstration Zone in the City of Gabrovo, Republic of Bulgaria (1998 – 2004) was developed by the Centre for Energy Efficiency EnEffect in active collaboration with the Ministry of Environment and Waters, the United Nations Development Programme (UNDP), the US Agency for International Development (USAID) and the Municipality of Gabrovo. The project had two major components: (a) Local capacity building; and (b) Demonstration projects. The main pillars of the project comprised the establishment of municipal EE offices, training local experts in community-level energy planning and management, streamlining communication mechanisms and information sharing among municipalities, identification of the barriers to efficient energy use and promoting adequate financing mechanisms for EE projects. Demonstrations were targeted at the most energy-intensive sectors of the municipal economy - street lighting, district heating, and energy efficiency of buildings. Apart from the technical lessons learned and the direct economic benefits, the demonstration activities were part of building the overall municipal sustainable development policy for efficient use of energy resources. They mobilized public support for EE policy and stimulated important changes in public behaviour. A model for integrating public policies with investment activities was successfully tested.

The process had further important spin off effects in the long term – the sharing of practical experience among the involved active municipalities started the national municipal network EcoEnergy; the partnering municipalities demonstrated growing motivation and self-confidence in searching international contacts and partnership; initiatives of self-organization at the micro level were also visible – groups of individuals and households started searching for ways to increase the energy efficiency of their homes and to switch to energy autonomous lifestyles even under unfavourable material and normative context.

Theme 2: Development of the legislative base. Collaborative activities at international level as enabling factor

Without any doubt, the adoption in 2008 and constant improvements of the Energy Efficiency Act distributing requirements and obligations to local authorities, but also, especially in the last years, incentivizing energy efficiency investments through the Energy Savings Obligation Scheme, has enabled the development of considerable internal administrative capacity. It guides the EE policy at local level through the requirements for the elaboration of EE plans and programs and their annual reporting. A major part of this process is the establishment of the national Energy Efficiency Agency, later transformed in Sustainable Energy Development Agency, being responsible for the implementation of the national policies of the area and the control over the execution of the obligations of the local authorities.

The changes in the institutional and legislative framework (being strongly influenced by the EU legislation in the last period) have a definite mobilizing effect on the EcoEnergy activities, providing stimulus for continuous exchange of experience and good practices. A considerable number of internationally financed projects to support the municipalities in these activities were executed since the establishing of the EcoEnergy network in 2003, as for example SPP Regions, Covenant CapaCITY, NET-COM, MODEL, Innovative Thinking, RUSE, DEFRA, BISE, PLAN, INVEST, BENEFIT (starting from the most recent ones); an even larger set of projects conducted by the NGO EnEffect (acting as Secretariat of EcoEnergy) were conducted at the local level. A specific highlight is the MODEL project (2007-2010), supporting municipal and international networking and enabling a broad range of activities. Coordinated by Energy Cities, it successfully addressed several topics: (a) the development and implementation of Municipal Energy Programs and annual Action Plans in the pilot municipalities (aimed at minimum 10% energy consumption reduction in the municipal sites), so that they could provide a policy model for

other municipalities; (b) the promotion of activities for strengthening knowledge and skills and for drawing public attention to possible action in the energy efficiency field; (c) the establishment and strengthening the Energy Management Units (EMUs) in the pilot municipalities; (d) the establishment a common methodology to be replicated and continually implemented throughout the country; and (e) the empowerment of a country-wide sustainable network, capable for initiating, coordinating and supporting the implementation of municipal energy policies aimed at saving energy and reducing CO_2 emissions (Dimitrova, 2016). The EnEffect team developed a methodology for Municipal Energy Planning, which was translated in 10 European languages, and recognized by the Joint Research Centre (JRC) at the EC as the most suitable for countries in transition. Following these methodologies, dozens of training courses for municipal experts were conducted all around the country, and tens of municipal energy efficiency plans were developed. Additionally, a UNDP funded project on Building the Local Capacity for Promoting Energy Efficiency in Private and Public Buildings (2006-2010) addressed poor awareness and professional knowledge/ skills in: (a) sustainable building design both in the design community and at the university level; (b) investment mobilization for the implementation of municipal EE action plans. As explained by a high-level manager of EnEffect, *"A number of positive examples have been developed - pilot and demonstration municipal plans and projects of very low energy consumption. Sustainable traditions of the network's functioning were formed - public events, competitions, publications, training courses, etc.; the network gained high international prestige and became a desired partner in international projects."* Municipal energy managers were assigned in many EcoEnergy member cities, and, with further support, municipal energy offices/information centres were opened, providing targeted assistance to the citizens. This had direct impact on the national legislation, as gradually, the Energy Efficiency Act introduced obligations for all municipalities to develop energy efficiency plans and to appoint an energy efficiency officer. Unfortunately, the control over the execution is not enough, mostly influenced by the changes in the financing framework during the last period of development, strongly dominated by subsidy programmes which in many cases act counter productively on the planning process and its perceived value by the local actors.

Theme 3. Available grant schemes and their disruptive action

The access to financing opportunities is by far the defining mechanism for support of actions in the area efficiency, either collective or individual, in a transition economy – as is the case in Bulgaria. In the pre-accession years, EcoEnergy was recognized as one of the "door-openers" for access to international funding sources, and the interest and active participation were a rule of thumb for most of the local authorities. However, the official accession to the EU and the opening of the Structural and Cohesion funds had an unexpected negative effect on the functioning of the network. The local authorities became dependent on the often unpredictable opening of new funding opportunities solely managed by the national government and ruled by fast execution of projects at lowest price and dubious quality and energy saving effects, which contradicts to the mission and the values of the network and its Secretariat. It is also counterproductive for the long-term energy planning (which is one of the pillars of the network), as the newly arising opportunities imply real-time prioritization of projects depending on the focus of the given source. One of the extreme examples is the National Energy Efficiency Programme mentioned above, providing 100% public grant for renovation to energy class C, which does not fit the ambition and economic reasoning accepted by EcoEnergy but requires full mobilization of the municipal resources towards a sector which has hardly been tackled before (and postponing any other activities foreseen in the plans). Under these conditions, the focus of the network turned to innovation support and international cooperation activities, which left only the most proactive and convinced municipalities as stable networking agents. On the other side, as explained above, the same programme has a positive effect on collective action at citizen level, so the impacts cannot be evaluated in a single-sided way.

Theme 4. Development pathways

During the first stage of EcoEnergy development (the pre-accession period of 1997–2007), the collective action was needed at a time when the need to increase energy efficiency was still entering the minds of most people and long before the state policy was realized. Bulgaria was not a member of the EU, and there was an acute need for training, clarification, good examples (mainly from abroad) and demonstration projects to present the essence and benefits of energy efficiency. These conditions determined the mission, objectives, tasks and forms of networking - to foster coherent energy efficiency policies both locally and nationally. In this period, EcoEnergy created a positive public climate to support the idea of improving energy efficiency, developed an energy planning methodology and introduced municipal energy planning, contributed to the development of the national and local energy efficiency

policy, supported the formation of municipal energy efficiency offices and the development of basic professional and administrative capacity in a collective action with broad societal impacts. During the second development stage of EcoEnergy (2007–2014), a new network strategy was adopted and the support for establishing the country as an equal-rights member of the EU has become the network's main mission. Energy efficiency was considered a state policy. Municipalities have opened new opportunities to promote energy efficiency through several international projects. Operational programs became the norm, specialized credit lines, funds (including the Energy Efficiency and Renewable Energy Fund) and other support instruments were also launched. EcoEnergy has been actively involved in these new opportunities, channelling support to municipalities. At the same time, it has lost its unique position as the single organization to support energy efficiency in municipalities. Gradually, EcoEnergy began to operate in a competitive environment where it became more and more necessary to rethink its specific mission, goals and forms of activity. The influx of excessive grant schemes via different sources on campaigning principle and without targeting optimal results in terms of energy efficiency, social and economic impact, has decreased the perceived value of the tools offered by EcoEnergy, especially in the area of municipal energy planning. Currently, EcoEnergy finds itself in its third stage of development (2014–2020). Not surprisingly, it coincides with the EU multiannual financial framework, as it is decisive in the adoption of the sustainable and ambitious energy efficiency policy of the European Union. However, the practical implementation still faces serious difficulties of a different nature. The mainstream investment in energy efficiency projects of, least said, moderate ambition, as demonstrated by the National Energy Efficiency Programme, is still hampering the large-scale realization of the vision of the network. One possible unifying aim of EcoEnergy could be to create engaging positive examples (practices) such as, for example, ambitious municipal energy efficiency plans that aspire to targets corresponding to the period beyond 2020, the design and construction of nearly zero-energy buildings (nZEB), training of local professionals on promising solutions and technologies in the field of energy efficiency, etc. It is also deemed appropriate to re-evaluate the existing organizational structure of EcoEnergy for its more intensive activities based on horizontal links between members of the network. In this period, the Network is concentrated on formation of a constantly expanding core of municipalities with clearly demonstrated advanced ideas, policies and regulations in the field of energy efficiency; overcoming formalism in addressing energy efficiency planning and promoting new ambitious development plans.

7.5 General discussion and conclusion

In countries such as Bulgaria, with an extremely high share of private ownership on dwellings, there is a high potential for building capacities to produce electricity in urban areas. Moreover, some formal entities to implement such collective decisions - the homeowners' associations, have already been constituted and have proved their effectiveness for joint practical action.

Energy projects in Bulgaria are still strongly associated with entities, mostly dealing with energy production/services or with ones having explicit expertise in the energy field. Changes in the existing framework could contribute to attracting participants from outside these two groups. This can be done by broadly promoting the opportunities and benefits in the energy area in media, public and virtual space. Providing favourable conditions for higher flexibility and broader opportunities in negotiating conditions and benefits would be also an effective step.

In the process of energy transformation there are opportunities for investment initiatives by collectives who would be able and willing to take their share of the risk but also the advantage of the benefits generated by the initiative. The consistency, predictability and transparency of the national legislator and the administration in implementing the national energy policy and in the use of renewable energy should be also taken in consideration as major positive factors in improving the framework effectiveness and encouraging decision-makers to support the energy transformation of the country and hence in the EU.

An important peculiarity of the national context until the beginning of 2017 was the presence of only one energy operator supplying and purchasing electricity in each region of the country. The lack of opportunity for choosing the energy operator with whom to negotiate the conditions for the purchase of energy from RES severely limited the capability of potentially proactive actors in the field. This has been changing since 2017 on the slow pathway to liberalization of the energy market.

Involving local authorities more actively in explaining the opportunities for implementing such projects in urbanized areas proved to be a key factor for raising a critical mass of quality projects, including the ones initiated and administered by the housing (homeowners) associations. Local authorities could be even more proactive in providing practical examples; e.g. since they are the owners of large civic buildings and facilities, their involvement as investors or initiators of public-private partnerships for deploying roof photovoltaic installations in turn of the provision of a higher quality public service. The liberalization of the electricity market would probably mean an increase in electricity prices but that would also have a beneficial effect on building a broader awareness and better focus on energy use issues and challenges.

In Bulgaria, there is an extremely interesting example of overcoming individualistic local authority interests within a highly centralized governance system with the goal to promote and implement local sustainable development policies through a collective action of mayors and municipal energy experts, supported by the non-government sector.

The study of the energy transition process in Bulgaria outlined important enabling factors for collective action as well as major challenges; it provided the argumentation for drawing some conclusions about the effectiveness of the steps undertaken up to present and about next issues to address:

On the country level: Undergoing a period of complex societal changes, the country has undertaken numerous efforts for responding to the current EU strategy in the energy field. They have resulted in dynamic changes of the national energy system with regard to energy production, distribution and consumption. The search for relevant approaches to EE under the particular social, economic and cultural context have motivated numerous pilot initiatives aimed at increasing the currently low EE of the housing stock but also at building the needed technological and administrative capacity at all levels in the country. The steps undertaken in providing grant-based financial support in parallel with empowering the local governance level and entrusting the collective decision making of homeowners have brought some positive results that should be carefully studied, and further action encouraged.

On the local level: The unique self-organization pattern of the local authorities, emerging from a centralized governance system with limited legislative powers and budgetary autonomy, but bearing increasing responsibilities and public expectations, proved to be an instrument for overcoming policy and regulatory deficiencies, as well as social, economic and environmental barriers at the local level through exchange of best practices and experience and access to alternative sources of financing. However, in a congested market driven by generous subsidy schemes and short-term governance visions, the collective action loses its appeal. In this relation, policy frameworks at national level needs rethinking in terms of design of the available financial tools, shifting from simple "adoption" of resources to more sustainable financing schemes, targeting proactive investment behaviour, innovation and ambition within the development programmes.

On the technology level: Functioning residential buildings are complex socio-technical systems; during their lifecycle they undergo numerous changes depending on various factors. The technological aspects of the EE-aimed interventions need to be related to varying aspects of inhabitants' needs and behaviour, perceptions of comfort, economic capacity, ownership, etc. The collective ownership on multifamily buildings results in a situation of varying capacities, attitudes. The buildings being equipped with energy installations of different type and age might result in the lack of interoperability between elements, services and uses. Relevant technological expertise is required throughout the life of the building in support of an adequately informed decision-making process at the level of the owners' collectives yet, it is not always available or practically accessible; providing such an expertise needs an explicit well-focused effort.

On the EU level: the major challenge in providing an integral policy framework would be expected to stem from the diversity of inherited and currently evolving socio-technical situations in places of differing climate, culture and emerging challenges. The one-size-fits-all approach should be therefore considered inappropriate; specific paths to reaching the common goals under varying conditions should be searched for; the mid- and long-term consequences of tested approaches should be taken into consideration.

8 Spain

8.1 Background

The Spanish case study deals with shared residential energy self-consumption from Photovoltaic (PV) systems. Until recently, this type of shared self-consumption from PV systems has not been allowed under Spanish Law. A recent court sentence, however, has opened the possibility of realising shared energy self-consumption in residential buildings and urbanisations. Consequently, consumers have started to take actions and there are now good chances that shared PV installations for self-consumption proliferate. Holaluz, one of the new retailers offering renewable energy, has been the first to successfully implement a shared residential system for self-consumption. The system is composed of seven solar panels and a smart battery and is located in Rubí, Cataluña. The installation provides service to the house owner and to one of the neighbours. This case study focus on two aspects:

- Understanding how the administrative environment affected the decision of Rubí's neighbours to pioneer in the installation of a shared self-consumption system, specially how the change in regulation influenced their behaviour;
- Analysing the how the new regulatory challenges may require the formalisation of rules and agreements among potential self-consumers and how this can impact on the proliferation of shared PV systems for self-consumption.

The collective energy consumption was specifically affected when the so-called "sun tax" legislation introduced in 2015 imposed restrictions on shared residential self-consumption from PV systems. Consequently, self-consumption was only allowed for common elements, such as the garage, electricity in the staircases or elevators, and for individual neighbours having their own installation.

This regulation was appealed against at the Constitutional Court by the Government of Cataluña arguing a breach in the scope of competences assumed by the Government of Cataluña in matters of promotion and management of renewable energies and energy efficiency. The Constitutional Court ruled in favour of the Government of Cataluña and removed the provision that outlawed shared residential self-consumption from PV systems and supports the possibility of implementing self-consumption systems in residential areas and multi-apartment buildings where several users can benefit from them. The sentence highlights that these systems are a means to implement the nearly zero-energy buildings to which the European Union obliges after 2020.

The Constitutional Court also stated that the State does not have the power to enrol and to manage the registration of the systems, which is under the competence of the autonomous communities. This means that the autonomous communities are responsible for regulating the shared self-consumption systems and their registering system.

However, there is currently a legal gap and any homeowners' association could install their system without any regional regulation. It seems that the autonomous communities have different visions regarding the need to regulate shared self-consumption systems. While some autonomous communities analyse the possibility of having regional regulations to assure a greater legal security for citizens who decide to share the energy they generate, other autonomous communities do not see the necessity for such a regulation.

In addition, the Spanish Government has presented a new regulatory proposal that, among other measures, regulates technically and economically the shared residential self-consumption. The draft regulates shared self-consumption whether the owner of the system is the consumer of the energy produced or not. This entails that the regulation accepts that the owner of the system supplies the energy to several consumers, opening a new business niche. However, the regulation establishes several restrictive elements. First, the self-consumption system must be in the same property registry number as the consumption point. Second, the electricity generated by the system will be distributed among consumers depending on the power they have contracted unless they reach a different agreement. This individual fee is paid every hour, so the that the energy that is not consumed every 60 minutes is injected into the network. Therefore, it is not possible to compensate some consumption points with others. Although in some cases the energy surplus can be sold, the imposition of an individual fee cancels the main advantage of sharing the same system, that is, making the most of all the self-generated energy and avoiding having energy surpluses.

The current situation for collective energy consumption from PV systems is very uncertain. Although after the sentence of the Constitutional Court shared residential self-consumption is allowed, the legal uncertainty and the unsecure regulatory environment is a barrier for collective action in this field. Still, some initiatives of shared self-consumption from PV systems have arouse and one of them will be analysed as case study in the following sections.

8.2 Description of Case Study 1: Shared residential self-consumption from PV systems in Rubí, Spain

As explained in the previous section, until recently shared self-consumption from PV systems have not been allowed under Spanish Law (Royal Decree 900/2015). The sentence of the Spanish Constitutional Court, however, opened the possibility of realising shared energy self-consumption in residential buildings and urbanisations. Consequently, consumers have started to take actions and there are now good chances that shared PV installations for self-consumption proliferate.
The first installation of such shared residential self-consumption has been implemented in Rubí, in the region of Cataluña (Spain). One of the new retailers offering renewable energy, Holaluz, was asked to install the system composed of seven solar panels and a smart battery. The system provides service to the house owner and to one of the neighbours.

The initiative started when the neighbours of the building (two-storey building, with common entrance and garage) contacted Holaluz to install an individual self-consumption system. At that time, shared self-consumption from PV systems were not allowed under Spanish law. However, this regulation (Royal Decree 900/2015) had been appealed against at the Constitutional Court by the Government of Cataluña.

During the process of installation of the individual system the Constitutional Court ruled in favour of the Government of Cataluña (Sentence 68/2017, 25th May 2017) and allowed the installation of shared self-consumption from PV systems. Consequently, the driver of the initiative (owner of the building) along with Holaluz decided to turn the individual PV installation into a shared self-consumption system to provide with energy the two neighbours living in the building.

8.2.1 Description of the representatives of the case study

The neighbours of the building: the neighbours of the building were, initially, promoters of an individual PV installation for self-consumption. These neighbours were already environmentally aware and conscious of the importance of the need of a sustainable energy model. They were already consuming renewable energy but were willing to install self-consumption systems. However, the roof of the building only allowed for one self-consumption system and therefore, it was one of the neighbours who contracted the installation of the system and who would benefit from it.

The retailer responsible for the installation of the system: the retailer was initially responsible for installing one self-consumption system but once the PV panels were installed the Constitutional Court's sentence came into play and the retailer understood that it had the opportunity to pioneer the installation of shared residential self-consumption system in Spain. It thus became the driver of the initiative, informing the neighbours of the building on the possibility they had ahead and leading all the process that led to the effective installation and operation of the system.

The Government of Cataluña: the role of the regional government was twofold. First, because of its appeal to the regulation that outlawed shared residential self-consumption from PV systems, these systems were allowed by the sentence of the Constitutional Court. Second, the Energy Institute of Cataluña (ICAEN) supported and accompanied the retailer in the whole bureaucratic processing with the energy distribution company. As it will be explained below, this has been one of the more complicated stages in the process of operationalising the system and therefore, the supportive role of ICAEN has allowed a smoother and less complicated process.

8.2.2 Main outcomes from the interview

The experience explained in the use case has been a breakthrough for the Spanish shared residential self-consumption from PV systems. It has opened the door to collective action in terms of energy self-consumption, consumers have started to take actions and there are now good chances that shared PV installations for self-consumption proliferate.

It has been a singular case where different elements aligned to make collective action in this field possible: the removal of regulatory barriers by a court sentence, the existing installation of an individual self-consumption system in the building, the willingness of the neighbours to turn the individual system into a shared self-consumption system and the leadership and support of the energy retailer to pioneer the installation of such system in Spain.

One of the success factors of this case has been the leadership of the retailer company that saw the opportunity to lead and support the neighbours in all the process of legalising the system according to the requirements of the distribution company, which took one year to be finalised. As pointed out by a retailer "*the decision to have a self-consumption system was of the client, but the decision to do this project was more our own than the client's*". There was a legal gap regarding how to measure and bill shared self-consumption and therefore it had to be negotiated and agreed with the distribution company. This lack of definition and unclearness was the most difficult barrier to overcome in the whole process. One of the interviewees mentioned that "*the distribution company wanted to intervene on to distribute energy among neighbours and put many barriers in this regard*". In this case, it was overcome mainly by the determination of the energy retailer but if the regulation remains unclear it will be an obstacle for collective action in this field. The support of the regional government in the negotiation phase was determinant to press the distribution company to reach an agreement. Since there were only two neighbours, the agreement between them was relatively easy, so the issue of how to measure and bill shared self-consumption was solved. However, this will be a problem in all future installations, unless it is clearly regulated, and will allow the distribution companies to complicate the process of legalisation of such systems. This will, ultimately, hinder and discourage collective action in this field.

It is currently being discussed in the Spanish Parliament how to measure and bill shared self-consumption, and one of the points of discussion is whether these self-consumers will need to create a legal entity such as a cooperative or some sort of ESCO to manage the distribution of the generated energy.

This experience can be considered as a pilot for figuring out which are the barriers hindering collective action rather than focusing on the enabling factors. The interviewees have mentioned that some sort of incentives (such as tax reliefs) could help shared PV installations for self-consumption to proliferate but they all have agreed that the key issue is the removal of bureaucratic and regulatory barriers and having clear and neutral and rules. As one of the interviewees pointed out, "*If the norm clearly stated how the energy must be billed, this would have to be done. The distributor could not object"*. Also, dissemination of successful experiences and information on the possibilities for collective action are mentioned as enabling factors. People need to be clearly informed on their possibility to install both individual and shared self-consumption systems. This work is being done mainly by small energy retailers and energy cooperatives with the collaboration of some local and regional public authorities but the big industry players are not involved.

Much remains to be done and it seems that there won't be a rapid spread shared residential self-consumption until the regulation is clear and other enabling measures are put in place. One of such measures is the possibility of sharing the energy surplus, which is not clear in the new regulatory proposal presented by the Spanish Government and still under discussion.

Additionally, given the high number of energy distribution companies operating in the different Spanish regions, more experiences such as the Rubí one need to succeed to foster shared self-consumption. Different distribution companies have different criteria (due to the lack of a common regulation) and different level of flexibility and, therefore, the fact that the shared self-consumption system was implemented in Cataluña does not mean that the same will happen in other Spanish regions. Before taking collective action and deciding to install such a costly infrastructure, consumers want to make sure that there is a precedent in their region and more pioneering initiatives will be needed. According to one of the interviewees, "this project will not allow shared self-consumption to be

generalized yet. It would be necessary to have such a system in each distribution zone to have a precedent in each zone".

8.3 General discussion and conclusion

- The case studies show how a change in the regulatory framework affects the decision of several consumers to pioneer in the installation of a shared self-consumption system. This is a clear case that shows how regulation affects collective action, to the extent of making it impossible and how a change in that regulation can pave the way for such collective action. It also shows how the determination and the pro-environmental attitude of consumers, more than funding and other incentives, motivates them to enter such a burdensome process.
- Nonetheless, the case also shows that due to other administrative or market barriers (the opposition of distribution companies) the support of other stakeholders might be necessary to trigger collective action. In some cases, new retailers offering renewable energy or energy cooperatives could lead and enable these initiatives by offering guidance and support to otherwise unexperienced neighbours or groups of consumers. They could have a key role in facing the challenge that bureaucratic burdens pose for those groups and overcoming the obstacles of the distribution companies.
- The case study has also identified other enabling factors that are needed to stabilise and boost collective action in this field:
- A clear regulation offering legal stability and avoiding the use of different criteria of the several electricity distribution companies in Spain. In this case, clear rules on how to measure and bill shared self-consumption is needed, as well as enabling to share the energy surplus among consumers.
- Control and standardisation of the requirements of electricity distribution companies to legalise the installations in order to avoid discriminatory situations in different regions.
- Promote shared self-consumption systems in medium-sized buildings where the agreement among neighbours to install such systems can be easier and more effective in terms of technical feasibility.
- Empowering consumers to understand and to face the administrative and market barriers they will encounter when choosing collective action. As mentioned before, the support of other stakeholders, along with information and training, can be a key enabling factor for collective action.

9 Turkey

9.1 Background

As far as Turkey's national energy framework and state-of the-art conditions are taken into account, it is foreseen that increasing energy demand and energy dependency, insufficient reserves of fossil fuels such as oil and natural gas, high costs of energy resources, and the current energy crisis, as well as problems regarding demand and supply balance, besides price instabilities in energy markets are the major factors shaping Turkey's national energy profile. In this regard, renewable energy resources emerged as a prominent driver to alleviate the adverse impacts of the above-mentioned factors (Energy Efficiency Association, 2017).

All these factors also trigger the establishment of collective structures such as renewable energy cooperatives. These collective structures are of high importance with respect to the fact that they create added value for the national economy and contribute to the employment. Renewable energy cooperatives particularly constitute significance in terms of in-place evaluation of indigenous and renewable resources, transformation of small scale capitals into large-scale investments, and electricity generation by prosumers (Energy Efficiency Association, 2017).

Renewable energy cooperatives also aim to provide scaled advantage and easy access for finance in licenced and unlicensed electricity generation. According to the Energy Efficiency Association, the renewable energy cooperatives are provided with an opportunity to generate unlicensed electricity up to 5 MW through the participation of more than 100 stakeholders (Republic of Turkey Ministry of Trade Directorate General of Cooperatives, 2018). Furthermore, additional quota will be allocated to these cooperatives benefiting from financial supports provided by IPARD (EU-funded Instrument for Pre-Accession Assistance for Rural Development) and state institutions and organizations (Energy Efficiency Association, 2017). In line with IPARD's ranking criteria, to be eligible for financial support, the collective structures including organizations, unions and cooperatives will be in an advantageous position (Agriculture and Rural Development Support Institution, 2018). Moreover, the cooperatives are allowed to be exempted from corporation tax and to benefit from domestic component support for 5 years (Bilal and Bayraklı, 2017).

Within the framework of Turkey's energy policies that have been shaped through a focus on renewable energy resources, related state institutions and organizations have started to provide financial and technical support for the so-called collective structures. Under the scope of regional plans designed by the development agencies, the concepts of sustainable development and environmental protection have been highlighted. Accordingly, renewable energy has been regarded as a key sector for some specific regions (Izmir Development Agency, 2018). In accordance with financial supports and grants provided by development agencies, specific priorities are defined. For example, the West Mediterranean Development Agency (WMDA) puts forward the following priorities:

1. Investment incentives for unlicensed electricity generation from renewable energy resources of 100 KW or more capacity,
2. Financial support mechanism for renewable energy resources in agricultural production (WMDA, 2018).

Moreover, Small and Medium Scaled Enterprises Development and Promotion Agencies in Turkey contribute to collective structures by designing support programs. The Energy Efficiency Support Program has turned out to be a successful example in terms of increasing energy efficiency awareness and sustaining the related activities. Within the scope of this program, the key points to be supported include consultancy services for energy efficiency projects, energy manager training services, and implementation expenses (Small and Medium Scaled Enterprises Development and Promotion Agency, 2014).

9.2 Description of Case Study 1: A Dairy Cooperative in Aegean Region of Turkey

Our case study is a dairy cooperative founded at the end of the '60s, and located in a town with a population of around 100.000 in the Aegean Region of Turkey is the largest cooperative in Turkey with the participation of more

than 2000 milk producers. The cooperative's area of operation was exclusively focused on joining the forces of its members, the dairy producers for processing milk and selling their products towards gaining competitive advantage. The cooperative adopts the protection of the producers as mission, and it aims to decrease production costs and increase production quality. Besides its investments in these fields, the cooperative has been successfully conducting multiple projects with the support of several government entities such as one of the Development Agencies in the Aegean Region of Turkey, the Metropolitan Municipality, and Ministry of Food, Agriculture and Livestock. Moreover, the dairy cooperative that has a leading role in the evolution of cooperative model in Turkey was selected as the best Rural Development Model in the world by United Nations.

The fundamental reason to choose the dairy cooperative as a sample for our case study is the solar energy-based milk cooling system used in the factory. In this regard, the cooperative is regarded as a successful model for our project with respect to its interests in grants and investments for renewable energy projects. The case study mainly concerns the establishment of solar panels in the central plant of the cooperative as well as plans to use solar energy for cooling the milk at points of collection.

In the interviews conducted with two different representatives, working in the management and engineering of the plant, the details of renewable energy projects, the process in these projects, and their outcomes are thoroughly examined. Moreover, the organizational structure and decision-making processes in the cooperative are analysed by considering motivating factors and barriers of the project. The analysis also involves how the government entities give support for these projects and restrain them by considering the experiences of the authorities in cooperative.

9.2.1 Description of the representatives of the case study

Within the scope of our case study analysis, interviews were conducted with two different representatives that have an active role in project investments and decision-making processes in the cooperative, aiming to reflect the differences and similarities regarding the perceptions of employees on different levels of the organization.

The first representative is an engineer of the factory and a member of R&D team (R1). The R1, that experienced the decision-making process of the solar energy project from the beginning to the end, shared his observations regarding the project process. Taking an active role in both R&D process and implementation phase of the project, the R1 highlighted the advantages and disadvantages of conducting a project in a cooperative atmosphere and multi-stakeholder system by considering the leading role of the related Dairy Cooperative.

The second interview was conducted with a manager (R2), in order to capture the experiences and observations regarding the project and related topics. Besides his duties as manager, R2 also participated in R&D team meetings. Through this interview, we were able to obtain information regarding the organizational structure of the cooperative and decision-making processes in detail. The manager, who presented the idea of a renewable energy project to the Board of Directors, also played a role as project coordinator, and emphasized the administrative, financial and legal problems as well as support mechanisms and solutions for the improvement of the projects.

Throughout the project, the company hired a project consultant since the company did not have the expertise to manage the related grant processes and the paperwork. Both interviewees agree that the associated process requires some bureaucratic know-how and is too complex to be handled by an industrial company alone.

9.2.2 Main outcomes from the interview

The project was launched in 2016, and it was completed in 2017. As agreed by both interviewees, the major aim was to decrease the energy consumption by covering the whole rooftop area of the milk processing plant with photovoltaic panels. The planned capacity is 200 KW. Once the project was completed and came into operation, the measured capacity utilization efficiency was around 80%. One of the Development Agencies in the Aegean Region of Turkey, by which 70% of the project expenses were covered, was a partner and supplier of this project. Moreover, a project consultant has been hired for those projects to have an accurate and accelerated process management.

The R2 points out that there were several motivators of the project including energy efficiency, cost reduction and benefiting from the grants offered by the government agencies (specifically the development agency for this case). He further identifies the grant amount as the foremost factor.

> *"The project was not only about solar energy. It had an aim to provide a proper system with solar energy generation and energy efficiency."*
> *"As a matter of fact, the 70% grant increased our motivation to conduct such a project and we achieved our goal."*
> ***Interview Turkey, Male Respondent, manager***

The cost reduction and efficiency increase goals also have direct and indirect impacts for the partners of the cooperative:

> *"These projects protect the rights of the farmers. Namely, the decrease in energy consumption becomes cost saving. If the costs start to decrease, there will be increase in sales and the milk prices will rise. This will be a great opportunity for farmers. Similarly, the payment amount in electric bill might be decreased and the sales might be increased, accordingly."*
> ***Interview Turkey, Male Respondent, manager***

On the other hand, the R1 believes that the motivator is mainly environmental factors since the cooperative is closely dealing with agriculture and nature, not referring to cost issues.

> *"The major driving factor is not about costs. On the contrary, the fundamental driving factor was totally about environmental issues since we believed that we had to be more different than other companies. This idea stems from the fact that our cooperative is closely dealing with agriculture and nature."*
> ***Interview Turkey, Male Respondent, engineer***

> *"The first and foremost priority should be environment. Secondly, the raw materials should be obtained from nature. Then, we can make an organic production and the consumers can be supplied with organic products. In this regard, the environment is the most important issue. The costs are in the second place."*
> ***Interview Turkey, Male Respondent, engineer***

With the ideas of implementing a funded project in mind, one of the main drivers was to come up with a project that fits the funding schemes, although not stated very openly:

> *"This project had a different structure. Namely, we had a consultant that closely followed-up the grants. This project was a part of rural development. He made a research about the grant and informed us about its details"*
> ***Interview Turkey, Male Respondent, manager***

> *"The costs are in the second place. As Development Agencies support these kinds of projects, they are not cost-oriented."*
> ***Interview Turkey, Male Respondent, engineer***

> *"As a matter of fact, 70% grant increased our motivation to conduct such a project and we achieved our goal."*
> ***Interview Turkey, Male Respondent, manager***

There were also other motivations stated, such as co-operative responsibility and being the role model for the partners of the cooperative and for the farmers, through a multiplier effect:

"... the Chairman wanted to be a role model with respect to environmental issues. We should also keep up with developing technology, and we have to improve our working conditions. As I have explained before, we have 2000 partners as a cooperative, and we have to be a guide for all these partners. Moreover, these partners should also be good models for farmers. We can simply become a role model for farmers by effectively using energy resources, properly launching products to the market, and protecting the environment."
Interview Turkey, Male Respondent, engineer

"The only desire of the Chairman is to have respect for the environment, become a role model, and protect the environment."
Interview Turkey, Male Respondent, engineer

"We can simply become a role model for farmers by effectively using energy resources, properly launching products to the market, and protecting the environment."
Interview Turkey, Male Respondent, engineer

The decision making process, as formally well-defined by the company follows a rather systematic approach that points to a top-down process:

"Firstly, I [the person with a project idea] prepare a file for the project by writing a part on scope and objectives. Namely, I [the person with a project idea] make a simple calculation and prepare a feasibility report. We present the report to the President and Board of Directors. We have also an R&D commission. The commission consists of Chairman of Board of Directors and managers from other departments such as Human Resources. Our R&D system is much more oriented to exchange of ideas rather than a technical R&D system. It involves the whole organization from managers to employees. If the commission approves our suggestion, we directly present it to the President"
Interview Turkey, Male Respondent, manager

However, the actual decision-making process does not totally fit with the formally defined system, as the situation in this case demonstrates. Although the managers of the company and the technical staff carry out regular meetings to come up with project ideas, the initial idea for this project was suggested by the Chairman of the cooperative. As an initiator, the motivation behind the project is the 'dream' of the Chairman of the cooperative to cool the milk with the electricity generated from solar energy. The manager argued that the Chairman is highly effective in decision-making processes as he is an innovative person and a supporting manager. Thus, it seems that the decision-making process is rather top-down and hierarchical.

"The Chairman is highly effective in decision-making process as he is an innovative person. He is always accepted as the leader in all the projects. … As it was a big project, the decisions were taken by the Chairman. Nevertheless, we always shared our ideas and suggestions with him."
Interview Turkey, Male Respondent, manager

The manager stated that the project team voluntered to participate in the project because of their personal interests in the field and since the project had an innovative perspective. The engineer, however, believes that the project team was more functionally established rather than voluntarily.

Regarding this project, the role of the public authorities is critical. As the manager argues, the project would not have been realized if the development agency did not have a convenient grant proposal at that time. Even further, the manager states that the process ran rather in the reverse order: the consultant has the responsibility of analyzing the relevant grant proposals and providing suggestions to the cooperative. Then, the cooperative identifies projects that will fit the current grants, and an application is made. If the grant is approved, the project is started.
The public authorities also provide support to cooperatives like this dairy cooperative, through the legislations that favour cooperatives. The support is via financial incentives, grant calls exclusive for cooperatives, or a less restrictive set of bureaucratic burden. Specifically, for this case, the dairy cooperative benefitted (and is currently

benefitting from) the financial support from the granting agency, a development agency, on- and off-grid systems, and the state guarantee for sale and purchase of the electricity produced from solar energy.

> *"Under exiting conditions, the government can probably provide us with the Ministry of Agriculture's grants or Rural Development grants."*
> ***Interview Turkey, Male Respondent, manager***

> *"One of the most important advantages of a cooperative is the opportunity to conduct projects as it is easier to take financial support. As a cooperative that proved its success, we can take financial aid from the government and we can put our projects into practice. In this regard, the government gives a priority to us rather than private companies."*
> ***Interview Turkey, Male Respondent, engineer***

> *"In case you have a surplus electricity, the government provides guarantee of purchase."*
> ***Interview Turkey, Male Respondent, engineer***

> *"However, the on-grid systems enable you to sell the electricity to the grid with guarantee of purchase. Moreover, the government provides incentives such as additional price for electricity generation per KW and environmental protection. The government guarantees that the company will be provided with additional price if it establishes renewable energy facilities so that the carbon emission can be decreased."*
> ***Interview Turkey, Male Respondent, engineer***

The interviewees also pointed to hindering factors brought about by the public authorities. To begin with, the projects are not fully funded; the company needs to have funds to account for at least part of such projects:

> *"As a cooperative, we benefitted from all rural development projects. It is also related to your financial power. Except for 70% grant, you need to have enough financial resources to cover 30% of the expenses. For a development agency project, it is sufficient to cover 30% of the expenses or you need to pay 50% of the price for rural development projects."*
> ***Interview Turkey, Male Respondent, manager***

Apparently, this prohibits some companies that are eligible in terms of innovative ideas and operational capabilities from applying to funding schemes:

> *"These projects require innovative ideas, financial power and fast decision-making processes. If you have these three dynamics, you can conduct successful projects. There are also other cooperatives that can come up with good ideas but they do not have adequate money to turn them into projects. Therefore, sufficient financial resource is of high importance"*
> ***Interview Turkey, Male Respondent, manager***

Moreover, the grant process is rather complex and the cooperative needs to work with a consultant, who explicitly follows the relevant documentation and ensures that the legislative process is carried out appropriately. The respondents also point out to the legal procedure, such as approvals and controls by government authorities always take too long and have the risk to delay the projects.

> *"…the procedures took a long time as it might be difficult to receive necessary permissions. These projects have high costs and technical procedures might take long."*

> *"…it is an intensive process in terms of procedures and collecting documents. … It will take quite a long time for an incompetent person to write a project. ... It is not impossible for an incompetent person to write a project, but it will not be so successful as a project written by a project consultant."*
> ***Interview Turkey, Male Respondent, engineer***

"This project had a different structure. Namely, we had a consultant that closely followed-up the grants. This project was a part of rural development. He made a research about the grant and informed us about its details."
Interview Turkey, Male Respondent, manager

The manager also complained about the frequent changes in the legislative/legal framework, which may affect the profitability, even feasibility of the project. His main argument was regarding the need for a consistent and continuous support from the public authorities during all the phases of the project. The cooperative currently faces another serious problem with the legislation. For different sizes of cooperatives/companies, different grants are designed by the public authorities. This setup is designed to favor smaller cooperatives/companies; thus, they have a wider variety of grants available. Now, the cooperative has increased capacity and is becoming a larger cooperative, therefore they are unable to apply for the types of grants that they used to. In a sense, the cooperative is partially losing support from public authorities because of becoming successful.

"Currently, we cannot benefit from rural development schemes owing to the fact that we are growing and we are not a small or medium-scale cooperative any more. We are regarded as a large-scale organization in terms of the number of employees, which brings a disadvantage."
Interview Turkey, Male Respondent, manager

The respondents also think that projects on renewable energy should be better supported, through higher grant amounts, smoother application procedures in (easier, shorter, and clearer), and smoother implementation and follow-up procedures.

"I think renewable energy resources should be promoted more. The incentives and support for these resources might be increased. There are many companies that do not have enough information about grants provided for renewable energy."
Interview Turkey, Male Respondent, engineer

For one thing, as with many cases, successful projects provide good examples and motivate other potential projects as well:

"Actually, they have some attempts. Some of the farmers benefit from these technologies in irrigation systems. Some of them even establish cooperatives to take financial support and grants. In previous years, there was a project for the establishment of a biogas facility."
Interview Turkey, Male Respondent, manager

Finally, the manager argues that, due to the high level of foreign dependency of the economy in Turkey, currency rate fluctuations pose most challenging factors for projects. That are instabilities and uncertainties are among the most hindering factors.

"As we are highly dependent on foreign equipment used in renewable energy generation systems such as solar panels, fluctuations in foreign exchange rate negatively affect the projects. This means that project costs will double."
Interview Turkey, Male Respondent, engineer

"Right now, the relations are so tense about the foreign exchange inflow and all materials you will buy are sold in euro. This can scare us. We can make a loaded agreement in euro about the pre-payment; there can be a policy to cause a great loss for contractor company; however, this agreement needs to be evaluated. There are very strict rules in your commercial agreements especially about euro parity. Otherwise, you do not have anything to do; the materials you will buy are the same, but someone will have a loss until the end of the project."
Interview Turkey, Male Respondent, manager

9.3 General discussion and conclusion

In the last years, the executives of the Dairy Cooperative started searching for opportunities to extend the collaboration to other areas. The main idea was to utilize the power of the vast number of members and to decrease their costs. To this end, the executive board of the cooperative started a call for projects and ideas towards cost reduction. One of the managers of the milk processing and production facility came up with the idea of using solar energy to decrease energy costs. The idea was supported by several members of the executive board and the manager of production was encouraged to develop and implement plans for the project. The focus of the project was decided to be the use of solar energy for cooling the milk collected from producers. Since preserving the cold chain for fresh milk is crucial for food safety, cooling the milk at the point of collection and keeping it cooled during transportation is significant. The project aimed at establishing photovoltaic panels at 62 collection points and using the produced energy for cooling the milk. The project that started in 2016 received a grant of around €200.000 from one of the Development Agencies in the Aegean Region of Turkey and is now in progress. One other component of the project is the installation of photovoltaic panels on the roof of the production facility to be used for the same purpose, cooling the milk, as well as other heating-cooling needs.

Several other initiatives are inspired by a Dairy Cooperative in the Aegean Region of Turkey project and are willing to implement similar projects. The project managers receive invitations from other cooperatives and associations, for sharing their experiences. There are already several proposals for joint ventures with Dairy Cooperative in the Aegean Region of Turkey regarding renewable energy initiatives.

In terms of Task 5.5, the case looks interesting on several fronts. To begin with, the evolution of the project idea stems from the demands by members to search for ways of cost reduction. The demands were considered by the management and finally turned into the project idea by the middle managers and supported by the policy-making level. Hence, the idea started as bottom-up, then continued as top-down.

Moreover, the mechanism that was in effect for the dissemination and spread of the project impact may also be considered as interesting. Currently, it turned out to be from collective decision-making level to collective decision-making level, as opposed to the common practice, that is, individual to collective. The analysis of mentorship, partnership and joint venture offers that the cooperative receives may lead to an understanding of impact mechanisms.

Another point of interest is the existence and roles of enthusiastic people or frontrunners in such initiatives. Although the process is one of the collective decision-making level, it was ‘pushed through’ the system by several members of the executive board of the collective and one middle manager.

The case reveals bureaucratic problems with the legislative infrastructure and project funding schemes. The respondents argue that the funding process is a complex one and cannot be handled by the company without the involvement of an expert consultant. At one point, the process turns into one where the consultant is continuously following funding opportunities and informs the company, triggering the development of the project. The documentation and other legislative requirements are also guided and closely monitored by the consultant. The respondents also point out that the formal procedure always takes too long and has the risk to delay the projects. The uncertainty associated with the frequently changing legislative/legal framework also comes up as a barrier for such projects. To begin with, such uncertainty affects assessments and projections about the profitability, even feasibility of the project. The respondents demand a consistent and continuous support from the public authorities during all the phases of the project.

One other related issue pertains to the segmentation of the companies/cooperatives regarding incentives or funding schemes. Different sets of opportunities are available for different segments, and usually more restrictive as the size of the company increases. This setup is designed to favour smaller cooperatives/companies; thus, they have a wider variety of grants available. However, in this case, a company may be placed in one segment for a year and implement successful projects may, owing to its success, switch to another higher segment the next year, decreasing its chances of receiving funds for similar projects. This has been experienced by the dairy company that is discussed as the case company.

10 General discussion

10.1 Summary of main results across the different countries

The main goal of Task 5.5., in continuity with the more general aims and activities conducted in the entire WP5, and in connection with the activities of WP6, was to conduct an exploratory analysis to investigate what are the main enabling factors for collective action in the energy transition domain, as well as the main barriers that might hinder such transition. In particular, we used a multi-national case study based approach, in order to understand and assess to what extent these enabling factors have the potential to influence energy consumer/prosumer behaviours. In this section we present a summary of the main motivators and barriers for transitions to collective actions in sustainable energy initiatives, as they emerged from the results of the investigation conducted across the various case studies considered in the different countries involved in Task 5.5. Below, a summary table of the main case study results is provided for each of the country involved.

Table 10.1: Summary of motivators and barriers in case studies from *Italy*

<table>
<tr><th>COUNTRY</th><th>ITALY</th></tr>
<tr><td colspan="2">Name of case study(ies)
1) E-go Car Sharing
2) Co-housing company</td></tr>
<tr><td>Motivators and facilitators

- Initiators' personal attitude towards sustainable mobility
- Active collaborations with energy companies
- Cooperation attitude between people who share the same sustainable lifestyle
- Sense of group membership and pride, collective identity</td><td>Hindering factors

- Insufficient sensitivity and lack of environmental concern of community involved in the case study
- Failure in an awareness-raising campaign
- Technical problem related to managing electric vehicles' use
- Complicated bureaucratic procedures
- Lack of a stable normative framework</td></tr>
<tr><td colspan="2">Enabling factors for collective action which may be fostered by policy-makers

a) Collective identity, social support and sense of community
b) General awareness campaigns on global change and on specific low-carbon initiatives
c) Involvement of private company's capital in pilot projects of low-carbon initiatives
d) Stability of normative frame, bureaucratic deregulation and financial incentives for individuals and firms</td></tr>
</table>

Table 10.2: Summary of motivators and barriers in case studies from Norway

COUNTRY	NORWAY
Name of case studies **1) EV charging in Housing Cooperatives and Car sharing** **2) Smart electric vehicle charging points in housing cooperative process**	
Motivators and facilitators - **The boards' knowledge about peak hours and load control.** - **The EV owner's knowledge about the grid and charging solutions.** - **Increasing EV demand. For EV to be a success the easy access to charging is crucial.** - **Smart charging can make boards save money when avoid peak hours.** - **New, specialized smart companies targeting cooperative housing**	**Hindering factors** - Boards lacking awareness of challenges related to the electricity grid and charging - Negative focus on home EV-charging in the media. - Challenges of coordination and local organization: moving from individual to collective decision.
Enabling factors for collective action which may be fostered by policy-makers a) **Policy makers have made it easier for section owners in housing cooperatives to provide charging point for electric cars through new regulations. The board cannot refuse sections owners to charge.** b) **In Norway, EVs have taken 47 % of the market share for new vehicles due to strong incentives to EVs. To build on these steps policy makers could:** I. **Consider implementing new economic incentives for collective smart charging solutions.** II. **Collect and synthesize knowledge across cases, and produce standardized advice on organization, technology choice and practicalities e.g. through ENOVA**	

Table 10.3: Summary of motivators and barriers in case studies from Austria

COUNTRY	AUSTRIA
Name of case study(ies) **1. E Car Sharing in Graz** **2. Co-housing project in Vienna**	
Motivators and facilitators ***Car sharing*** - **Strong ideological background** - **Funding** - **Consulting services** - **Regulatory framework** - **Consulting program for cities, communities and regions** - **To talk to people and provide information** - **Pick up the user where he or she is at that certain moment** **Motivators and facilitators** ***Co-housing*** - **Clear task sharing of the people involved** - **Cannot be done by laymen: the "leader had to be informed and become a specialist over the years"** - **Look for people who share the same ideas** - **Many (good!) discussions** - **Clear contracts** - **Clearly defined budget from the beginning** - **Every project has to be developed very specifically according to the respective framework conditions** ***In common between case studies*** - **Take fears of people seriously and be there for people** - **Personal conviction**	**Hindering factors** ***Car sharing*** - Public decision-makers nevertheless prioritize central initiatives and have committed themselves to keeping it that way for the next few years - Negative framework conditions **Hindering factors** ***Co-housing*** - The requirement to provide a certain amount of apartments to people who did not know anything (and were not so much interested) in the co-housing idea
Enabling factors for collective action which may be fostered by policy-makers a) **For carsharing: provide good framework conditions not only for central initiatives but also to private ones** b) **For co-housing: dedicate a whole housing block for co-housing projects**	

Table 10.4: Summary of motivators and barriers in case studies from Bulgaria

COUNTRY	BULGARIA
Names of case studies **1. Homeowners' energy cooperative** **2. Grant based complex renovation of residential buildings** **3. Municipal Energy Efficiency Network EcoEnergy**	
Motivators and facilitators ***Homeowners' energy cooperative*** - **Well-organized small communities with a developed set of rules; teams that have decided to take advantage of the services of professional managers;** ***Grant based complex renovation of residential buildings*** - **The availability of 100% funding for the energy saving measures.** - **The legislation framework enabling the registration of owners' associations to represent the owners was an important step at the national level** - **Long-term personal commitment and responsibilities voluntarily taken by owners with relevant technical expertise and self-identification with the idea.** ***Municipal Energy Efficiency Network EcoEnergy*** - **The estimated need for developing the national legislative and institutional framework (1997-2007)** - **EU collaboration projects and networks** - **The proactive involvement of NGOs and citizens' organizations**	**Hindering factors** ***Homeowners' energy cooperative*** - Encountered inner barriers: the large number of stakeholders with different social and economic profile; the lack of community spirit caused by the frequently changing or missing homeowners; the lack of experience. - The numerous short-term changes in the active regulatory provisions, which resulted in overall uncertainty about rules and outcomes. - The non-finalized liberalization in the energy sector, the monopoly on electricity supply and purchase, and on district heating supply. ***Grant based complex renovation of residential buildings*** - Deficit of awareness and understanding about the currently active funding schemes in support of energy efficiency measures. - Low level of trust among the owners to the professional organizations providing services ***Municipal Energy Efficiency Network EcoEnergy*** - Centralized governance system - The availability of excessive grant financing with non-synchronized goals and priorities. - The achievement of the initially set targets with missing clear message on next goals could be a strongly demotivating factor.
Enabling factors for collective action which may be fostered by policy-makers ***Homeowners' energy cooperative*** a) **Well communicated reforms based on sound impact evaluation.**	

Grant based complex renovation of residential buildings

a) **Further empowerment of homeowners' collectives through clearly defining their rights and obligations in the process aimed at energy transition.**

b) **Simplification of the administrative procedures for EE measures related to the refurbishment of buildings and installations**

c) **Reducing the share of owners required in collective decision-making on the implementation of EE measures (from 100% to 75%).**

d) **Synchronizing all rules and actors' practices in the implementation of EE measures but also during the long-term functioning and management (the life cycle) of the buildings and the installations would result in more positive attitudes among the owners implementing their own collective decisions;**

e) **The clear identification of needed action and responsibilities for the proper exploitation and maintenance;**

f) **Providing for higher level of trust to the service providers - based on training, certification and experience in innovative technologies; the role of public procurement and demonstration projects should be explicitly considered.**

g) **Developing effective tools and mechanisms for the communication between energy service companies (ESCO) and collective homeowners.**

Municipal Energy Efficiency Network EcoEnergy

a) **Smart policy and financing design requiring proactive investor/prosumer behaviour.**

b) **Setting up of a clear long-term vision with ambitious targets, continuity in policies.**

c) **Support to innovation, research and market development; promoting best practices (also through procurement policies).**

d) **Establishing favourable conditions for local administrative and professional capacity building.**

Table 10.5: Summary of motivators and barriers in case studies from Spain

COUNTRY	SPAIN
Name of case study(ies) **1. Shared residential self-consumption from PV system**	
Motivators and facilitators - **Leadership or backing of an energy retailer or other entities that facilitate the bureaucratic processing** - **Previous pro-environmental attitude and awareness of the need of an energy transition**	**Hindering factors** - Specific regulatory restrictions on shared self-consumption from PV systems. - Legal uncertainty and unsecure regulatory environment. - Legal gaps and undefinition regarding the measurement and billing of shared self-consumption - Need of agreement of very heterogeneous groups of neighbours, with different attitudes and interests regarding renewable energies, shared self-consumption systems, their legality and investment costs. The need of agreement between neighbours regarding the measurement and billing of shared self-consumption is especially critical in it not a clear regulation
Enabling factors for collective action which may be fostered by policy-makers a) **There is no need of financial incentives, but the removal of bureaucratic and regulatory barriers** is essential**.** b) **Clear regulation offering legal stability and avoiding different criteria in terms of the requirements to legalise shared self-consumption.** c) **Disseminating successful experiences of collective action and informing on the possibilities for such collective action.** d) **Empowering consumers to understand and face the administrative and market barriers that will encounter when choosing collective action**	

Table 10.6: Summary of motivators and barriers in case studies from Turkey

COUNTRY	TURKEY
Name of case study **1. Dairy cooperative**	
Motivators and facilitators - **Existing incentives** - **Project funding through regional development agencies** - **Operational costs savings** - **Environmental contribution**	**Hindering factors** - Sophisticated legislation - High-cost of investment - Inexistence of similar implementations in Turkey - Constant shifts in legislative processes
Enabling factors for collective action which may be fostered by policy-makers a) **Establishment of a smoother legislative procedures** b) **Promotion of existing incentives and funding options** c) **Supporting projects with environmental contributions** d) **Increased level of technological support**	

10.2 Conclusions

As outlined in the introduction, the main aim of Task 5.5 was to assess what kind of enabling factors for collective action in the energy transition domain could be identified, and to what extent these enabling factors have the potential to influence energy consumer/prosumer behaviours. Both, motivating and facilitating factors as well as hindering factors were collected and summarized in the tables in chapter 10.1. Both give useful hints on how policy makers can react on that to improve the framework conditions.

The exploratory analyses of Task 5.5 dealt with case studies from six countries throughout Europe, covering the three technology areas that were defined at the beginning of the project: electro mobility, smart energy technologies and buildings. The case studies were selected carefully as they should help to reveal how and why we make the energy choices that we presently do across Europe.

From the description of the case studies and specifically from the interviews with key stakeholders policy-relevant advice for the authorities in the respective countries and in a next step, for the European Commission and its Member States in its quest to realize the goals of the Energy Union can be derived.

Most cases cover the area of e-mobility, in two cases connected with e-car sharing, in two other cases (both in Norway) connected with the installation of charging points. Another area were co-housing projects with two cases in two different countries and another two cases dealt with self-consumption of electricity from PV systems, in one case it was done by two neighbors, in the other case, it was done in a cooperative with more than 2.000 members. Other cases were dealing with energy cooperatives, the renovation of residential buildings and a municipal efficiency network.

Firstly, some characteristics of the different countries (key words in italic) will be summarized here briefly:

In **Italy** the highest barrier is the difficulty of the transition for upscaling the initiatives from an individual (or small group) action level to a more systematic collective level, which would likely result in a more systematic adoption of sustainable energy opportunities across larger strata of the population in the Italian society. This is strongly linked to the bureaucratic barriers existing in the *complex regulatory framework* in Italy, both *at a national and at a local governance level*, which seems to limit the individual willingness to undertake and implement more systematic actions in sustainable mobility or sustainable housing.

For **Norway**, due to its high share of hydroelectric power (95.8%), it is important to roll out new charging *infrastructure* to advance the e-mobility transition further and to work on the weak electricity grids, improving grid management. People are highly motivated, but these initiatives also have to be organised and managed properly and a constructive dialogue has to be established. These are not simply passive groups who respond to policies and market signals. Rather, they can serve as a key actor group, both in terms of advocating and pushing for new solutions. The cases in Norway also illustrate the potential of neighborhoods and collective housing as sites of *democratic participation* and deliberation around energy transition activities.

The interviews with public authorities and desktop research in **Austria** revealed that many public funding opportunities are available; at the same time, it became obvious in the interviews with initiators of more or less private projects, that these *funding schemes are often not tailor-made* for specific approaches and ideas. Sometimes the funding is hampering new ideas in their implementation: the funding might be too low but with too high requirements to be fulfilled. Small and often private initiatives that would bring new incentives into the market should be favoured more.

In the case study analysed in **Bulgaria**, the high share of private ownership on dwellings suggests there could be a high potential for building capacities to produce electricity in urban areas, also because formal entities for implementing collective decisions are already operating and showing a good degree of effectiveness in the country. The good organization of small communities with a developed set of rules, the *availability of 100% funding* for the energy saving measures, the *legislation framework* supporting owners' associations, the *personal commitment* and responsibilities by owners with relevant technical expertise, the *proactive involvement* of NGOs and citizens' organizations, and the presence of several *EU collaboration projects and networks* have all been identified as positive driving factors. Among the hindering factors it is important to mention the variability and lack of community

spirit among stakeholders, the short-term changes in regulatory provisions, the incomplete liberalization and monopolies in the energy sector, the lack of awareness about active funding schemes, the low level of trust on professional organizations, the centralized governance system.

The case study in **Spain** clearly shows how *regulation* may affect collective action in both ways: on te one hand to make collective action impossible, on the other hand, it demonstrates how a change in that regulation can pave the way for collective actions. The case study also shows how the *determination and the pro-environmental attitude of consumers*, more than funding and other incentives, can motivate people to enter such a burdensome process. Nonetheless, the case also shows that due to other *administrative or market barriers* (e.g. the opposition of distribution companies) it might be promising that specific stakeholder groups get public support to trigger collective action: In some cases, new retailers offering renewable energy or energy cooperatives could lead and enable citizens' initiatives by offering guidance and support to otherwise unexperienced neighbours or groups of consumers. The *support of these specific stakeholders*, along with information and training, may be a key enabling factor for collective action.

The case in **Turkey** originated on the basis of cooperative members' demands to search for ways of cost reduction. Hence, the idea started as bottom-up, then continued as top-down, as the middle level management and the policy-making level supported the idea. Although the process developed at the collective decision-making level, it was 'pushed through' the system by several members of the executive board of the collective and one middle manager. The *extremely complex funding process, many different funding schemes for different sizes of companies, and the uncertainty* associated with the *frequently changing legislative/legal framework* were identified as strong barriers for such projects, requiring consistent and continuous support from public authorities during all the phases of the project.

Although the cases are quite different, there are some things most of them share: concerning the **facilitating factors**, the presence of a strong environmental motivation of the key stakeholders involved, the presence of clear external financial incentives, and the presence of a social support system (for example in terms of sharing a common identity and ideas) have all worked as positive driving forces in the case studies presented in this report.

Concerning the **barriers** of establishing collective initiatives, also some common factors could be identified: a general lack of awareness and environmental concerns, a certain lack of community spirit that hinders collective initiatives. Another big issue is the current (sophisticated) legislation and especially legal uncertainty and many bureaucratic burdens individuals and collectives have to face when deciding to start an initiative relevant for sustainable energy transition. Thirdly, technological gaps still have to be closed in the domains considered, for example the stabilization of grid infrastructure.

10.3 Recommendations for policy makers

The case studies showed how useful it is not only for scientists to analyze the energy culture of a society in a systemic way. As described in the Introduction, the focus of this analysis was set on the identification of those factors in the field of "materials" (as part of the Energy Culture approach) that influence the actual "energy" actions of citizen groups in the various countries as a framework condition. As mentioned at the beginning, "Materials" summarizes precisely those areas of action that can be directly shaped by policy makers.

The case studies showed that, depending on the country, policy makers face very different and specific challenges in promoting energy transition activities by population groups. A key result is that on the one hand, legislation, incentives, funding schemes still have room to be improved, clarified, simplified; but that at the same time, new fields of action for policy makers arise, such as the coordination of newly emerging local actor groups, the promotion of participation/participation management/information management of the numerous emerging players; energy management structures including the necessary targeted technology promotion and accessibility (example: grid management by smart charging).

Some important enabling and hindering factors are more difficult to be addressed or influenced by specific public policies (such as for example, intrinsic motivation to do things better and create solutions). However, some general recommendations can be formulated for policy makers. If policy makers want to support more collective approaches by private citizens, firms, and company, here are some points that are necessary:

- Clear and better legislation: harmonizing different regulatory frames
- Compliance between national, regional and local policies in terms of funding, incentives, regulations
- Active support of individual and collective actions: clear and concise information about existing incentives and funding options, easy access to funding (supported by consulting, clear forms, etc.), have a dialogue with citizens, not hampering initiatives
- Increase of awareness of the need for accelerating the transition to more sustainable energy lifestyles and practices, among single individuals, self-organized informal collectives and representatives of formalized agencies: there is a need for systematic information and action campaigns targeting different public categories
- Clear and better administrative procedures: a fast handling of cases, streamlined and simplify procedures are needed
- Investment in Research and Development: there is a need to do research on different technologies (e.g. on charging technology) and to bring these technologies further
- Increasing awareness of initiatives among individuals and companies: more information at different levels and institutions about e.g. e-car sharing, co-housing, etc. has to be available

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