

# JRC SCIENCE FOR POLICY REPORT

## SOCIAL INNOVATIONS FOR THE ENERGY TRANSITION

*An overview of concepts and projects contributing to behavioural changes, and increased wellbeing*

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## **Abstract**

This report reflects upon the concept of social innovation and the way it is used in the energy sector. It does so by bringing together theoretical investigations and empirical knowledge. We aim to clarify the concept of social innovation in the energy sector by reviewing the literature and reflecting over a number of social innovation projects in Europe. The analysis of the projects against various contextual factors and their goals reveals the significant potential of social innovation on accelerating the energy transition while tackling societal problems. Energy production, energy efficiency and energy literacy are the main domains to which socially innovative activities contribute the most. High competences of project leadership and management observed though projects are often small in scale and context-dependent. This indicates that successful socially innovative energy initiatives require advanced bottom-up governance structures even if that may imply limitations for scaling up. This setting may complicate top-down support as legal, financial or even cultural policy-making must be tailor-made and reinvent or adjust continuously. Nevertheless, social innovative activities are expected to further proliferate the following years and move towards a sound environmental, cultural, political, economic and social direction, as knowledge creation and diffusion of technological and governance innovations accompanied with policy support are on the rise.

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## Executive summary

### Policy context

The recent communication from the European Commission ‘A Clean Planet for All’<sup>1</sup> lays out the strategic long-term vision for a prosperous, modern, competitive and climate-neutral economy. One of the priorities is to “recognise and strengthen the central role of citizens and consumers in the energy transition, foster and support consumer choices reducing climate impact and reap collateral societal benefits improving their quality of life”. Citizens will have an important role to play in the energy transition and social innovations of different types will provide the means to do so. It is generally recognised that social innovation can play a crucial role in achieving long-term climate and energy targets and accelerate the energy transition. However, there is little evidence about which types of social innovations are effective for contributing to the energy transition and what is their particular role.

In order to reconstruct our consumer society towards sustainability, technological and environmental innovations are needed. However, techno-managerial solutions alone cannot solve the issue as they are inherited part of the problem that lies in man-made climate change resulting from the complex societal system that we depend on. Social innovation comes in place to offer tools to support the transformation of existing structures towards a low-carbon society. Social innovation contributes to new social practices, institutions and systems, and its ultimate goal is social change, while actions often take place decentralised at the level of collectives or groups. Therefore, the impacts of social innovations can be diffused more easily on individual and community levels promoting sustainable behaviour and lifestyle changes.

In recent decades, the energy sector has experienced a lot of pressure to transform resulting in many innovations that enable the transformation. The energy market liberalisation, different regulatory developments and the technological advances in, and the mass-market production of, renewable energy technologies have spurred the emergence of new actors in the energy sector. The development of small-scale renewable energy technologies and battery solutions have created a group of prosumers – consumers who produce their own energy. These developments have also brought along governance innovations in the energy sector as a new context for social innovation emerged.

### Quick guide

This study is based on a review of multiple case studies of recent projects classified as social innovations in the energy sector. We provide an overview of the ways social innovation contributes to the energy transition based on a literature review and an analysis of 21 empirical cases (see section 3 regarding the methodology for selecting the projects). The study improves the understanding of impacts that social innovation has on local communities, local values and culture as well as on potential regional and national implications. Moreover, in each case study, we identify the mechanism of social innovation contributing to the energy transition, the impacts in terms of behaviour and lifestyle changes, scalability to determine the potential outreach of the innovation, and contextual success factors. Further, we focused on six social innovation projects identified among the initial 21 selected cases to investigate the success factors, barriers faced and implementation context. The findings are principally based on interviews with the project owners. Since there is only a limited amount of written material available on the six case studies, (particularly in English), the empirical contribution of the study is novel. The case studies included in the detailed analysis are biomass projects in Hungary (Told village) and Bosnia and Herzegovina, renewable energy projects in Spain (GoiEner) and Germany (Wolfhagen BEG), an Earthship community house in the UK (Brighton) and the European Energy Neighbourhoods<sup>2</sup> project promoting energy efficient behaviour in 16 EU Member States. The biomass project in Bosnia and Herzegovina represents cases of a top-down social innovation, the Energy Neighbourhoods<sup>2</sup> project is somewhat of a mixed type, whereas the other four are portrayed as bottom-up social innovations.

### Main findings and conclusions

The set of social innovation case studies in this project demonstrates a wide range of largely positive impacts. Regarding the energy transition, energy savings have been made and use of Renewable Energy Systems (RES) has increased; both changes can be measurable. Other tangible advances can be seen in the reduction of energy poverty and in the advancement of circular economy as waste materials have been reused or used in energy production. Less tangible positive impacts can be seen in empowerment and participation of citizens. Based on multiple case studies, we find that social impacts of energy-related social innovation influence lifestyles, employment, emission reduction, change in energy production modes and increase of energy efficiency, creation of acceptance to technological innovations, increase the level of trust, generation of local value and involvement of the local community. The impacts

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<sup>1</sup> [COM\(2018\) 773](#)

can also be visible on different spatial scales (local, regional or national) depending on the project. We confirm that so far energy-related social innovations often have a very local character with a limited focus on upscaling. Nevertheless, some of the examined projects have been growing steadily or being replicated enlarging thus their scope and impacts beyond the borders of their communities.

The successful social innovations appear to have some features in common. They have a clear vision and organisational capabilities as project plans or business plans are often prepared in advance. At the same time, there has been agility to adjust to changing circumstances or to seize opportunities and indicate tolerance for delays on the advancement of the project. Co-operation with local policy-makers and municipalities as well as other partners has been very important. In addition, it was observed that they put a strong focus on soft skills like communication and marketing abilities, and the capacity to cooperate and work together. Technical, economic, and juridical skills have been in high demand as well and often provided by volunteers if the affected communities lacked the competence.

Although the six cases studied in detail have a natural positive bias and are perceived as successful ones, each and every one has faced some barriers and obstacles on their way. Many of those challenges have been solved or disappeared while some still remain. Those obstacles are related to the legal, political, or societal context in which the case studies have been implemented. While the EU RES legislation facilitates RES development, the electricity market legislation creates additional challenges through unbundling requirements. National legislation and policy have important roles as well. For example, wood energy legislation in Bosnia and Herzegovina (BiH) is still missing, while building regulations can be a challenge for the construction of off-grid autonomous climate-neutral buildings (Earthships). National policy, or the lack of it, can either boost or hinder the development of RES. Some case studies have challenges for acquiring financing that limits their growth potential and threatens their survivability, particularly if they do not have a solid business model. RES cooperatives are new market entrants competing with large national energy companies which have abundant financing sources. Moreover, the availability of land and land prices can be an obstacle for RES development while forest ownership structures set the scene for wood energy value chains. Despite these barriers, the future and upscaling of the case studies look promising. From the six projects analysed in depth all but the Energy Neighbourhoods<sup>2</sup> are still in operation and apart from the biomass project in BiH they are in no immediate risk of closure.



# 1 Introduction

It is generally acknowledged that the current resource use exceeds the carrying capacity of the global environment and climate change poses a threat to our societies. This calls for novel solutions to reconstruct and transform our consumer society towards sustainability. Technological and environmental innovations are needed but, as the problem lies in the man-made climate change resulting from the complex socioeconomic system that we depend on, technology alone cannot solve the issue (e.g. Renings, 2000; Diedricha et al., 2011). Social innovation could thus offer tools to support the transformation of existing social structures towards low-carbon societies (Eichler and Schwarz, 2019; Jäeger-Erben et al., 2015).

Social innovation has been an emerging concept in research and policy in recent years (Wittmayer et al., 2019). In the European Union (EU), for example, besides the financing of numerous related research projects (see Moulaert et al., 2017), the social innovation is highlighted in the European Union's Europe2020 strategy towards smart, sustainable and inclusive growth (Angelidou and Psaltoglou, 2017). Overall, a desirable social change is a key objective for social innovation, hence, social innovation is increasingly turned to when attempting to address pressing social needs and emerging issues that require a social impact (Neumeier, 2017), such as the energy transition (Eichler and Schwarz, 2019). However, it is a concept that is still somewhat disputed (Ziegler, 2017; Repo and Matschoss, 2019), especially in relation to specific societal sectors, such as energy where more sector-specific research is called for (Angelidou and Psaltoglou, 2017).

Indeed, there is a variety of ways that social innovation has been defined and understood (Angelidou and Psaltoglou, 2017; Ayob et al., 2016; van der Have and Rubalcaba, 2016). Some scholars consider social innovation as a necessary element to complement technological innovation in order to enable a transformation towards more sustainable societies. However, social innovations are more than simply non-technical enhancements to products (Cajaiba-Santana, 2014). Repo and Matschoss (2019) define social innovation as an innovation that addresses social needs or has a social impact and find in their empirical study that social innovations emerge less due to technological or political but rather depend on factors that have a social dimension. Indeed, social networks and social processes create important opportunities for societal development and help make societies more sustainable, cohesive and resilient through inclusive practices, coproduction and grassroots initiatives (Grimm et al., 2013).

Cajaiba-Santana (2014) similarly elaborates that social innovation contributes to new social practices, institutions and systems, and that its ultimate goal is social change, while respective actions often take place at the level of collectives or groups. Manzini (2014, p.57) defines social innovations in the following way: "social innovations are widely understood as new ideas that aim at meeting social goals". Mulgan (2006, p. 146) defines that "social innovation refers to innovative activities and services that are motivated by the goal of meeting a social need and that are predominantly diffused through organizations whose primary purposes are social". Angelidou and Psaltoglou (2017, p. 114) characterise the concept in more detail by stating that "social innovations are new solutions (products, services, models, markets, processes etc.) that simultaneously meet a social need (more effectively than existing solutions) and leads to new or improved capabilities and relationships and better use of assets and resources". They, thus, also resort to the view of emphasising the establishment of new social practices. Howaldt and Hochgerner (2018) highlight that such self-organisation in collectives of groups is an approach attempting to solve market challenges that emerge rather from bottom-up than being a top-down response.

In recent decades, the energy sector has experienced on the one hand a lot of pressure to transform and, on the other, a lot of innovations that enable the transformation. The energy market liberalisation, different regulatory developments (such as feed-in-tariffs), and the technological advances in, and the mass market production of, renewable energy technologies have spurred the emergence of new actors in the energy sector. The development of small-scale renewable energy technologies and battery solutions have created a group of prosumers – consumers who produce their own energy. These developments have also brought along social innovations in the energy sector as a very new context for social innovations (Magnani and Osti, 2016).

Frost and Sullivan (2015) have monetised and calculated the value of social innovation in energy annually. They have calculated an annual sum of \$1.17 trillion by 2020 emerging from market opportunities and benefits to customers and society, especially related to health benefits. They term that the real benefit of improving energy efficiency and increasing shares of renewable energy through social innovation lead to improved air quality and to significant improvements in people's health. Though, several other domains of social innovation have targeted the prevention and impacts of climate change beyond the energy sector. When assessing the impacts of such activities, it is important to bring innovation and its desired social dimensions closer together. Social innovation contributes to new social practices, institutions and systems, and its ultimate goal is social change while actions often take place at the level of collectives or groups. Therefore, the impacts of social innovations can take place at the level of individual behaviour change and at collective lifestyles. They have a great potential to improve the living conditions of ordinary citizens also through

the dynamics of energy transition that bring small-scale distributed energy solutions close to localities and their living environment.

The objective of this report is to provide an overview of social innovations in the energy sector, discuss their potential contribution to the energy transition, and identify their broader or locally experienced effects across a range of realms. To do so, it utilises both insights deriving from the literature and from in-house research on the concept. We base several of our consideration at the empirical results of a recent European project 'SI DRIVE', (performs an extensive analysis of social innovation cases with 74 primarily energy supply cases) as it is one of a few completed research projects that has explicitly focused on research on social innovation in the energy sector.<sup>2</sup> Furthermore, by focusing on a list of 21 projects around Europe we present an overview of different types of social innovations in the energy sector to highlight the plurality of approaches and increase our understanding over the possibilities of diverse activities. Via an analysis, we discuss their benefits and disadvantages in domains including energy poverty, employment, gender equality, empowerment and involvement of local communities, equity, justice and creation of trust. Going a step further, in this report we utilise data on six out of the 21 projects extracted via interviews and documentation. These cases are extensively presented so to better understand them and grasp their mechanisms of contributing to the energy transition, their impacts in the local community, their scalability potential, and their suitability with large political initiatives.

In the next section, we examine the debate over the existing definitions of social innovations and conceptualise over how social innovation is related to the energy sector. Subsequently, we provide a methodological note to guide the reader towards the analytical part and present the list of 21 social innovation projects in the energy sector around Europe on which we focused. Section four provides an analysis of the role and contribution of social innovations in energy transition drawing upon literature and information deriving from the identified projects. Sections five and six discuss impacts, benefits and disadvantages of social innovations in the energy sector using qualitative data extracted by the six specific case studies and the publicly available information from the list of the 21 selected projects. Finally, the last section summarises the findings and concludes this study.

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<sup>2</sup> In 2019, several other projects working on social innovation in the energy sector launched under EU funding (to name a few, SONNET, Newcomers, SocialRes, Comets) and started producing results while is expected to contribute further to knowledge creation in the field the following years.

## 2 Conceptualisation of social innovation

The understanding of the concept of social innovation is highly context depended (country, timing, culture, discipline etc.) (Angelidou and Psaltoglou, 2017). This study seeks to conceptualise social innovation in the energy sector in Europe mainly looking on developments that took place the last ten years while considering the contextual diversity of different European socio-spatial landscapes and schools of thought.

This section focuses on the analysis of the concept of social innovation based on existing definition(s) and how it can be used and associated with the energy sector. Edwards-Schachter and Wallace (2015) have identified 251 definitions of social innovation in academic publications between 1950 and May 2014. Nevertheless, none of the definitions has gained common acceptance, which most likely is due to the very character of social innovations. Almost any novelty can be termed innovation and adding the social aspect to it just broadens the possibilities of what to consider as social innovation. We do not, therefore, attempt to provide an exhaustive literature review on all possible definitions on social innovation, but rather to be explorative and demonstrate different dimensions of social innovation, finally focusing on its relation to the energy sector.

Recent years have witnessed the emergence of several projects focusing on social innovation with attempts to create a deeper understanding of the concept as well create the links of it with the energy sector. Such EU-funded projects include [TEPSIE](#), [SI DRIVE](#)<sup>3</sup>, [CrESSI](#), [TRANSIT](#), [CASI](#), [SONNET](#), [Newcomers](#), [SocialRes](#) and [Comets](#) to name just a few. Furthermore, several hundred academic publications linking social innovation and energy started to appear. All the above indicate a dynamic field of research that will continue to expand and produce results and knowledge in the following years. This section explores the academic understanding of social innovation in the research literature and associates it with the empirical outcomes of these or similar energy-related projects.

### 2.1 Empirical considerations

As social innovation can be labelled every change of social practice able to satisfy human needs when established institutions fail to deliver (Ganugi and Koukoulakis, 2018). Social innovation relates to social values, processes and impacts and, therefore, the concept complements and redefines established innovation typologies, which, for example, consider products, services, and processes. Dias and Partidario (2019), in their review of scientific literature on social innovations, have identified two approaches to the conceptualisation of social innovation. The first they call “Cartasian”, which refers to social innovations having a measurable and tangible impact (Dias and Partidario 2019, p. 11). The second they call the “disruptive view of social innovations”, which relates to social innovations as a response to societal problems with the aim to change the system (p. 12). They further note that social innovation “is not just about inventing new things but it is also about recognising and managing new ideas and ways to do things, with the objective of provoking transformation of the system” (Dias and Partidario, 2019, p. 8).

Scholars highlight the intentionality or the directionality of the innovation that forms the core of social innovation. Pol and Ville (2009, p. 881) state that “an innovation is termed a social innovation if the implied new idea has the potential to improve either the quality or the quantity of life”. They further parallel social innovations to public goods stating that social innovation is characterised by the virtual impossibility to exclude others from its benefits and that adding another person making use of the innovation does not cost anything. Mumford (2002, p. 253) refers to social innovation as “the generation and implementation of new ideas about how people should organise interpersonal activities or social interactions to meet one or more common goals”. Murray et al. (2009, p. 3) refer to the desirability of social innovation from society’s perspective in their definition: “Specifically, we define social innovations as new ideas (products, services and models) that simultaneously meet social needs and create new social relationships or collaborations. In other words, they are innovations that are both good for society and enhance society’s capacity to act.” According to Grimm et al. (2013) social innovation can thus refer to both, the means and the ends of action.

This view is especially highlighted in Howaldt and Schwarz’s definition (2010, p. 16): “A social innovation is new combination and/or new configuration of social practices in certain areas of action or social contexts prompted by certain actors or constellations of actors in an intentional targeted manner with the goal of better satisfying or answering needs and problems than is possible on the basis of established practices.” Phills et al. (2008, p. 36) provide a similar definition for social innovation as “a novel solution to a social problem that is more effective, efficient, sustainable, or just than existing solutions and for which the value created accrues primarily”.

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<sup>3</sup> While the report is based on a considerable literature review, certain sources have been used more than others. These include the Atlas of Social Innovation (Howaldt et al. 2018) as well as Boonstra et al. (2015). The former is a comprehensive publication on the topic while being very up to date on the latest research results as well as empirical evidence. The latter report especially focuses on social innovation in the energy sector, which has been less considered in the literature.

Nevertheless, there are also voices that call for a definition of social innovation that is not dependent on social goals, methods or outcomes. Avelino et al. (2017) claim that social innovation is not always necessarily intentional or oriented towards social goals. They conceptualise social innovation “as changing social relations, involving new ways of doing, organising, framing and knowing” (p. 3). However, it can then be argued that such innovations are not social innovations as per the majority of definitions but rather something else. Their definition is also so broad that it can include just about anything, which does not create much conceptual clarity.

In a previous work of the European Commission, the report of Moulaert et al. (2017) identifies three key principles that characterise social innovation in previous literature and projects. Social innovations are not focused on a certain sector of the economy, nor on a particular field of activity, but rather comprise a variety of practices and activities in order to address social challenges. They share the view of Grimm et al. (2013), and Repo and Matschoss (2019) that social innovation “does not separate means from ends but treats needs and problems as inherent in social relations” (Moulaert et al., 2017, p. 25). They conclude that this leads to the extension of the effects of social innovation beyond the immediate satisfaction of needs and that “social innovations improve long term opportunities for individuals and/or communities, or produce more efficient, effective and/or sustainable means for society to deal with its challenges”.

Empirical considerations about social innovations have found that most social innovations start within civil society (either in the non-profit sector or the informal/communities sector) (TEPSIE project, 2014) and that societal challenges and local social demands are the key motivation for social innovation. In addition, it is driven mainly by individuals, groups and networks (Howaldt et al., 2016). These studies thus highlight that social innovation initiatives and their sustainability are highly dependent on the actors initiating them. One reason is that many social innovations are not embedded in public innovation programmes, but rather emerge as local responses to societal challenges.

## 2.2 Social innovation in the energy sector

When considering the energy sector, due to the special character of energy and its high dependence on suitable infrastructures, technology plays a key role in enabling and supporting social innovations. This can take place either by providing solutions as alternatives to old, unsustainable technologies and routines or by providing the socio-technical platform whereby social innovation can take place, allowing large scale cooperation and the appearance of new business models (Angelidou and Psaltoglou, 2017; see also Boonstra et al., 2015; Budde et al., 2015).

In their study of business models of social innovations in the energy sector, Hiteva and Sovacool (2017, p. 632) see the value of social innovation to lie in “linking concrete aspects of energy justice with empirical examples of mechanisms for creating, capturing and monetizing value from energy services”. They find that social innovation in the energy sector can include (1) disruptive or breakthrough innovation to meet the needs of large groups of customers whose needs are not met by current offerings, (2) to capitalise on new technology by building a business model to deliver it, (3) focus on fulfilling an unmet need, (4) to fend off competition from low-cost producers, and (5) the need to respond to rapidly changing competition (ibid., p. 633). More broadly and unsurprisingly, social innovation in the energy sector relates to the challenges posed by the transition towards an increase in renewable energy and energy efficiency (Boonstra et al., 2015). Thus, the power of bottom-up innovation to address issues of energy justice and democratization while in parallel mainstream new sustainable practices and behaviours at the individual and collective level are key areas in which social innovation in the energy transition contributes.

Previous research has examined energy communities and other forms of social innovation in the energy sector (e.g. Hargreaves et al. 2013; Hewitt et al. 2019; Magnani and Osti 2016; Caramizaru and Uihlein, 2020). European research on energy communities has found that they are in a position to promote socially fairer forms of energy prosumerism because they can enhance citizen’s democratic decision-making (Caramizaru and Uihlein, 2020). Magnani and Osti (2016) highlight the importance of the interaction between the micro-level actor-network, referring to initiators and implementers of energy, and the macro institutional framework referring to the infrastructures, rules and regulations etc. According to their empirical study, the importance of institutional and cultural factors has been especially emphasized at the macro level. Institutional factors in the energy sector mean financial support, land-use policies, incentive and taxation schemes, legislation concerning the production, sale and distribution of electricity, and organisation of the electricity grid. The cultural factors refer to traditions of energy activism and legitimacy issues. Especially in the energy sector there is a difference between the emergence of social innovation in the southern European countries and the northern European countries, which is more a result of cultural factors than institutional ones.<sup>4</sup>

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<sup>4</sup> This report at hand will not further examine energy communities in more detail. Please refer to the JRC report focused on energy communities [\*“Energy communities: an overview of energy and social innovation”\*](#).

## 2.3 Cultural and governance influences

Across European countries and regions, we observe a divide regarding the degree on which energy-related social innovation operate. Magnani and Osti (2016) point out that Southern European countries lag behind in the involvement of civil society in the energy transition, especially when it comes to energy. In terms of innovativeness of new solutions in social innovations, there also seems to be a difference in favour of Northern Europe. In addition, trust among citizens and between citizens and government can be low and have a negative connotation in some Eastern European countries for historical reasons (Howaldt et al., 2016). Therefore, energy-related social innovations are less likely to develop in Eastern European countries, whereas, for example, in Denmark local cooperatives are historically and culturally embedded and are therefore an important part of the renewable energy system (ibid). In general, a European project SI DRIVE has found that the more innovative the solutions are, the more often they originate in the north (52 %) than in other parts of Europe (Howaldt et al., 2016). Though new regulations introduced in the southern parts of Europe (e.g. energy communities' law in Greece) may change this situation.

In terms of the influence of culture on social innovation in the energy sector, there are not so many finalised studies. Though the European Commission via the "Social Sciences and Humanities aspects of the Clean-Energy Transition" HORIZON 2020 call, funds numerous research projects that can provide further insights. One of the few identified sources considering the influence of culture is the SI DRIVE project. It has identified that social innovation in energy supply seems to depend heavily on sustainability awareness, but especially on a co-operative culture that relies on trust among citizens and practices of collaboration.

Cultural contexts affect internal governance dynamics within communities and projects, though institutional governance dynamics and the energy market structure plays an important role on the observed differences around Europe on the way and degree at which social innovation is present in energy supply (Boonstra et al., 2015). The energy supply is more centralised in some countries, while in others the local or regional governments are the key actors organising the energy supply. Energy market liberalisation has influenced the market structure differently in different countries also impacting the possibilities for social innovations, which is a governance issue. The liberalisation of the energy market has led to an emergence of new players and the end of state-owned companies in some countries. In other national contexts, in spite of liberalisation, several major players have remained strongly controlled by the state and are de facto monopolies hampering the entrance of new players to the market. Boonstra et al. (2015) have found a correlation between countries where the market structure is fully liberalised and countries where energy governance is organised on a local level. They suggest that the former ones better incorporate civic initiatives in the energy supply and social innovations. A stronger degree of energy market liberalisation can be seen as a condition that reinforces the emergence of social innovations in the sector (Howaldt et al., 2016).

## 2.4 The role of funding and resources

The availability of fossil fuel sources against the renewable energy potential, the local storage capacity to deal with intermittent renewable energy production, the secure access to the grid in remote areas and the presence of smart grids are crucial to the energy transition. While such technological and geographical challenges play a key role in the energy transition, they also affect social innovation in the energy sector more broadly as they can be enabling factors or barriers for change. National policies also play an important role as they provide the supporting framework needed so market and civil society initiatives can emerge. Boonstra et al. (2015) state that "the way in which EU legislation is translated into actual national policy determines, to a large extent, the behaviours and expectations of the other actors in the energy market." It seems that sustainable change towards energy transition can be advanced through comprehensive funding programmes, whereas non-coherent or unstable energy policy hinders the energy transition. A recent study by Repo and Matschoss (2019) confirms that policy attention for social innovation per se should not be necessarily direct. Indirectly though, policy measures are needed to remove administrative barriers and offer institutional support after which social innovation can organically emerge. Funding and financial support schemes are nevertheless important as they enable individuals, communities and enterprises to proceed with investments, for which they would not have the resources otherwise. Capacity is also complemented by needs, thus for social innovations to emerge in the energy supply side, conditions of energy poverty could be an even stronger incentive (Boonstra et al., 2015). Yet disadvantage social groups also often lack resources, skills or organisational capacities for engaging with social innovative activities. In those cases, multiple types of support by external actors are needed to complement funding and successfully nurture socially innovative projects in energy.

## 2.5 Defining social innovation in the energy sector

As with social innovation itself, social innovation in the energy sector represents a concept that lacks clear definition. Various theoretical interpretations, empirical evidence, policy agendas, scientific traditions, and actors generate

countless conceptualisations over it with broader or narrower ends. The SI DRIVE project has formulated the following definition on social innovation in energy supply: “Social innovation is understood in the SI-DRIVE project roughly as ways, in which actors or groups of actors try to address societal needs and problems in different ways than existing practices. In the energy sector, this translates into achieving a sustainable, renewable energy system in other ways than the existing top-down, central, mostly fossil-fuel based way. Citizens, local communities, civic initiatives or collaborations between these parties and market players and/or government can have a major role by deploying renewable energy sources complementary to those developed solely by the market or governments. Furthermore, these initiatives add additional values, such as increased local liveability or quality of life, local investments and jobs, more involvement of private stakeholders and civil society and empowerment of citizens” (Ooms et al., 2017, p. 7.)

Hoppe and de Vries (2018, p. 1) on the other hand have provided a shorter definition based on 20 article contributions by authors from different academic disciplines, all considering social innovation from the perspective of energy transition: “In the context of energy transition social innovation can be defined as innovation that is social in its means and which contributes to low carbon energy transition, civic empowerment and social goals pertaining to the general wellbeing of communities”. Similarly the SONNET project uses a straightforward definition of social innovation in the energy sector interpreting it as “a combination of ideas, objects and/or actions that changes social relations and involve new ways of doing, thinking and/or organising energy (Wittmayer et al., 2020a).”

Koukouloufiki (2020) considers social innovation in relation to energy transition in terms of types of innovations and its link with social justice and empowerment. The working definition proposed states that “social Innovation in the energy transition regards practices and processes that entail social, economic, technological, governance and/or policy innovations capable to satisfy energy needs and contribute to a low carbon energy transition while in parallel empower vulnerable social groups, and cultivate democratic civic traditions of trust, equity and solidarity within and beyond the spatial context on which they occur.” This definition is thus much broader in the sense that it also includes ethical considerations including trust, equity and solidarity. Empirical case studies nevertheless show that not always do social innovations have a dimension focusing on solidarity as sometimes the groups of people that the innovation extends to are difficult to recognise and identify in the process of designing the innovation.

Taking note of the advice of Eichler and Schwarz (2019, p. 14) based on their systematic literature review on social innovation, stating that any definition of social innovation should include (1) social need, (2) innovative element, (3) implementation and execution, (4) improvement, (5) relationships and collaborations, we derive an account for social innovation in the energy sector from these previous definitions as follows:

*Social innovation in the energy sector is an innovation that is social in its means or methods often emerging bottom-up rather than top-down, and which contributes to civic empowerment, improved relationships or collaborations, while advancing the low carbon energy transition usually at a local or regional scale, by taking account of the native cultural particularities, social needs or goals while simultaneously striving for the general wellbeing of the society during its implementation or execution.*

Nevertheless, as there is no single interpretation of what social innovation in the energy transition can entail across contexts; it can be further opened up as a concept to provide the room for science, policy and community experimentation that is needed for its understanding and operationalization towards a large-scale socio-technical change of the energy systems (Wittmayer et al., 2020b).

## **2.6 Practice fields for social innovation in the energy sector**

The SI DRIVE project has identified several practice fields for social innovation that can influence people, their lifestyles and their behaviour (see Boonstra, 2015). One of them is the domestic production of energy by individual households, businesses, industries, farmers, etc., which is one of the most direct ways of how innovation in the energy sector affects people. Ever more individual households act as prosumers who feed-in energy back to the distribution network and can receive a financial reward for it. Especially in rural areas or in areas far from affordable energy grids some individual households can even be off the grid and self-sufficient. It is, however, unclear, whether such developments can be termed social innovations, as they can just be results of mature enough technical innovation leading to adoption by households. If there is an innovation enabling the adoption of energy production equipment, such as joint procurement of solar panels (Saikku et al., 2017), for example, or a business model innovation such as direct sales of produced energy to other consumers, like the unique Farm Power service in Finland (Kallio et al., in review), such novel practices can be termed social innovations. Nevertheless, local production leads to the need for defining a new role for grid administrators, local/regional/national governments, energy suppliers, etc. and to novel kinds of interactions among actors (Boonstra et al., 2015).

In some parts of Europe, energy collectives, the collective consumption energy and the self-production of energy in collectives are gaining momentum and are thus popular ways of how social innovation in the energy sector affect

people. Examples include collective purchasing, energy, business collectives and energy efficient-housing collectives. Boonstra et al. (2015) specify that this is a form of social innovation since energy collectives are often new combinations or figurations of social constellations and they often include actors not previously engaged in energy in new governance arrangements.

Boonstra et al. (2015) further identify 'working with smart meters' as a social innovation in the energy sector. While smart meters are more a technology than social innovation in itself, their introduction to energy users can induce new behaviour and make it possible to address energy transition. For example, as the meters make it visible to the users how much energy they consume at a given time, this when accompanied by behavioural insights, can stimulate individuals to reduce or shift their energy consumption, and spur even comparative and competitive behaviour among citizens. Smart meters also enable novel kinds of innovative services (see e.g. Dileep, 2020, Matschoss et al., 2015).

Energy services include initiatives that provide energy-related services to citizens, companies or governments. Boonstra et al. (2015) term energy services as social innovations when the service is used in a new way to tackle the challenges of renewable energy and energy efficiency. Energy Service Companies (ESCOs), energy advice, services and solutions for marginalised and socially disadvantaged groups targeting energy poverty, and international innovation networks are examples of service-related social innovations (ibid).

The provision of examples and inspiration in forms of innovative information campaigns, renewable energy model regions, and different kinds of award systems is a practice field that has an influence on people's lifestyles and behaviour through information sharing (Boonstra et al., 2015). The typical actors providing such information related to social innovation are public authorities, businesses, Non-Governmental Organizations (NGOs) or others. One example is open homes walks where people can get to know energy-related practical solutions of others in their local community (Heiskanen et al., 2015), or projects that aim to intensify knowledge exchange among users and experts, such as MotiVoittaja project in Finland that promoted the diffusion of the low-energy concept through a technology procurement competition (Heiskanen and Lovio, 2010). The ways that these different sources have influence on people relate to the purpose of social innovation, namely to empower citizens, increase their ability to choose from different alternatives, increase the variety of options, improve the situation of individual citizens but also of local communities, and have positive social effects through the shift towards low-carbon societies.

Finally, energy is a necessity throughout our society. There are obvious linkages to other sectors and fields such as mobility and transport. Sometimes it is even difficult to distinguish innovations in the energy sector from innovations in other related and close fields. We have not included mobility-related social innovations into the consideration for this report, but rather attempted to focus on 'clear' cases related only to the energy sector.

## **2.7 Types of social innovations in the energy sector**

Social innovations relevant to the energy sector relate differently to the areas of energy use and production they are affecting, and the behaviour type and target groups addressed. The affected energy use or energy production can include, for example, dwellings (as energy users or as energy producers), types of appliances, or modes of energy use, e.g. lighting. The target group of the innovation can be specific or more general social groups separated by key characteristics like citizens living in different types of housing, professional activities, spatial aspects, e.g. urban vs. countryside, work communities, leisure groups.

Previous literature has found that key topics relevant to social innovation in the energy sector pertain to 1) technological innovation leading to new market models, actor configurations, and institutional settings, 2) new governance arrangements, 3) community energy, its impact, implications, and social incentives and policy to empower it, 4) new participative research approaches to test and learn from living labs and best practices, 5) 'green nudges' to stimulate behavioural change, and 6) serious energy games (Hoppe and de Vries, 2019).

Social innovations related to energy can be, for instance, behavioural incentives, novel social structures, organisation forms, new business models, institutional innovations, novel governance arrangements or policy innovations. The various energy uses/production can include elements such as: dwellings as energy users, dwellings as energy producers (RES), mobility, appliances and lighting, and they encompass all renewable energy sources. Behaviour types can be summarised in procurement behaviour and habitual energy behaviour (daily energy behaviour). Target groups can include citizens living in different types of housing; types of professionals addressed; urban areas vs. countryside; mobility for commuting, work and leisure. Furthermore, the geography and natural resources have been recognised to influence the social innovations emerging in the energy sector of a country (Ooms et al., 2018), as they bear an influence on the energy production, transmission, distribution and consumption possibilities of the country, in short: its energy system.

The SI DRIVE project has executed an extensive mapping exercise related to social innovations during 2006–2015. The project has identified 74 social innovation cases related to energy supply. Through their mapping activity, the project

found that completely novel solutions are not the most frequent in social innovations related to energy supply (29 % of the cases). In energy supply, rather more than the half of the innovations (51 %) relate to adopted and moderately improved solutions, and 20 % to significantly improved, yet adopted, innovations (Howaldt et al., 2016, p. 26).

Mulgan (2006) examines different phases of social innovations: coupling of ideas with a need that is not being met, developing a promising idea and testing it in practice, scaling up, replicating, adapting and otherwise diffusing an idea that has proved itself in practice, and learning and adapting ideas into forms that may be very different from the original (see also Jaeger-Erben et al., 2015, p. 794). These phases can reveal much on the process of social innovation and on the support measures needed in different phases of the process.

There are several other typologies and classifications used within the science policy debate on social innovations in energy and more expected to be created as the research on the field is advancing (see Wittmayer et al., 2020a). Typologies and classifications for the moment offer mainly conceptual understanding over developments on the ground. Though they can be used to inform policy and lead to targeted interventions in the future. Annex 1 provides an example of project's classification against different categorisations and types of energy related social innovation's using the 21 projects examined on this report.



### 3 Methodological note on projects' selection and analysis

The objective of this study has been to enhance the understanding of the stock of social innovations in the energy sector, how they contribute to the energy transition, and identify the effects social innovations can have. The project started with an extensive desktop research and literature review that looked into the definitions of social innovation, provided an overview of the concepts based on scientific and other literature and identified a longlist of various types of practical cases termed as social innovations related to energy in the field.

A database of 33 social innovation cases in the energy sector has been created during the desk study. Out of this stock, a list of 21 projects (Table 1. ) were chosen leaving out non-European cases, cases with inadequate information available in English and cases based solely on energy communities. The cases' stock is balanced over different regions of Europe. When the case stock was subject to categorisation according to different typologies (see annex 1.), it became evident that the cases fill almost every category as described in these typologies. The key limitation of the list is that there may not always be many cases in each category to allow comparison. The database of those 21 projects provides basic information about the project, the timing, the organisers, and the geographical scale of the innovation (e.g. urban, regional) and other available relevant information. Various sources were used to identify cases and collect data. These included academic literature, the EU project database Cordis<sup>5</sup>, the Atlas of Social Innovation<sup>6</sup> and a general online search. The EU-financed databases ENERGISE<sup>7</sup> (sustainable energy consumption initiatives) and MURE<sup>8</sup> (energy efficiency policy measures) also were important sources.

The inclusion criteria have been the following:

- Cases can be from all other sectors but transport (multi-sectoral cases may include elements of transport)
- Cases should be European and be balanced over different geographical areas of Europe
- Cases on all other social innovation types but energy communities
- There should be adequate information available to judge whether the case is relevant for in-depth analysis

An initial analysis of the 21 cases performed with the objective to collect empirical material on the role of social innovations in the energy transition.

This analysis concentrated around the following themes:

- Mechanism of contributing to the energy transition including energy and climate impacts, scalability, and cost-effectiveness (Chapter 4)
- Benefits and disadvantages of the social innovations including fuel poverty, employment, gender equality, empowering and involving the local community, equity and justice and creation of trust (Chapter 6)
- Classifying the projects in regard to various typologies of social innovation (Annex 1)

At the end of this exercise a workshop was organised among the members of the working team to reflect and select six of the 21 case studies for a more in-depth analysis aiming to improve the knowledge base. To narrow down the number of potential cases studies for an in-depth analysis, the case studies were scrutinised based on the availability of data such as the impact of the action, scalability of the action and availability of evaluation information.

In order to move beyond publicly available information and documentation, interviews were held with key stakeholders of the six selected cases. A detailed form was used for collecting information by the interviews (see Annex ). The interviews were carried out over an online meeting (5 interviews) or over the telephone (1 interview). Most of the interviewees have been working on the project since the very beginning (the respondents are mentioned in the list of references). Some were in a managerial position while others were responsible for communications and became interviewees for practical reasons such as proficiency in English language. Most interviewees provided additional material such as web articles, articles in printed media, reports, PowerPoint presentations and video-links, on top of their own websites. However, the main source of information has been the interviews because formal reports were a rarity and sometimes information even on websites was very limited. The projects' representatives also provided the

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<sup>5</sup> See: <https://cordis.europa.eu/projects/en>

<sup>6</sup> See: <https://www.socialinnovationatlas.net/>

<sup>7</sup> See: <http://energise-project.eu/projects>

<sup>8</sup> See: <https://www.measures.odyssee-mure.eu/>

photos used in this report. Comprehensive case descriptions are presented in 'Boxes' 1-6 (Chapter 5) and prepared based on the collected data. The case descriptions were sent back to the interviewees for review to avoid errors.

Findings based on the interview results and additional materials provided by the interviewees are presented in Chapter 5. The discussion is organised around the following topics, comparing cases where applicable:

- top-down vs. bottom-up approach to social innovation
- business structures
- transnational vs. local activities
- impact of contextual factors (legislative, political, societal)
- social aspects (energy poverty, gender, other)
- scalability

For each case study, their relation to larger policy initiatives like the EU Green Deal Goals and the Sustainable Development Goals (SDG) has been also analysed (see Chapter 5.5).

Chapter 7 provides the conclusions and recommendations arising from the case studies. It discusses the common success factors and cross-cutting lessons learnt.

### 3.1 List of selected projects

Table 1 displays the 21 identified projects which are perceived as social innovation in the energy sector and are used for analysis in this report. It offers a short description of the main activity of the innovation in question. Initially answers a first inquiry on 'what?' social aspect the innovation activity specifically targets. Then and closely linked tries to answer on the 'why?' question so to identify how this particular innovation can tackle the existing social issue. While the table provides basic data on the cases, more detailed data is collected in a separate database. The findings on the whole stock of cases are discussed in chapters 4 and 6 while chapter 5 provides a more thorough analysis on six of those projects.

**Table 1.** List of examined social innovation cases in the energy sector<sup>9</sup>

	Name	Period	Country and level of intervention	Short description
<b>1</b>	Real Pearl Foundation - Against fuel poverty with biomass briquettes	2012-	Hungary (local, Told)	The objective is to introduce a technology with which the locals can produce cheap, clean and sustainable heating fuel for themselves. The American Legacy foundation developed a technique with which biomass-briquettes can be made with very simple, mainly hand-powered machinery made of locally sourced materials. This is to provide an alternative to poorly accessible, expensive wood as well as to reduce the burning of inappropriate materials (plastic, rubber, treated wood, etc.).
<b>2</b>	Earthship Brighton	2002-2007	United Kingdom (local, Brighton but there are similar projects internationally)	Earthship Brighton is an off-grid building with the aim to deliver a sustainable community centre for local needs and to inspire individuals to make positive actions to generate environmental change by modifying people's behaviour to less carbon-intensive lifestyles. The building heats, cools, and powers itself from the sun, harvests its water from the sky and reuses the wastewater by using plants as a cleaning system. The building is constructed from waste car tyres and other recycled materials and uses the planet's natural systems to provide all its utilities.
<b>3</b>	Agrarholz Pilotprojekt	2009-ongoing	Germany (regional)	This pilot project creates a "bioenergy region" in the Hohenlohe-Odenwald-Tauber counties that have a significant biomass potential. The aim of this project is to produce wood that can be used for energy production. The idea is to develop species of trees that grow quickly and therefore offer a good source of bioenergy production for the region.
<b>4</b>	Wolfhagen BEG	2012-ongoing	Germany (local)	A consumer cooperative that is co-owner of a municipal energy producer, the Stadtwerke Wolfhagen. A 'public-common' partnership, where a municipal utility is co-owned and co-governed by a cooperation between the public authority and a citizens/consumer cooperative.
<b>5</b>	Energy Neighbourhoods (Phases 1 and 2)	2011-2013	16 EU Member States	An energy-saving challenge was taken up by cities in 16 countries. The purpose of Phase 2 was to challenge the citizens' way of living so that the

<sup>9</sup> The shaded cells indicate the projects that used for a detailed analysis (see chapter 5).

	Name	Period	Country and level of intervention	Short description
			(implemented at city-level)	participants (citizens) would save at least 9 % of energy over four winter months in 2010/2011 and in 2012/2013. The first project was followed by another similar project (EN2).
6	INFORSE International Network for Sustainable Energy	1992-ongoing	International	INFORSE is a global network of independent non-governmental organisations working for sustainable energy solutions to reduce poverty and protect the environment. Objectives: <ul style="list-style-type: none"> <li>- To raise awareness and provide advocacy</li> <li>- To build up capacity at local, national and international level</li> <li>- To work for institutional reform</li> <li>- To support research and development</li> </ul>
7	"Qvinnovindar" (Women of Wind Energy)	2007-ongoing	Sweden (national)	Qvinnovindar is a platform to launch new economic associations. They invest in wind power and start new businesses. Members (women only) come from diverse lines of work: a farmer, a florist, a dentist, a bookkeeper, a consultant, and a retail clerk, among other professions. Their common motivation was to own wind power and invest in renewable energy.
8	GoiEner Co-operative	2012-ongoing	Spain (regional, Basque country + Navarre)	GoiEner's goal is to recover energy sovereignty for citizens by penetrating the currently liberalised parts of the electricity sector: retail (the purchasing of energy) and energy generation. GoiEner involves citizens in renewable energy generation and consumption in a participatory and democratic way. It functions as a non-profit co-operative and strengthens the local economy by employing people from the region, distributing tax payments locally, and buying local goods and services. GoiEner is supporting the creation of new renewables elsewhere in Spain in order to increase local, democratic, and renewable energy resilience in other regions.
9	Cloughjordan EcoVillage	2002-ongoing	Ireland (local, Cloughjordan)	Cloughjordan Ecovillage is a registered educational charity and an internationally recognised destination for learning about sustainable living. They have over 100 residents living in high-performance green homes, over 20,000 newly planted trees and Ireland's largest renewable energy district heating system. Construction is ongoing to complete the planned total of 130 homes. Their strategy is to be a centre of excellence for awareness-raising and education in the areas of: energy conservation and production; reduction and recycling of resources; sustainable livelihoods; sustainable, local, food production; broad community understanding of the converging environmental, social and economic challenges and the need to develop resilience as the key response.
10	Robin Hood Energy - a not for profit company	2015-ongoing	United Kingdom (local, Nottingham City Council)	Robin Hood Energy is the first not-for-profit energy company, owned by a local authority set up to tackle fuel poverty and to help give people a cheaper, more helpful alternative to the 'Big Six' – the UK's largest energy supply companies.
11	Ēnostra	2014-ongoing	Italy (national)	Not for profit and democratic RES (renewable energy source) electricity supplier. Ēnostra through its membership in EU REScoop Federation in March 2016 started delivering, at the national level, sustainable electricity to households and SMEs, with special tariffs reserved for not for profit organisations. To make sure that the energy sold to its members is sustainable and ethical, Ēnostra developed the assessment tool, with the supervision and validation of a Scientific Committee.
12	Farmpower (original language: Farmivirta)	2014-ongoing	Finland (national)	The energy company Oulun Energia acts as a middle actor between small scale renewable energy producers and individual customers. It offers the small-scale producers a platform through which the customers can buy energy produced by renewable energy and the producers can sell their electricity with a price that is set by themselves.
13	Biomass Energy for Employment and Energy Security in Bosnia and Herzegovina (BiH)	2009-2019	Bosnia and Herzegovina (national)	The overall objective of the Project is the long-term reduction of CO2 emissions and improvement of local population living standards by supporting the sustainable use of wood biomass through strategic action, the establishment of a market value chain framework and awareness rising of the general public on positive aspects of utilization of this energy source. <ul style="list-style-type: none"> <li>- Enhancement of secure energy supply</li> <li>- Foster the development of enterprises for processing locally available wood biomass</li> <li>- Set up sustainable partnerships, that contribute to the economic development of micro-regions.</li> </ul>
14	MotiVoittaja - a user-friendly low-energy housing concept	2000-2001	Finland (national)	MotiVoittaja competition sought to promote the diffusion of the low-energy concept through a technology procurement competition. The award was designed to function as a label of endorsement, allowing prospective customers to identify 'certified low-energy houses'. Moreover, 'initial buyer group' of prospective homebuilders was gathered, willing to make a commitment to purchase a MotiVoittaja house.
15	An Earthship village	2009-2016	The Netherlands (local/Olst, similar projects internationally)	The idea was to build up a whole Earthship village through the construction of an ecological housing project of self-sufficient Earth houses whereby all aspects of sustainability are taken into consideration. In effect, 12 of

	Name	Period	Country and level of intervention	Short description
				planned 24 dwellings were Earthships meaning that they were self-sufficient in energy.
16	Together4Energy (European network of Vulnerable Consumers Energy Advisors)	2017-2020	International	The project aims to activate engaging of consumers in the energy market, and a positive change of behaviour in relation to energy consumption and to influence the design of policy at all levels to tackle fuel poverty issues.
17	Energy Co-operative Lug (Energetska kooperativa Lug)	2013-ongoing	Croatia (regions of Karlovačka and Zagrebačka županija)	Energy cooperative to promote renewable energy sources in the two regions. The objective is to increase renewable energy and energy efficiency through community-based projects, individual's projects, other investor's projects; to educate citizens and other stakeholders on new possibilities such as new technology and to change habits and consumption patterns.
18	Energy Awareness Week for second graders in primary schools	1996-ongoing	Finland (national)	Each year almost half of Finland's second form pupils (nearly 25 000 pupils, aged roughly eight years), take part on the national Energy Awareness Week. Energy issues and sustainable development are included in the Finnish national school curriculum. Local energy companies support schools by providing education packages, organising visits to energy utilities and awarding the schools locally. Teaching materials include teacher's guide, energy book, energy agents' record card, posters, weekly class schedules, memory cards and diplomas for children. At home, children observe their families' way to use energy and possibilities to improve energy efficiency. They practice energy-saving and environmental activities – and record the results. The theme week at schools culminates in a national energy-saving competition.
19	One-stop-shop for energy advice (PRIS/FAIRE)	2013-ongoing	France (national)	In 2013, local one-stop-shops (Points Rénovation Information Services – PRIS) were launched to support households in their energy renovation works plans. In September 2018, this service was further strengthened by legislation strengthening the position of PRIS and by initiating a national network named "FAIRE" (means "Doing" in French) which provides a common hotline and website to give advice to households.
20	Sustainable energy awards	2003-ongoing	Ireland (national)	The SEAI Sustainable Energy Awards recognise and reward excellence in all aspects of energy efficiency and renewable energy. Categories are open for individuals, groups, businesses or organisations, public and private sector. Categories: Large Business (exemplary energy management), SME (exemplary energy management, Public Sector, Sustainable Energy Community, Buildings, Research, Energy Team/Manager of the Year.
21	Introducing teleworking in public administration	2008-ongoing	Malta (national)	The government published a teleworking policy for its' employees. Teleworking guidelines were also issued to complement the policy, with the intention to facilitate the implementation of telework as a flexible working arrangement. In 2008, it was not yet so common to institutionalize teleworking in government offices in all countries of Europe. The policy has impacts on energy efficiency, efficient use of space and mobility.

Source: author's elaboration

## 4 Analysis of social innovation's contribution to the energy transition

This section provides an overview of how social innovation contributes to the energy transition based on previous literature and an analysis of the identified energy-related social innovation projects we selected. Previous research has found that social innovation can play a unique role in the energy transition. In the TRANSIT project, Strasser et al. (2019) have theorised a concept of *transformative social innovation*, whereby learning processes of actors and networks play a crucial role in the creation of competence to reach transformative impacts. Dias and Partidario (2019), on the other hand, find that social innovation can lead to truly transformative systemic change and to real impact only if the innovation has durability and if it scales up, which can take different forms.

The European SI DRIVE project lists roles of social innovation in advancing transformation (Ooms et al., 2017, p. 6)<sup>10</sup>:

- change in the energy behaviour of consumers
- achievements of broader impacts than only in energy consumption including liveability and empowerment
- creating action towards the realisation of a sustainable system
- enabling investments in renewable energy sources
- increasing transparency in energy prices
- creating independence from actors in fossil energy production.

When it comes to the development stage at which various projects can be distinguished, four phases are identified *invention, idea or inspiration stage, testing phase, and implementation stage* where impacts can be observed.

Based on the list of innovations we studied we observe that the majority of cases identified are already in the implementation phase, which could be expected as information on ideas only in the conceptualisation or in the idea phase are usually not widely disseminated. Some innovations are already so advanced that they are at the phase of impact. Most of the cases identified are currently on-going and many exhibit significant growth, while a few of them, having been projects, have been completed.

This section thus focuses especially on *impact, cost-effectiveness, scalability* and *evaluation* of the identified cases. This task especially examines factors determining the effectiveness of social innovation on the energy transition. The effectiveness of the innovation is evaluated through studying the actionability of the innovation, i.e. whether it has been truly taken into practice. In addition, the upscaling potential is studied in terms of growing, replication, accumulation and transformation of the social innovation. We also attempt to find information on the cost-effectiveness of the innovation and report the availability of evaluation results. Table 2 shows the roles which the identified projects play in the energy transition and indicates at which phase the cases are, from invention to impact.

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<sup>10</sup> The SI DRIVE project has also developed a list of mechanisms contributing towards social change. These mechanisms include learning, variation, selection, diffusion of technical innovation, conflict, competition, cooperation, tension and adaptation, planning and institutionalisation of change, external development, societal needs, intrinsic motivation and culture. Annex 1 introduces direct quotations from the report D7.4 of the SI DRIVE project that describe these mechanisms of social change in more detail.

**Table 2.** Social innovation cases contribution to energy transition goals

	<b>Project</b>	<b>Stage (invention, idea/ inspiration, testing, implementation)</b>	<b>Energy efficiency</b>	<b>Renewable energy</b>	<b>Local energy production</b>	<b>Energy security</b>	<b>Transparency of energy prices</b>	<b>Energy poverty</b>	<b>Energy sufficiency</b>	<b>Behavioural changes</b>
1	Real Pearl Foundation - Against fuel poverty with biomass briquettes/Hungary	Impact		x	x	x		x		
2	Earthship Brighton/UK	Impact		x	x	x			x	x
3	Agrarholz Pilotprojekt/Germany	Testing		x	x	x				
4	Wolfhagen BEG/Germany	Implementation/Impact	x	x	x	x	x	x		x
5	Energy Neighbourhoods (Phases 1 and 2)/16 EU Member Countries	Impact	x						x	x
6	INFORSE/International Network for Sustainable Energy	Impact (implementation ongoing)	x	x	x	x	x	x		
7	"Qvinnovindar" (Women of Wind Energy)/Sweden	Impact (implementation ongoing)		x	x					
8	GoiEner Cooperative/Spain	Impact (implementation ongoing)		x	x	x	x			
9	Cloughjordan EcoVillage/Ireland	Impact (implementation ongoing)	x	x	x	x			x	x
10	Robin Hood Energy - a not for profit company/UK	Impact (implementation ongoing)					x	x		
11	Ēnostra/Italy	Impact (implementation ongoing)		x	x	x	x			
12	Farmpower (Farmivirta)/Finland	Impact (implementation ongoing)		x	x	x	x			
13	Biomass Energy for Employment and Energy Security/ Bosnia and Herzegovina	Impact (implemented)		x	x	x		x		
14	MotiVoittaja - a user-friendly low-energy housing concept/ Finland	Impact (implemented)	x							
15	An Earthship village/ The Netherlands	Impact		x					x	x
16	Together4Energy/ International	Implementation						x		x

	<b>Project</b>	<b>Stage (invention, idea/ inspiration, testing, implementation)</b>	<b>Energy efficiency</b>	<b>Renewable energy</b>	<b>Local energy production</b>	<b>Energy security</b>	<b>Transparency of energy prices</b>	<b>Energy poverty</b>	<b>Energy sufficiency</b>	<b>Behavioural changes</b>
17	Energy Cooperative Lug (Energetska kooperativa Lug)/Croatia	Impact (implementation ongoing)		x	x	x	x	x		x
18	Energy Awareness Week for second graders in primary schools/Finland	Impact (implementation ongoing)	x	x						x
19	One-stop-shop for energy advice (PRIS/FAIRE)/France	Impact (implementation ongoing)	x	x				x		x
20	Sustainable energy awards/Ireland	Impact (implementation ongoing)	x	x						x
21	Teleworking in public administration/Malta	Impact (implementation ongoing)	x							x

Source: author's elaboration

## 4.1 Impact evidence in the case studies

As indicated on table 1, social innovation projects can cover the total range of the various energy transition goals and usually multiple ones per project. Energy efficiency is at the core of the energy transition while supply solutions, even zero-carbon ones, are supplementary, although much easier to implement and providing quick reductions on carbon footprint. However, even renewable energy entails environmental impacts and uses non-renewable resources. While renewable energy solutions are more prevalent in the stock of cases, many cases address specifically energy efficiency or energy efficiency together with renewable energy sourcing, providing a more holistic approach. An example of such a case with multiple goals is German Wolfhagen BEG in which both energy advice and financing solutions are provided alongside with renewable energy supply. Energy efficiency is also the focus of e.g. the two Energy Neighbourhoods project, the Energy Awareness Week for pupils and energy advice offices in France.

Generating energy from local sources guarantees energy security, lowers transmission costs and provides extra value on previous unexploited resources. These are the main reasons behind the willingness to invest in social innovation projects. In the case studies, there is a strong emphasis on biomass sources, but solar power is also often used e.g. in the Brighton and Olst Earthship buildings and the Cloughjordan EcoVillage in Ireland. Beyond the local level, those innovations can also be termed responsible from a broader perspective as they support national sustainable energy production and advance the development of national energy production capacity (energy security). Security of energy supply is very strongly in focus in the Agrarholz Pilotprojekt in Germany, which goes beyond biomass use, producing it by fast-growing forest plantations. In general, pursuing energy self-sufficiency, and at the same time energy security, is a clear objective in many of the cases. In the Spanish case, it is vocalised as protection of the consumers at the liberalised energy markets and the same idea appears to be behind Robin Hood Energy.

Opportunities related to energy production impact also the business models currently operating. Those are changing fast and as new public-private partnerships are being established, conventional energy companies are creating new services and business models, while cooperatives and community-based enterprises are proliferating to create and manage energy production projects. Multiple cases include the introduction of new business models or the establishment of public-private partnerships trying to improve the transparency of energy pricing. They typically operate on not for profit bases.

While energy poverty has received long-term attention across Europe, the reduction of it is well represented as a goal in multiple cases studied (Together4Energy among others). A new rising theme is energy sufficiency, namely having enough energy but not using too much. While energy efficiency has limited the growth of energy consumption, action

needs to be taken to reduce energy use significantly to meet our climate change and societal goals. This is a socio-cultural goal that can be achieved only by lifestyles and behaviour changes at individual, household and collective levels. The eco-villages and Earthship buildings contribute towards this objective. The term 'energy sufficiency' should not be mixed with 'energy self-sufficiency' which enhances security of supply for a given entity.

## 4.2 Cost-effectiveness and profitability

The identified social innovations can be profitable in the long run, while their immediate returns may not be very high at the beginning. However, in social innovations, the focus is not necessarily in monetary profitability. In several of the identified cases, the price of the product or service is set so that the production costs can be covered, but there is no aim to gain profit from the activity. Some energy communities collect contribution fees from the participants to cover the capital cost of the investment, which are, however, sometimes paid back if the member leaves the energy collective.

A few of the cases have been implemented by companies, meaning that they have seen at least some economic profit-making potential for the new services provided (e.g. the Agrarholz Pilotprojekt in Germany or Farmpower in Finland). However, generally, the social innovations addressing energy improve household economics by providing energy saving opportunities (e.g. energy advice), affordable energy (e.g. Robin Hood Energy and cooperatives) and other indirect economically beneficial solutions (e.g. teleworking policies).

## 4.3 Scalability and diffusion

Murray (2009) has studied the scaling and growing of social innovations. He finds that solutions rarely spread in a straightforward manner but that the supply of ideas and demand for them tend to co-evolve. Organisational growth and franchising seem to be the most direct ways of growing and an organic way of growing including the adaptation of ideas. According to Murray (2009), most social ideas have spread not through the growth of an organisation but through emulation. The TEPsIE project has found that many social innovations usually are only weakly disseminated. Reasons for this are suggested to be due to not recognising the relevance of the innovation, the failure of the innovation after introduction, or an inappropriate application in different conditions or context.

Naber et al. (2017) have studied the upscaling of sustainable energy innovations and found four patterns of upscaling: *growing, replication, accumulation, and transformation*. They find that for growing and replication broad and deep social networks hold a key importance. For replication of innovations, articulating and sharing expectations are the most important activities as well as broad and reflexive learning processes. The latter is critical also to transformation as a form of upscaling of innovation in the energy sector.

The European SI-DRIVE project (Howaldt et al., 2016) has found that social innovations are linked to bottom-up initiatives of citizens, civil servants and local stakeholders. The literature related to bottom-up initiatives in energy often deals with so-called "grassroots initiatives" (see e.g. Hargreaves et al., 2013, Seyfang and Smith, 2007). The concept of bottom-linked governance on the other hand, emphasises the central role of local initiatives and institutions created to support them in order to ensure their sustainability, one way of which is to support the upscaling of the innovation from the local context to the national context (e.g. Garcia et al., 2015, Pradel et al., 2013).

As the purpose of social innovations is rather to address a social challenge often in a specific area rather than spread or grow, upscaling and dissemination do not occur often. Such activity would require imitation and social contagion on a larger scale (Howaldt et al., 2016). In addition, the stage of the innovation has an influence on the type of diffusion and upscaling: organisational growth, increased target group and network extension are more frequent for projects in earlier development stages, such as testing, idea/inspiration, invention, whereas in more mature project stages, such as impact or implementation, other kinds of upscaling can take place (ibid.).

In addition, when considering grassroots innovations, it is clear that their small scale and their geographical rootedness makes upscaling difficult (Seyfang and Smith, 2007 p. 596). Such small-scale, niche innovations require reinterpretation and transposing for other scales. Nevertheless, small-scale initiatives can, however, be reproduced elsewhere in a suitable context by ensuring that the actors are well connected regionally and nationally. Hargreaves et al. (2013) in their review of energy communities in the UK even question whether the development of such a community niche is desirable because there are differences in their aims, approaches, ideologies and local contextual situations. Therefore, the challenging task for policy-makers would be to understand the driving factors of those grassroots initiatives and with adequate policy interventions to bridge them so to reformulate and adopt practices suitable on wider scales.

We find that in the list of social innovations identified for this study, most cases have up scaled through growing or through replication. Growing typically takes place in networks but also the case of female investors in wind power in Sweden demonstrates upscaling by growth as long as it happens within one country. An example of replication is the



Energy Awareness Week for pupils which was first implemented in Ireland, information on the approach was disseminated through a European project, Finland adopted it in 1996 and the idea was further introduced to school teachers in Turkey by Motiva Oy, a company owned by the Finnish Government.

In several cases, upscaling could take place easily through replication from region to region or country to country. Exemptions are cases where there are physical limitations such as the availability of biomass. There could be also e.g. institutional or cultural barriers, but this does not appear to be so evident in the existing stock of cases. However, the Maltese teleworking policy for government staff was rather novel in 2008 when it was introduced as many governments were slow, and may still be, to allow and promote teleworking or connecting it to energy efficiency goals.

#### **4.4 Evaluation**

Mulgan (2006) has listed four phases of social innovation creation: (1) coupling of ideas with a need that is not being met, (2) developing a promising idea and testing it in practice, (3) scaling up, replicating, adapting and otherwise diffusing of an idea that has proved itself in practice, and (4) learning and adapting ideas into forms that may be very different from the original. In practice, we focus here on innovations in the third and fourth phases of social innovations creation, because there is little information available from the first two phases of the innovation process.

Evaluations can address the four steps of any intervention: input, output, outcome and impact. Quantitative indicators can be established at all levels. At the input level it is typical to monitor expenditure, at the output level the quantity of activities (e.g. the number of energy advice), at the outcome level the number of activity participants and at the impact level the changes in peoples' lives (e.g. the number of people avoiding energy poverty) or in the environment (e.g. energy saved or emissions avoided). Particularly in the impact level also qualitative evaluation is commonly used to identify and describe the impacts.

Like in any sets of energy-related social innovation case studies, the stock of cases is very mixed in terms of evaluations carried out. Both generally and within the case stock in this study, it is rather common to report outputs as well as outcomes because these are used in communication on the activities and this information is usually required by the financiers. Information on the cost of activities is typically also known but not always published.

Impact evaluation is not as common, but it is more typically required of policy measures (e.g. energy advice in France which reported energy savings) and projects implemented through international financing institutions (e.g. Energy Neighbourhoods and probably the United Nations Development Programme (UNDP)-financed biomass project in Bosnia and Herzegovina). Other cases subject to evaluation studies have been Cloughjordan EcoVillage in Ireland and MotiVoittaja in Finland. Often the impact evaluations are prepared in national languages and may not be made available publicly.

## 5 In-depth analysis of six selected projects

This chapter deliberates over information extracted via interviews and other means from six selected projects representing different types of social innovative activities in the energy sector:

- Against fuel poverty with biomass briquettes, Hungary
- Biomass Energy for Employment and Energy Security, Bosnia and Herzegovina
- Earthship Brighton, United Kingdom
- Energy Neighbourhoods Phase 2, 16 EU Member States
- GoiEner Co-operative, Spain
- Wolfhagen BEG Co-operative, Germany

A comprehensive description of each is given in the boxes 1 – 6.

The analytical framework consisted of typologies of social innovation; mechanism of contributing to the energy transition including energy and climate impacts, scalability and cost-effectiveness; as well as an inquiry of the benefits and disadvantages of the projects in domains including energy poverty, employment, gender equality, empowering and involving the local community, equity and justice and creation of trust.

All the six cases are currently ongoing (as of April 2020) besides the Energy Neighbourhoods2 project which was completed in 2013. The project in Bosnia and Herzegovina is planned to be finalised by autumn 2020 but possibilities for continuation are being investigated.

### 5.1 Top-down vs. bottom-up and (Trans)national vs. local projects

Social innovations in the energy sector can be in general categorised given the way a project is perceived, initiated and governed as bottom-up, top-down or side-to-side. The bottom-up initiatives are initiated by local communities or entities e.g., citizens, NGOs that aim to locally empower the target groups. Top-down social innovations are usually based on central policy programmes deriving from public or private entities that combine incentives, support, nudging, regulation, and prohibitions. Their mode of interaction is hierarchical, but the dynamic depends on the acceptance and the active involvement of the people addressed (Rehfeld et. al. 2018). Side-to-side innovations are also relevant given that they represent socio-technical disruption able to trigger systemic shifts.

At best, the top-down and bottom-up approaches co-exist, strengthening each other. For example, Holtgrewe and Millard (2018) suggest a strategy in which bottom-up approaches simultaneously solve problems and develop the agency of social innovators and beneficiaries, whilst top-down approaches create supportive political and regulatory frameworks and also mind sets and ways of living and working. The governance practice of such mixed socially innovative initiatives can be well described by the term bottom-linked where social actors drive internal governance mechanisms within their organization while external governance mechanisms are established by interacting with others (Pradel et al., 2013).

Among the six case studies, the top-down approach is demonstrated by the UNDP biomass project in Bosnia and Herzegovina which supports the sustainable use of wood biomass through strategic actions, establishment of a market value chain, and awareness-raising (see Box 1). The bottom-up approach is mostly demonstrated by the biomass project in Told village in Hungary (see Box 2). It started as an initiative by a grassroots charity, 'The Real Pearl Foundation'. The objective was to provide affordable heating by biomass briquettes in the small and remote village suffering from extreme poverty. The Spanish and German and the UK based projects were all initiated by local residents representing clean-cut bottom-up initiatives. The Energy Neighbourhoods2 energy efficiency project is a mixed case. The project was co-financed by the European Commission and its objectives were thus aligned with the energy and climate targets of the EU. On the other hand, the project proposal was prepared as an initiative of a consortium of national teams and local teams, 'energy neighbourhoods', which signed up for the competitions on a voluntary basis.

Neither bottom-up nor top-down approaches appear to be inherently better although social innovations more often emerge bottom-up rather than top-down. Top-down and bottom-up social innovations have different goals and can co-exist supplementing each other. Among the case studies, there were no examples of organically co-existing bottom-up and top-down social innovations yet. However, the project in Bosnia and Herzegovina has the potential of setting the scene for future bottom-up innovations in the biomass value chains. The top-down approach can improve governance, change structures, develop skills, and provide facilities for other operators, inherently reaching scale almost immediately. The disadvantages are, e.g., considerable financing needs and decision making which is happening quite far from final beneficiaries. The bottom-up approach immediately involves citizens, making them decision-

makers and actors as opposed to target groups. Some impacts are achieved quickly through experimentation and agile changes in the approach, if necessary. The disadvantage is the typically great need of human resources particularly at early stages; devoted people willing to use a lot of time and develop new skills are a must.

**Figure 1.** The biomass project in Bosnia and Herzegovina



Source: UNDP, Bosnia and Herzegovina

Oftentimes when accessing a project's spatial distribution of activities and impacts distinguishing between the scale (transnational, national, regional, local etc.) of intervention is straightforward. Transnational social innovations are typically top-down initiatives prompted by international or EU politics and programmes. As usual, exceptions apply; for example, creating informal international networks with other likeminded citizens or experts around any topic is easier than ever due to information technology. On the other side, local activities are usually grassroots bottom-up initiatives initiated at a neighbourhood or city level. However, even very local actions can be strongly linked to global movements or can grow into global movements like, for example, the energy efficiency-related Sydney Earth Hour.

The Energy Neighbourhoods2 project stands out as the only truly transnational project among the case studies. Despite large geographical coverage in 16 EU Member States, the Energy Neighbourhoods2 project was implemented in close co-operation with municipalities and with very hands-on involvement of the citizens (see Box 5). Contrary, the Hungarian biomass initiative in Told is very local in nature. The Wolfhagen BEG co-operative has members mainly locally but acquires wind power from the broader region. The GoiEner was established in the Basque Country and Navarre regions in Spain but has today members across the whole country. Although not in any manner centrally led, setting up the two energy cooperatives in Germany and Spain have become part of national and international movements. The biomass project in Bosnia and Herzegovina is national in character. The Brighton Earthship community house in the UK, being a single house, is a very local case study (see Box 6). However, it is clearly part of a wider international movement itself being prompted by Earthship projects in Mexico and elsewhere.

**Figure 2.** The Biomass Briquette project in Hungary



Source: Real Pearl Foundation

**Box 1.** Biomass Energy for Employment and Energy Security in Bosnia and Herzegovina

The overall objective of the project is the long-term reduction of CO<sub>2</sub> emissions and improvement of local population living standards by supporting the sustainable use of wood biomass through strategic action, the establishment of a market value chain framework and awareness-raising of the general public on positive aspects of utilization of wood biomass energy in Bosnia and Herzegovina (BiH). The four-year project started in 2016, implemented by UNDP in partnership with relevant ministries and authorities of Bosnia and Herzegovina, received financing from the Czech Development Agency (CzDA). The project builds on the knowledge and results of a previous bioenergy initiative from 2009-2015 in BiH, co-funded by UNDP and the Global Environment Facility (GEF).

Concrete activities and outputs of the action comprise among others are: a study on identification of policy gaps within the energy and forestry sectors in the segment of wood biomass in BiH; a comparative analysis of the wood biomass quality situation in the BiH market with recommendations for improvement; feasibility studies for potential wood biomass infrastructure projects for 7 municipalities; a guide for sustainable utilization of wood biomass for energy production; establishment of a working group on wood biomass with representatives of relevant institutions from forestry and energy sectors; establishment of Biomass Innovation Centre under the Biomass Association; development of an Atlas on Biomass Potentials in BiH together with a Report on Biomass Potentials Monitoring; study on recommendations for introduction of financial mechanisms for wood biomass fuel switch projects in public buildings; a study on recommendations for adoption/revision of forest governance mechanisms in the Federation of BiH and Republika Srpska to increase utilization of wood biomass for energy production; development of plans for utilization of wood biomass for selected forest management areas; and of general public on positive aspects of utilization of wood biomass in BiH.

Challenges the action faced varied from the absence of relevant frameworks and legislation in the sector partly due to dual government structure, lack of data on biomass potential and utilisation to insufficient competence and capacity in biomass energy generation, and the indifference of the general public toward energy issues.

The project has been successful in the development of policies for sustainable wood biomass utilisation, it has carried out several successful pilot projects thus generating good practices, trained professionals and improved competence as well increased employment in the biomass energy sector, as well as educated and increased awareness of professionals and citizens through communication channels, especially via social media. Gaining acceptance to biomass energy production and general interest in energy matters among people has been challenging but is gradually improving. Informing people of the benefits of their own actions and their potential impact on the local economy and living conditions is at the core of the awareness-raising activities.

Donor funding from international funding institutions has accelerated structural transformation of biomass energy production in Bosnia and Herzegovina and thus facilitated potential for economic growth, improved employment and started behaviour change toward sustainable development. The project reports to donors on technical progress and achievements, as well as the use of funds. The project reflects the progress against pre-set indicators and monitors the progress quarterly for internal purposes. Specific evaluation reports of the project are not publicly available.

**Box 2.** Against Fuel Poverty with Biomass Briquettes in Told, Hungary

The aim of the briquette program was to help the families in the village Told, living in extreme poverty, by providing high-quality heating fuel for an affordable price during winter as well as to reduce the burning of inappropriate polluting materials such as plastic, rubber or treated wood. Moreover, the availability of proper heating fuel decreases the need to collect other heating materials in a questionable manner.

The village Told is a small segregated village near the Romanian border with about 270 inhabitants of which 70 % are of Roma origin and 30 % Hungarian and Romanian. The Real Pearl Foundation works on various projects within the region as it is one of the ten poorest regions of Europe (Hungary's Northern Great Plain region). The centre is in Berettyóújfalu, 260 kilometres from the capital Budapest. They have been operating there since 1999 working on issues related to equal opportunities and social integration for the poor. Their goals and priorities are helping end child poverty and the endless cycle of extreme poverty for the next generation, with the assistance of the current generation.

At first, they started with the establishment of an art school which gained national and international recognition; they attracted more than 600 students per student year and 70 % of them are coming from underprivileged social background. They soon thought realised that it is not enough to work within the walls of a school, in order to achieve a real change, so started the work with families and communities. In 2009 their operations in Told commenced and at first, they focused on gaining trust among the families, especially women. They started to work with a key person (a Roma woman) of the community to obtain a common understanding of the goals and means to gain commitment to the briquette programme.

They initiated the project by producing hand-made bio-briquettes as fuel in 2012. Then American Legacy foundation developed a technique with which biomass-briquettes can be made with very simple, mainly using hand-powered machinery transforming locally sourced materials, predominantly fibres of plant origin. Unlike large industrial production, this could be made in a community or by a family with lower costs without electrically powered machines. However, the bio-briquettes were poor in heating value. This community project involved approximately 40 families who also contributed labour to the briquette production to earn their share of briquettes.

In 2017 the project expanded and further developed to produce briquettes with better heating value more efficiently. Wood was not available, and thus agricultural materials, mainly straw, were used as a locally available and low-cost material. The project received donations to procure briquette machines for the production.

The Real Pearl Foundation managed to achieve good relations at an institutional level and its goals and transparent activities to improve the living condition of the poor, without any political ambitions, were acknowledged. Now they are participating in a national program, supported by the Hungarian government. The name of the project is '300 village' and its aim is to create opportunities in rural and segregated regions of Hungary.

The briquette project will be followed by an energy efficiency programme (doors and windows renovations). The goal of both programmes combined, is to improve housing conditions and heating comfort, achieve self-sufficiency, leading to cost and energy poverty reduction.

The case study of Told proves how an idea to reduce energy poverty can generate activities involving the whole community for common good. The project integrates the three pillars of sustainability – social, economic, and ecological – and, additionally, tackles ethnic stigmatisation.



## 5.2 Business structures

A very common business form that we often meet when looking into the world of energy-related social innovations is energy cooperatives. Those are 'social enterprises' which have been established for various reasons such as providing affordable energy, social inclusion and poverty reduction, providing a local option to the large (national) energy companies, demonstrating new technologies, abating climate change and boosting the local economy and vitality. They emerge when different stakeholders have a strong appeal to becoming owners while sharing mutual interests and visions (Soiero and Diaz, 2020). The internal organisational structure and practices differ while national legislation provides the legal framework within which they operate.

Soiero and Diaz (2020) point out that as a member of RES, citizens may actively participate in energy policy debates and may more clearly or quickly see the implications of their actions for a better environmental and energy future. On the other hand, RES promote local development, creating green jobs or by offering additional services such as microfinance, among others. It is not clear exactly how many energy cooperatives operate in Europe. Though the REScoop.EU which is the European federation of renewable energy cooperatives represents over 1 250 members involving one million citizens. The Friends of Earth Europe (2018), a grassroots environmental network with presence all over Europe, estimates that there are approximately 2 500 renewable energy cooperatives active in Europe.

Two of the projects we analyse in this section are actually energy cooperatives, namely GoiEner in Spain (see Box 3) and Wolfhagen BEG in Germany (see Box 4). Apart from these cooperatives, the other projects do not run based on business structures as there is no direct formal economic transactions taking place that require the creation of a legal economic entity. This reality can be quite common on social innovation projects in general. Potential for boosting new business exists in the biomass project in Bosnia-Herzegovina, which is developing biomass value chains. However, the actual emergence of new businesses or realisation among the old operators remains to be observed in the future.

GoiEner has been an active networker with other cooperatives Europe-wide. It is co-founder of Unión Renovables, the Spanish national federation of renewable cooperatives representing more than 70 000 citizens in Spain. GoiEner is also a member of REScoop.EU. Wolfhagen BEG collaborates with other citizen energy cooperatives in the North of Hesse. They exchange experiences, support each other and bundle investments in wind parks in the North of Hesse. Wolfhagen BEG received support in the cooperative's founding process from Genossenschaftsverband– Verband der Regionen e.V., an institution that controls cooperatives during the founding process and oversees, on annual basis, that the members' investments are safe.

Stadtwerke Wolfhagen's investments in the construction of wind (10 MW in 2012) and solar power (12 MW in 2014) benefited from favourable feed-in tariffs introduced relatively early in Germany. This is reflected in electricity prices which are lower than market prices in Germany. Wolfhagen BEG has also invested directly into four wind power projects. Members also get dividends and can receive small subsidies for energy efficiency investments from a designated fund. In contrast, GoiEner has not received feed-in tariffs or any other public financial support. Hence, electricity prices are not on average lower than market prices and dividends are not paid but some social tariffs apply. Instead, the main motivations for participation are the promotion of sustainable energy investments, avoiding customership of large traditional energy companies and the social projects GoiEner is carrying out. The first two are important drivers in Wolfhagen BEG as well.

GoiEner started with 32 founding members and Wolfhagen BEG with 254 members. In both the most important marketing method has been through the word of mouth. A poll among all new members in GoiEner indicates that this was the main communication channel among 70 % of new members. In Wolfhagen BEG, the proportion appears to be even higher.

Several notable differences can be identified between energy cooperatives and large energy companies. These are discussed hereunder based on the case studies. In energy cooperatives, members can participate in decision-making, thus making them an alternative to owning stocks of large corporations, which is often impersonal. They have the possibility to affect investment decisions and thus contribute in a very concrete way into making the energy mix more sustainable. In addition, both operate beyond renewable energy generation and distribution with very participatory approaches that lead to the empowerment of citizens.

Cooperatives are open only for those who can afford the membership fees. The EUR 100 fee in GoiEner may be affordable to more people than the EUR 500 fee in Wolfhagen BEG, but the latter also allows payment in instalments. Negotiating with financiers is not always easy as even social financial institutions have strict criteria. Large energy companies, which are also investing in RES, do not typically have such difficulties in accessing capital. So even if the legislative framework is in place creating a level (or even favourable) playing field, cooperatives still remain on an unfavourable starting position. The positive outcome is, nevertheless, that investments in renewables are being made also by large companies driven both by the EU and national RES targets and increasing consumer requirements. If they

do not offer green electricity to their customers, other market entrants, like energy cooperatives, can fill the market gap.

For energy cooperatives, the quantity and quality of available labour is critical for their success. Both Wolfhagen BEG and GoiEner rely on devoted volunteers on a few or many aspects of their functions. A mixed set of skills is needed from the very beginning ranging from technology, economics and law to marketing, communications, and social matters to be able to address the demanding hybrid environment of the social and conventional energy market in which they operate.

**Figure 3.** Wolfhagen solar park



Source: Wolfhagen BEG

**Box 3.** GoiEner Energy Co-operative, Spain

GoiEner Cooperative was founded in 2012 in the Basque Country in Spain with an objective to recover energy sovereignty for citizens by penetrating the currently liberalised parts of the electricity sector, i.e. purchasing of energy and energy generation. Key goals of GoiEner's approach to this endeavour are the alleviation of energy poverty, democratic and participatory involvement, and equal representation of men and women.

GoiEner involves citizens in renewable energy generation and consumption in a participatory and democratic way. It functions as a non-profit cooperative and strengthens the local economy by employing people from the region, distributing tax payments locally, and buying local goods and services. GoiEner also supports the creation of new renewables cooperatives in other regions of Spain in order to increase local, democratic, and renewable energy resilience.

The cooperative succeeds at attracting increasingly more citizens, companies, and entities in the field of the social and environmental economy and public entities. The members include citizens and more than 80 municipalities. It started with 32 founding members in 2012 and has expanded, having nearly 12 000 members, 15 000 contracts and 5 regional offices by April 2020. The membership fee of 100 euros entitles members to take part in decision-making and join the general assembly. The fees go as a contribution to cooperative's collective capital, and if a member decides to leave GoiEner, this contribution is paid back at the value of the share at the time of withdrawal.

The cooperative has 35 employees and 190 volunteers working in altogether 30 working groups focusing on eight main aspects of the activity: administration, internal processes, communication, IT, innovation, retail, generation and social impact, and several sub-groups. In 2015 the volunteer based GoiEner Elkarte association was established to promote the social objectives of the GoiEner S. Coop. retail cooperative. Its main actions since include e.g. promotion of renewable energy generation, the achievement of e-mobility and tackling of energy poverty. The association is also active in carrying out awareness and training activities aimed at public, educational, economic, and social stakeholders, and in promoting research and studies contributing to the collective objectives, and networking with entities like municipalities, universities, and other cooperatives.

GoiEner reports of its activities and achievements to the General Assembly in a format of an annual status quo report and collects feedback during the year through questionnaires. A social audit is performed by a local entity and published publicly every year presenting how the cooperative performs e.g. financially, in transparency, democracy, working conditions, gender equality and ecology.

The cooperative structure of GoiEner with participatory involvement, democratic decision-making (1 vote/1 member) and gender equality, complemented by openness, honesty and trust in operations, attracts new members and thus increases the number of renewable energy projects. GoiEner's drive for independence presents challenges in obtaining new collaborations or financing for projects and does not receive government subsidies nor income from feed-in tariffs. Though a financial diversification strategy is ongoing as efforts to increase the collaboration with banks with similar values e.g. ethic bank 'FIARE'.

GoiEner has been an active networker with other cooperatives Europe-wide; is co-founder of Unión Renovables, the Spanish national federation of renewable cooperatives, which currently has 17 members. The federation represents over 75 000 citizens and lobbies the national energy ministry, while members help each other to adapt to regulatory changes. GoiEner is also a member of REScoop.EU, a federation of European renewables cooperatives bringing together more than one million citizens involved in renewable energy, energy efficiency and responsible consumption initiatives.



**Box 4.** Wolfhagen BEG Co-operative, Germany

Wolfhagen BEG Co-operative established in 2012 to contribute to energy efficiency and production of renewable electricity, as well as to democratise access and ownership by citizens of energy supply. The target was to produce 100 % of the energy demand of City of Wolfhagen from renewable sources by 2015. Time was favourable to start a cooperative in 2012 because the municipality had purchased the ownership of the grid in 2006 and the feed-in tariffs were in place for renewable energy.

The cooperative is a co-owner, with 25 % of shares, of the Wolfhagen municipal energy producer the Stadtwerke Wolfhagen. The municipal utility is co-owned and co-governed in cooperation between the public authority and the citizens' consumer cooperative. The cooperative is a partial owner of four wind parks. The cooperative membership has grown from 264 in 2012 to 920 members and capital of EUR 4.6 million on 1 June 2019. Only energy customers of the municipal utility can become members of the cooperative by purchasing up to five shares for EUR 500 each. The limitations (as of 2013) to membership ensure democracy among members and loyalty and stable customership to the small local utility. Membership is increasing, while only a few members have left the cooperative. The main reasons for leaving include lower electricity prices elsewhere and the need to use the invested funds for other purposes.

The shareholders pay a normal tariff for their electricity consumption but receive dividends on their investment. The cooperative operates also in the field of energy efficiency through the energy efficiency fund, funded by surplus revenues of the cooperative. A share of the fund is allocated to grants for different interests and needs of the members helping some 50 households yearly, e.g., to purchase energy-saving appliances, and enterprises to update energy-saving equipment. While various energy-efficient project implemented like the support for the introduction of LED lighting for households and the municipal entity.

The citizens' cooperative as a business structure provides acceptance and good possibilities for local renewable electricity production. Starting cooperatives grapple with several challenges: lack of funds upfront thus needing a strong partner (e.g. utility company, municipality, bank); long period of time from planning to implementation; maintaining motivation and commitment and attracting a multitude of skills from starting members; patience to receive dividend on investment; and ambition to succeed.

The main drivers of Wolfhagen BEG include the general features of cooperatives: democratic decision making, open membership to all energy customers, members' investments are secured due to controlled regulation of cooperatives, and more case-specific ones, such as showing responsibility and receiving justice in energy access and generating better acceptance for wind energy production. Wolfhagen BEG faced major challenges in the beginning by political parties represented in the city council who strongly opposed erecting wind turbines in the local forest questioning the environmental and aesthetic impact of the project. Some residents opposed the project finding both the investment in wind power and the financial risk to be high. The mayor and parliament elected in 2011 supported the development of wind power and to receive wider acceptance proposed the establishment of the citizens' cooperative. Furthermore, the cooperative as a new branch of the Stadtwerke enabled the city to be better prepared for the energy transformation and competition in the energy market. The city channels their profit of the Stadtwerke e.g. to voluntary services for the citizens, such as kindergartens and a public swimming pool.

Wolfhagen BEG has received interest from the student community with several studies on community participation and a doctoral thesis on Wolfhagen BEG, which serve as unofficial evaluations of the cooperative's activities. The cooperative has received wide international attention: visiting delegations from several countries in Asia and Europe and media attention worldwide. The community has benefited from the public-private partnership. Once the 100 % renewable energy production target was achieved, the cooperative invested in new projects to tackle future challenges while has grown significantly both in terms of membership and electricity production.

### 5.3 Impact of socio-political and legislative factors on the projects' development

The interplay between social and political realities and its degree of influence on legislative frameworks on various levels creates the setting that affects any operations of social innovations creating opportunities and barriers for their development and evolution. Moulaert et al. (2017) have observed that more attention should be paid to the political context within which social innovation operates: "Both academia and policy-makers tend to focus increasingly on the outputs of SI. This tendency has been accompanied by a decline in interest for the decision-making and governance processes in which the decisions are made – or not made. More emphasis on participation processes and questions of political representation would benefit future SI research."

Every social innovation develops under a given political context composed upon local, regional, national, or federal and EU governance dynamics. Local, regional, and national/federal level operate with different competencies in different countries having their own impact. In the European multilevel governance context, the main of those arise either by the EU legislation which all Member States need to implement nationally or the national legislation which is distinct from EU policy-making and varies across countries. Furthermore, in federal countries there are split jurisdictions between the federal and regional governments, while in many areas municipal authorities have rights to regulate several aspects that influence socially innovative activities. It is natural that bottom-up social innovations often cooperate most with the local administration and policy-makers, while top-down initiatives are often initiated at the national or EU level as well as by international organisations.

Social innovations, political realities and citizens are in a constant dialectic. Some projects are developed explicitly to accommodate the existent political context like the initiatives that are created specifically as a response to an EU or national policy call. Though often social innovation is a result of a policy failure that creates a space for action for them to emerge and create political transpositions. In Europe, we have seen the way civil action is pushing towards the increase of RES investments, thus generating policy or governance (social) innovation.

The political context can either boost certain types of social innovations or hinder others. A positive example is providing financing and other types of support (nudging, non-monetary incentives etc.) as well as removing administrative barriers. A negative is the unwillingness to address issues related to remaining state-controlled energy monopolies, or private sector created oligopolies that hamper the entrance of new small players to the market. The interviewees of the six analysed cases reported some impacts from the political, social and legislative context as discussed hereunder.

When it comes to political support and opposition, Wolfhagen BEG cooperative reports two contrasting trends related to the way the political setting influenced the project. On one hand, the energy generation projects were supported by the national feed-in tariff system while on the other, developing wind power faced opposition by the local political parties due to impacts on the local environment. The GoiEner interviewee reported that in Spain, only the government of 2018 started to clearly support renewable energy. Prior to that, traditional energy companies have always had a very strong role in energy policy while the cooperative never received any financial support. At the local level, the situation is quite different as GoiEner closely cooperates and is consulted with and by the local governments to solve various local problems. Local support was also important for the Low Carbon Trust in Brighton which has had good cooperation with the city as well as in Told where the support from the local mayor has been very important in the implementation of the project. The Energy Neighbourhoods2 project has been financed in the context of the EU's challenging energy and climate objectives, and the project was implemented in close cooperation with local municipalities facing supportive political structures. Similarly, support was guaranteed by the biomass project in Bosnia and Herzegovina as it has been strongly linked to top-down policies. Though a study on identification of policy gaps within the energy and forestry sectors in the segment of wood biomass highlighted the need for capacity building activities with different stakeholders at all levels to advance governance.

Beyond contextual political realities, an example of the difference of the degree at which the EU legislation can influence national realities comes via the recast of the RES Directive (Directive (EU) 2018/2001) that raises the goal of the EU renewable energy consumption to 32 %. While the EU regulation requiring unbundling of activities in the electricity market has required the reorganisation of generation and sales activities in both cooperatives (GoiEner-Wolfhagen BEG) and did not jeopardise operations. In the case of Spain, GoiEner reports that it particularly helped the cooperative by necessitating the implementation of new favourable measures at the national level. On the contrary, in Germany, the impact of the RES Directive was not strong since national action had been taken earlier; and e.g. feed-in tariff was introduced already in 2000. Germany also experienced a boom of RES investments in 2010-2013 due to announced discontinuation of access to the feed-in tariff scheme. Another interesting example comes from Bosnia and Herzegovina. The interviewee reported that the legislation for the energy sector, also regarding RES, has progressed but legislation for forestry lags as wood is still not at all recognised as an energy source by the national law. There is also no legislation in place for energy service companies. However, on a more optimistic note, due to the EU accession process, there will be progressive advancement on the legal framework due to the harmonisation process.

A combination of the EU legislation and local planning regulation created obstacles for the Brighton Earthship case. The EU legislation bans end-of-life tires from landfill (Landfill of Waste Directive 1999/31/EC). It has been up to the Member States how to implement the legislation and different approaches have been taken. Old tires were to be used in the construction of the Brighton Earthship, but only after the existing law interpretation was first challenged by the project as it was also not straightforward to get the planning permission for the use of such materials.

**Figure 4.** The Energy Neighbourhoods2 project: Youngest member of the Romanian winning team talking about his experiences with energy savings



Source: Energy Neighbourhoods2 Project coordination

**Box 5. Energy Neighbourhoods2 – The Energy Challenge (EN2)**

The Energy Neighbourhoods2 project was designed to promote cooperation on energy-saving between municipalities and citizens. The goal was to save a specific percentage of energy during a certain period through simple and cost-effective measures such as changes in user behaviour, using energy-saving lamps and avoiding letting electronic devices on stand-by modes. As a behavioural change project, there were no hardware investments allowed. The Energy Neighbourhoods2 (EN2) project, with participants from sixteen European countries, was the successor of the previous Energy Neighbourhoods project launched in autumn 2008 on a European level. The concept was originally developed in Belgium. Both Energy Neighbourhoods projects received co-funding from the Intelligent Energy Europe (IEE) programme.

Cities challenged their citizens in two consecutive years to save at least 9 % energy for four months compared to the same period in the previous year. The approach combined a competition on local, national and EU level with a multitude of measures, such as training of households and municipalities, monitoring of consumption, and local climate campaigns. Furthermore, information and knowledge were provided to all participating households directly and at information events throughout the process. The project trained 'Energy Masters', motivated local volunteers, to support and encourage households in the challenge. Consumption was followed through a web-based calculation tool which provided an overview of the energy savings achieved by each household and functioned also as an important control and motivational instrument. Energy Masters supervised monitoring of energy consumption and provided informative and training materials, such as 'DIY energy audits' guide for households. Local authorities were supported by the project partners to implement the project.

The main results of the project were 10 % reduction in energy consumption in private households and increased awareness of energy-efficient products and climate protection policies. The results meet the designed objectives to raise awareness and inform various groups of individual consumers on energy saving best practices, energy-efficient behaviour and energy-efficient appliances and products. At the end of the action, the initiative was planned to be continued and further developed in several of the partner countries, however, there is no follow-up information available.

The pan-European EN2 project has generated a pool of lessons learned, experiences and tips to be considered. The EN2 concept worked well in all participating countries and is perceived as transferable to other national contexts. However, cultural differences between countries should be considered in the planning of actions. In order to meet the objectives of the action and expectations of involved participants it is focal to ensure that the rules are clear and transparent, and the data and results are consistent and carefully monitored and evaluated.

While the saving results are an important, concrete result of a project, behaviour change toward more sustainable choices has longer-lasting effects beyond the project's lifecycle. To ensure the long-lasting effects it is necessary to provide tailor-made energy saving tips and to accompany and support the participants throughout the competition. After having established certain behavioural patterns within the campaign, the participants tend to adopt energy efficient behaviour as a routine in their lives over a longer-term.

A positive spin-off effect arose along with the implementation of CO<sub>2</sub> challenges, conversations, and exchange of experiences between the EN2 participants activating further ambitions, such as travelling by electric cars to EN2 events, providing CO<sub>2</sub>-friendly catering or organising seasonal cooking classes.

**Box 6. Earthship Brighton**

Earthship Brighton is an off-grid building that uses solar energy to heat, cool, and power itself, harvests its water from rain and treats its wastewater onsite. The Earthship aims to increase awareness about the links between buildings that people live and work in, the carbon dioxide emissions that are produced by this and the resulting climate change.

The objectives of the Earthship Brighton project were to deliver a sustainable community centre in response to a genuine local need, change values in the construction industry and inspire positive action in individuals to generate environmental change through modifying people's behaviour to less carbon-intensive lifestyles. The focus has been, from the beginning of the project, distributing a positive message of climate change education and helping people to change their behaviour to live with a lighter carbon footprint. Earthship Brighton was the first project of Low Carbon Trust and was the first Earthship to be built in England.

Low Carbon Trust is a not-for profit organisation established in 2001 to set up, manage and promote environmental projects around the built environment. The main approaches of the Low Carbon Trust are innovative community construction projects, such as Earthship Brighton, and extensive communications work, including sustainable construction training courses, tours and Eco Education Days for schools. The Low Carbon Trust receives funding and support from grant-making organisations, government, companies, and private individuals.

Low Carbon Trust offers training courses on how to build an Earthship and other green building techniques to empower people and communities to realise new skills and gain the confidence to use them. They communicate best practice also to the construction industry and government to enable the faster uptake of low carbon technologies and approaches to building. Through Eco Open Houses, the Low Carbon Trust promotes measures for energy efficiency and water conservation in existing houses and raises awareness to lower carbon emissions.

The main drivers of the Earthship Brighton Project have been delivering a sustainable community centre in response to a genuine local need, changing values in the construction industry and inspiring positive action in individuals to generate environmental change through modifying people's behaviour to less carbon-intensive lifestyles. The Earthship Brighton has evolved throughout the years and now provides jobs for local workers and enables people to experience a cutting-edge eco-build and be inspired to find their own ways to respond to climate change.

**Figure 5.** The Earthship Brighton



Source: Low Carbon Trust



**Figure 6.** GoiEner General Assembly



Source: GoiEner

Civic engagement is an important social factor, particularly in the emergence of bottom-up social innovations. If there is no tradition or current interest in the participatory approach, they are harder to emerge, no matter how important they would be in the development of communities and even enhancing democracy. Social innovative traditions in the energy sector thus blossom easier in the context which has strong civic engagement and cooperation traditions. Nevertheless, people might be involved in trainings that boost deliberative capacities and participatory approaches such as participatory budgeting, even in contexts in which there is low social capital (DellaValle and Sareen, 2020).

In the Basque Country, there is a strong tradition which enabled the establishment of the GoiEner cooperative that managed to attract 32 founding members. However, this operational model was first challenged culturally as some called it a 'hippie community', as the interviewee described the situation. The general atmosphere changed over time as information and activities spread along with the political changes and the implementation of the EU RES legislation facilitating the initiative. Also, in Germany, there is a long tradition of cooperatives, the model boomed in the renewable energy sector taking advantage also from the favourable feed-in tariff system. However, cooperatives do not necessarily work everywhere; in Bosnia and Herzegovina the interviewee did not consider it as even an option right now due to the lack of citizen participation in common activities and mistrust levels in the country.

Another factor cited as an obstacle of socio-political nature in the case studies relates to how land use planning, regulation and ownership structures affect energy-related social innovations. In Germany, there is a lack of land for wind power development which makes it challenging to develop projects. Auctions for land for power plants are difficult for cooperatives to compete as financing is needed up-front. Also, in the UK, land is a scarce resource and the lack of suitable land along with high property prices can hinder construction of Earthship communities. In Bosnia and Herzegovina, the private forest owners own 30 % of the total forest land. They typically own small land plots of around only 0.5 hectares used for self-consumption. This makes integrated forest management challenging and effectively stops sustainable empowering business models to emerge unless strong and solid cooperative initiatives emerge.

## **5.4 Spreading and scaling up possibilities**

The key question when reviewing any successful example of energy-related social innovation is if it can be implemented at a large scale. This can occur by the growth of the original initiative or by replicating it in a new location. The Social Innovation Atlas concludes that successful, scaling social innovations are characterised by their compatibility and connectivity (in a non-technical sense) with their institutional and cultural and normative environments (Holtgrewe and Millard 2017, p. 72). The previous sections already discussed numerous contextual and other aspects which are either specific to the case studies or are common to some of them and have created the setting under which each of

the case studies has succeeded. This section discusses the scalability and diffusion potential of the six cases drawing on the projects' perspectives and reflection over their scalable elements.

The association carrying out the biomass project in Told is already planning to extend the operations to other villages in the region. In new projects, additional attention might be paid beyond the use of biomass to the energy efficiency of the buildings. The difficulty in replicating the approach is that there is no business model to capitalise upon it and funding of the operations relies totally on donations and volunteering manual labour.

In the biomass case in Bosnia and Herzegovina, after the initiated processes will be completed, there is more room for fine-tuning than replicating within the country. The overall project's logic and the approach on how to plan and implement development projects could be repeated elsewhere, especially in accession countries. Though the nature of it and top-down character has limited its scalable potential after the end of the funding period. Some bottom-up activities, such as boiler replacements are expected to be replicated.

In the cases of the cooperatives analysed in Spain and Germany, scalability at least on the local level is being achieved as they have grown very well utilizing only modest marketing efforts. Both report that the main communication channel has been word of mouth and Wolfhagen BEG even had to limit the number of shares per member due to the demand. The continuous growth in both cooperatives indicates that they are perceived as serious operators in the energy market. While the interest in Wolfhagen BEG brought in international attention as interviews and articles are written for the case even beyond EU news outlets e.g., from China and Taiwan.

For this success, it is clear that both have had strategies, business plans and have accepted that the building up of the business takes a lot of time. A key challenge for any new cooperative would be finding enough skilled volunteer staff particularly at the beginning of operations. It appears that considerable volunteer contribution may be needed also after the initial stages, depending on the scope of operations. Both initiatives mentioned the need for a genuine passion for change and the ability to work together for a common goal as a key to success.

The basic idea presented in the Energy Neighbourhoods2 project, competing in energy-saving around Europe – or even nationally – could be repeated. The objective itself is just as topical as it was almost ten years ago. Today, there are technologically advanced possibilities for consumption monitoring as smart meters have been introduced in the markets. An obvious challenge is finding financing for the coordination of such a project. At the end of the Energy Neighbourhoods2 project, the team considered different options such as trying to get financing for a new project, contacting city networks and housing companies, and developing a new project for schools. However, despite a strong positive immediate impact, there has not been much continuity. The French project partner planned to continue the activity in 70 municipalities but there is no follow-up data. The project is no exception as this has been the situation in so many other European projects despite the very best efforts to consider continuation during project planning and implementation. Activities often fade after financing discontinues.

The bottom-up social innovations, such as the one in Brighton, seem to have better possibilities for continuation, especially after critical phases have been completed or critical size of operations achieved. This surely on continued monetary and human capital, which the studied cases seem to have achieved. The construction of Earthships depends strongly on the building regulations, availability of land as well as construction skills. Building regulations normally emphasize only energy efficiency, not the circular economy, or independence from procured energy while, at the same time, expectations for buildings becoming net energy producers are increasing. This increases the interest in similar projects and there are now more examples of Earthships construction in Europe. Brighton reports that there has been a lot of interest coming from, e.g., France, Germany, the Netherlands and Sweden and a film on their operations (Garbage Monster) have been distributed in places like Canada and at the Cannes Film Festival. To promote knowledge diffusion the Low Carbon Trust organises Earthship construction courses in Brighton which can lead to new construction projects around the world.

Finally, replication chances are increasing further via the advancement of communication regarding the projects. The case studies presented in this report have been recognised by various prizes thus receiving credits and visibility. The Real Pearl Foundation was awarded a prize on Social Integration by the Erste Foundation in 2013. Wolfhagen became one of the five winners in the 'Energy Efficient City Competition' in Germany in 2010. Although this happened two years before the establishment of Wolfhagen BEG co-operative, Stadtwerke Wolfhagen was already in operation and the city had decided to fully rely on green electricity in 2015, which was achieved after the establishment of Wolfhagen BEG in 2012. The Brighton Earthship and Low Carbon Trust have received numerous awards, e.g., the National Gold Winner of the Green Apple Award (2007), highly commended in the Low Carbon Development of the Year category of the South East Low Carbon Awards (2007), highly commended in the Construction and Renovation category of the National Energy Efficiency Awards (2007) and Argus Eco Award for Greenest Building in Sussex (2010).

Beyond the scalability of a project itself, providing a platform driving broader energy-related behavioural change is also a goal on its own for social innovation projects in the sector. The Energy Neighbourhoods2 project is a good

example of such behavioural transformative potential. Its activities were built on a good understanding of the main obstacles to energy savings in private households trying to change established habits. The project managed to achieve a strong impact, namely measurable energy savings using mainly behavioural measures. The savings totalled 5,662 MWh corresponding to 9-13 % of the energy consumption of the participants. The project self-analysed its main reasons for success in the following way:

- Group action - being part of a team and contributing to the overall performance
- Support of Energy Masters, municipalities, and national coordinators (tailor-made energy-saving tips and other support was provided all the way)
- Competition between different groups with awards galas on national and European level
- Positive and fresh image of the competition
- Realistic chance to win the competition
- Direct control of energy consumption via an online tool

The project successfully utilised the competitiveness of humans, making the activities motivating. However, this only works up to an extent across cultures, the project's team emphasises that cultural differences between the countries should not be underestimated. In order to meet the expectations of all participants, it is important to ensure that the rules are clear and transparent, while the data and results are consistent and carefully checked.



## 5.5 Linking to political initiatives

This subchapter discusses the alignment of objectives and actions of the case studies with European and international sustainability targets. The projects themselves had no particular reference to such mega policy strategies though we try to understand how social innovation in the energy sector could be contributing to the advancement of the European Green Deal and the United Nations Sustainable Development Goals (SDGs).

### 5.5.1 European Green Deal

The European Green Deal, adopted in the EU in December 2019, is a development strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases by 2050 and where economic growth is decoupled from resource use.<sup>11</sup> The Green Deal is an integral part of the European Commission's strategy to implement the United Nation's 2030 Agenda and the SDGs, and the other priorities announced in President von der Leyen's political guidelines (European Commission, 2019). Table 3 shows which elements of the Green Deal the six analysed social innovation cases touch upon.

All cases contribute to the reduction of greenhouse gas emissions, and being social innovations with innovative features, all foster innovations in their own ways. All cases but the energy efficiency project supply green energy, namely biomass for heating or electricity from wind, solar and biogas. In four cases, these energies are provided for other users but the Earthship is an off-grid building demonstrating solutions for self-sufficiency. Also, all the projects lead to a reduction of non-carbon emissions. It is very evident in solar and wind installations and energy savings that they cut particle, NO<sub>x</sub> and SO<sub>2</sub> emissions from electricity generation from fossil fuels. In the biomass cases, the objective is to reduce either local air pollution or indoor exposure from poor installations.

Additional objectives can be found in Brighton where the Earthship was built from recycled materials, the biomass project in Bosnia and Herzegovina is based on sustainable use of forest resources, while energy cooperatives demonstrate alternative financing options for energy investments. While achieving positive social impacts is at the very core of social innovations, different cases target different groups and, therefore, not all cases have been given the mark for 'Leave no one behind'. The biomass project in Hungary targets those in extreme poverty and energy poverty is strongly in the focus of the biomass project in Bosnia and Herzegovina as well. The Brighton community house organises visits for, e.g., school groups facilitating equal learning opportunities. The European energy efficiency project challenged peoples' energy behaviour, not their investment behaviour, thus creating a level playing field in the competitions.

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<sup>11</sup> See: [https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal\\_en](https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en)

**Table 3.** Case study targets alignment with the elements of the European Green Deal



























Project, Country	Elements of the European Green Deal										
	Increasing the EUs Climate ambition for 2030 and 2050	Supplying green, affordable and secure energy	Mobilizing industry for clean and circular economy	Building and renovating in energy and resource efficient way	Accelerating the shift to sustainable and smart mobility	From "Farm to Fork"	Preserving and restoring ecosystems and biodiversity	A zero-pollution ambition for a toxic-free environment	Financing the transition	Leaving no one behind (Just Transition)	Mobilising research and fostering innovation
Against fuel poverty with biomass briquettes, Hungary	x	x						x		x	x
Biomass Energy for Employment and Energy Security, Bosnia and Herzegovina	x	x					x	x		x	x
Earthship Brighton, UK	x	x	x	x				x		x	x
Energy Neighbourhoods Project, phase 2, 16 European countries	x							x		x	x
GoiEner Co-operative, Spain	x	x						x	x		
Wolfhagen BEG Co-operative, Germany	x	x						x	x		

Source: author's elaboration

## 5.5.2 Sustainable Development Goals

The social innovations examined address multiple SDGs (Table 4).<sup>12</sup> The data collection by the interviews did not include direct questions on SDGs but the evaluation has been made based on the case materials and interview results. The SDGs marked here are the most noticeable ones while it is possible that some of the cases may yet promote others. However, the objective is to show differences in the focus of the various social innovations, which would be blurred if minor contributions to other SDGs were also highlighted.

**Table 4.** Sustainable Development Goals addressed by the case studies

Name, Country	Sustainable Development Goals
Against fuel poverty with biomass briquettes, Hungary	   
Biomass Energy for Employment and Energy Security, Bosnia and Herzegovina	       
Earthship Brighton, United Kingdom	   
Energy Neighbourhoods Project, phase 2, 16 European countries	  
GoiEner Co-operative, Spain	   
Wolfhagen BEG Co-operative, Germany	  

Source: author's elaboration

<sup>12</sup> See: <https://sdgs.un.org/goals>

Every single case addresses climate change although through somewhat different mechanisms. The energy cooperatives in Germany and Spain have invested in the generation of green electricity. The projects in Bosnia and Herzegovina and Hungary aim at sustainable biomass production. The Energy Neighbourhoods2 project's primary objective was to save energy. This is, however, a co-objective also in most other cases too. The Brighton Earthship tackles climate change through its energy solutions and circular economy.

The biomass project in Bosnia and Herzegovina appears to be addressing the largest number of SDGs. In addition to the energy and climate goals, it also pursues sustainable management of forest resources, improved air quality during the heating season and subsequent health benefits as well as building up the necessary infrastructure for sustainable use of biomass which can also lead to new jobs.

Only the projects in Bosnia Herzegovina and Hungary have a particularly strong focus on alleviating energy poverty. Particularly, the project in Hungary tries to help people living in extreme poverty by European standards. However, reduced risk of energy poverty may be a co-benefit of other projects too, such as those pursuing energy efficiency.

The reason why job creation is indicated for GoiEner and not Wolfhagen BEG is that the former already employs hired staff while Wolfhagen is still on the edge of doing so. Briquette production in Told in Hungary employs two persons before and during the heating season in a village where virtually no jobs are available.

## 6 Benefits, caveats and disadvantages of social innovations in the energy sector

The literature on energy-related social innovation reflects insufficiently on the direct benefits that it brings. The empirical analysis and descriptions usually focus on the impacts of the innovation as such and on barriers and drivers of social innovations as processes. There is little information available on benefits going beyond the expected or observed impacts and hardly any on disadvantages.

Previous research on social innovations argues that solving current difficult societal challenges requires the inclusion of public, private and non-profit sectors (Phills et al., 2013). Phills et al. (2013, p. 43) even suggest that innovations emerge, in particular in such contexts where these sectors converge, mainly because there the private funding meets public and 'philanthropic support'. This offers novel and better possibilities to create social value. Therefore, policy should support such cross-sectoral flow of ideas, capital, knowledge and values.

Resistance to change and a general risk aversion can limit social innovation. The literature suggests that centralised and hierarchical structures which are linked to slow and bureaucratic nature of decision making and to a high degree of risk aversion can prevent change (Howaldt et al., 2016, p. 82). Another identified restricting factor is the lack of suitable funding models. Howaldt et al. (2016) recognise the 'lack of second-round financing' as especially important. This is the case for the implementation of an idea that has received funding for initial development but would need more funding to enable piloting in a larger scale, more intensive roll-out or the upscaling of the innovation. Funding is often too short term, with which the real impact of the innovation does not have time to unfold, or acquiring funding is too complex, which is too heavy or difficult for small-scale innovators (ibid.).

Related to problems of upscaling due to lack of funding are problems in knowledge diffusion. In many cases, much work would need to be done to share knowledge on successes, best practices, workable solutions and on the other hand on failures and mistakes so that others could avoid such caveats (Howaldt et al., 2016). Finally, there are also conflicts of interest in play. Social innovations often tackle complex societal problems, and therefore there are many kinds of stakeholders involved in the innovative practice. In such cases, there are also mixed interests and potentially unequally distributed benefits, which may lead to tensions (Howaldt et al., 2016).

Business innovations seem to have a particular feature regarding social innovations; not all business innovations are social nor are all social innovations with entrepreneurial activity business innovations. Pol and Ville (2009) discuss such subset of social innovations that are particularly subject to market failure and address needs that the normal market mechanism does not help to satisfy. Hiteva and Sovacool (2017) have linked business model social innovations especially to the question of energy justice. They find that such innovations need supportive environments and protection in order for them to develop and materialise. They state that "social innovations are building on a concentration of existing skills, knowledge and social capital". (Hiteva and Sovacool 2017, p. 637). They find that an important driver for social innovation is a purposeful capacity building that is localised and contextually dependent.

Our investigations have shown that the impacts of the long list of cases are multiple. The cases highlight one or more impacts on the:

- change in energy production or consumption
- reduction in waste of energy/energy efficiency improvement and entailing emission reduction
- poverty reduction
- local energy solutions creating employment
- gender equality (e.g. local energy solutions empowering women as investors)
- empowering and involving the local community
- increasing the level of trust
- creation of acceptance to technological innovations
- spatial development

The social impacts could often not be quantified. The projects refer to influences on lifestyles, employment, emission reduction, energy efficiency, changes in energy production, creation of acceptance to technological innovations, increased level of trust, generation of local value, and involvement of the local community. Spatial dimensions are also considered as the impacts can be attributed denominators across governance and

geographical scales (local, regional or national). We have especially focused on the impacts in terms of social justice (e.g. equity and inclusion), gender, and contribution to reducing energy poverty, local regeneration and employment. We identify the main social group that is empowered through the activity, e.g. workers, migrants, deprived or service lacking areas, habitats of a specific neighbourhood, etc. We also attempt to identify impacts that were unforeseen and surprising.

## **6.1 Fuel and energy poverty**

Energy poverty is a societal issue currently gaining attention in the EU as it has a significant impact on the quality of life of European citizens<sup>13</sup>. Energy poverty is a socioeconomic state in which due to inadequate resources or living conditions a person/family/household has inability to obtain the necessary energy to power their home and meet basic needs (warm during the winter, cool during the summer, lighting etc.) (Filippidou et al., 2019).

In our study, several of the reviewed projects aim to alleviate energy poverty directly or indirectly for the local population and beyond. A clear benefit of social innovations that focus on energy self-production and energy poverty is that they offer sustainable and cheap energy for vulnerable and deprived communities. Such cases often also benefit local employment by creating jobs while offering effective tools for social service administrators and municipal officers in their work with citizens facing energy poverty. Alternatively, and even more in line with the EU's Energy Efficiency First Principle, social innovations can lead to improvements in energy efficiency by actions aiming to upgrade the housing stock.

In the stock of cases analysed, affordable energy is provided by new energy companies (e.g. Robin Hood Energy, GoiEner, Ěnostra, Lug and Wolfhagen BEG) where social tariffs schemes are present. Energy efficiency is enhanced by energy advice and educational activities as well as numerous Earthship projects. Two of the case studies analysed, namely those in Hungary and Bosnia and Herzegovina, are addressing particularly vulnerable social groups while others are mainly empowering the general population. The village of Told in Hungary is facing conditions of extreme poverty and before the briquette project, households were burning rubbish and furniture during the heating season. Few could afford commercial fuels and the houses are badly substandard in terms of energy performance. The biomass project in Bosnia and Herzegovina has carried out local activities in the town of Srebrenica, which was one of the places that suffered the most in the Balkan war. After war refugees returned, they were not able to afford wood pellets and were not aware of how to use other wood biomass. The UNDP first carried out a gap analysis in this area to improve the skills at the institutional level and provided concrete guidance on wood biomass use and forest management practices.

## **6.2 Employment**

One of the main contributions of energy-related socially innovative activities in local economies regards the benefits on employment as energy projects assist the local labour market by employing people from the region. This can contribute positively to the development of new skills for the local population while helping retain medium to high skilled labour in the region by creating local employment opportunities especially in the field of renewable energy generation. Furthermore, both during the construction and the operation phases opportunities for low skill employment arise (for example, bioenergy projects in Bosnia and Herzegovina and Hungary, among others) providing income to locals. The local economy can also benefit from the use of local products and services. In the Hungarian case, Real Pearl Foundation biomass-briquettes were made with very simple machinery that came from locally sourced materials.

Today teleworking might be an increasingly common practice, however, when introduced in Malta's case, it was a novel endeavour for the public sector. It can be contested in terms of social innovation classification as it can either be perceived as a socially innovative policy or a top-down social innovation. Nevertheless, beyond the energy-saving potential, it can improve employment opportunities for people with different challenges in mobility such as poor access to transport, disabled people or single-parent families. In Malta, the immediate impact of the policy upon its introduction rose teleworking in government offices by almost by 50 %.

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<sup>13</sup> The inability to keep homes adequately warm is monitored by EU statistics on income and living conditions (EU-SILC) and refers to the percentage of persons from the total population who are in the state of enforced inability to keep their home adequately warm.

## 6.3 Gender

Gender issues are of a relevant consideration in the energy transition from different viewpoints. A recent study initiated by the European Commission (Clancy et al., 2017) estimated that more than 54 million people suffer from energy poverty in Europe having difficulties paying their energy bills or having limited access to high-quality energy because of low incomes. However, women are at a greater risk of energy poverty than men for several reasons while they are under-represented in the energy sector workforce. Women have lower average incomes and women with low incomes are disproportionately found as heads of households either as single-parent families or, due to their greater longevity than men, living alone at pensionable age. Age is a significant factor in dealing with heat and cold stress. Developing more gender-aware approaches to address energy poverty can also benefit from using social innovations as a tool.

Women are underrepresented in the energy sector, making up only 22 % of the workforce globally on conventional sectors while reaching 32 % on renewable industries (IRENA, 2019). This narrows down the pool of talent in the sector. The response by the Clean Energy Ministerial<sup>14</sup> to set up the international campaign 'Equal by 30' can be seen as a top-down social innovation to address the problem. It is a public commitment by public and private sector organizations to work towards equal pay, equal leadership, and equal opportunities for women in the sector by 2030. The Canada-based Women in Renewable Energy (WiRE)<sup>15</sup> works to advance the role and recognition of women in the energy sector.

Within the analysed cases this often plays a distinct role in the project's aims and success as some of them highlight especially the role of women. Several projects focus on the empowerment of women, for example through granting microcredits to introduce women as investors (e.g. in Sweden in wind power), designing better technology solutions, offering capacity-building and guaranteeing equal access to all energy services. Teleworking policy introduced in government offices in Malta, while affecting mobility and allowing efficient use of space, improves work-life balance which is often particularly challenging for women.

The case with the strongest point on gender issues is the GoiEner cooperative. It emphasises gender equality and makes women visible in its operations. It reports that since its inception, it has aimed for equal representation of men and women in the project, as well as gender-equitable language and balanced participation in its working groups. Up to 70 % of the project's staff are women on various roles which is high in comparison to the energy industry in general.

In Wolfhagen BEG, even if in the membership and ownership of cooperative shares men are over-represented the management is mixed and balanced in terms of gender. While men are typically a majority in all construction-related activities, the Low Carbon Trust in the UK has discovered that women engage in large numbers during the courses on the construction of Earthships. The Energy Neighbourhoods2 project reports nearly equal participation of both women and men. In Told, women were key to gaining acceptance of the project while it has been men who have been working on the manufacturing of the briquettes. While in Bosnia and Herzegovina, the project published a short study regarding gender and climate change 'Women and Forests – circumstances and trends in Bosnia and Herzegovina'.

## 6.4 Empowerment, justice and involvement of local communities

The empowerment and involvement of local communities are a fundamental aspect of social innovations in energy. First and for most, local activities can enhance access to energy in remote/deprived communities. Then, innovations have supported the creation of new projects in order to increase local, democratic, and renewable energy resilience; both in the initial region and through scaling up and spill over effects in other neighbouring regions.

For example, in the case studies, empowerment of local communities by introducing new technologies for local production of heating fuel has accumulated to local employment, reduction of fuel poverty and strengthened the local economy in the Hungarian project. In Croatia, the Energy Co-operative involved local policy-makers, stakeholders and citizens by promoting local ownership and enhancing the use of renewable energy, and thus improving local employment and access to energy.

Some cases attempt to increase democratic and participatory involvement as well as inclusion. This is happening quite naturally in Earthships and ecovillages. Moreover, cooperatives addressing energy efficiency challenges often aim to keep the cost per share at a reasonable level to enable all prospective consumers, households, customers to become members of a co-operative. There are also restrictions on how many shares each

<sup>14</sup> See: <http://www.cleanenergyministerial.org/campaign-clean-energy-ministerial/equal-30>

<sup>15</sup> See: <https://www.womeninrenewableenergy.ca/>

shareholder can purchase to maintain equity and democratic decision making in the co-operative (e.g. Wolfhagen BEG) and secure power balance. Finally, offering trainings (deliberate or not) to the local communities on the concept of renewable energy or on specific skills and capacities, represent a form of empowerment as they increase energy literacy.

## **6.5 Creation of trust**

Social innovation in some cases has managed to increase peoples' trust in alternative energy providers. Projects managed to challenge the established way of large-scale market player dominance and has changed the role of the incumbent company to become an actor that mediates between small scale producers and customers. Local companies have the possibility to demonstrate corporate responsibility at a local visible level and when energy advisory roles are held by members of the same community trust building processes accelerate.

The creation of trust in an energy supply project can happen through several mechanisms. An important trust gaining aspect is the ability to demonstrate the provision of 100 % renewable energy rather than an energy mix. Then energy suppliers should establish clear codes of ethical values, demonstrate that they are respected and be able to provide energy at affordable rates. Ideally, the activity can be subject to supervision and validation by a third party (e.g. scientific committee) to assess that sustainability and ethical values have been fulfilled. This is the strategy adopted, e.g., by the Italian co-operative Enostra.

Trust building processes are observed also on other contexts. In the case of Told in Hungary, there were two ethnic groups that were not in good terms with each other when the project started. Reportedly, it was not straightforward or easy to get around these problems, but in the end, the project helped people work together for the common benefit and alleviated some of the tensions. Similarly, despite the establishment of GoiEner in the Basque autonomous community and fears that regionalism might not allow scaling up; the co-operative moved beyond the geographical limits of the Basque region and acquired a lot of members all around Spain.

## **6.6 Other impacts**

Social innovation projects relate to each other and thus energy related ones are being created or create spill over effects from and via other social innovation initiatives. Thus, some impacts are more unexpected and go beyond the energy sector as an area of innovation. Such observed impacts include the advancement of opportunities in higher education, enhanced access to public water, waste management services, accumulation of pension funds for retirement security, and improved healthcare services while health benefits may be achieved from better indoor conditions.

Capacity building can happen at all levels. Awareness and training activities aimed at the public, educational, economic and social agents, public administrators, and so forth are carried out. Social innovations involve citizens of different age groups and social backgrounds. The Wolfhagen BEG cooperative reports very strong involvement of senior citizens. It has managed to involve many skilled and experienced volunteers among them. Moreover, numerous learning opportunities outside the classroom activities are organised in the Brighton Earthship for school groups. Social innovation may also promote studies and research that contribute to the objectives of the collective and stimulate the development of agreements and networking with other entities, such as municipalities, universities and other.

Finally, more specific monetary impacts include the integration of social and environmental costs in prices of energy services and the redistribution of tax payments locally.

## **6.7 Disadvantages**

The examined cases did not reveal any clear disadvantages to the target groups, actors, society or the environment. Especially, as many initiatives have been initiated to deal with and solve recognised social challenges and problems, especially in local context. The purpose of social innovation is by definition to reduce social problems, and aspects like inclusion and energy justice have proved to be detrimental in the analysed projects.

Finding information on disadvantages of social innovations especially in a local context is difficult, as organisers of local experimentation and innovation do not often want to highlight failures or problems (Heiskanen and Matschoss, 2018), for example, due to their commitment to the innovation or the continuation of funding for the innovation. However, some disadvantages can be identified from the literature or based on practical experience.



There are several case studies on RES. Initiating a cooperative for RES can be quite capital intensive and possibly take considerable time depending on the legislative framework. The capital needs may make membership fees too expensive for many. In addition, cooperative projects are in practice launched by citizens who are not professional entrepreneurs and often lack the skills needed in terms of financial and legal expertise or the technical input (Rescoop.eu, 2017).

One of the main benefits of many social innovations examined in this report is at the same time one of the main barriers which needs to be overcome. That is the regional or even very local nature of the cases. While this entails many local benefits, practice has shown that scaling up fragmented initiatives for a larger national or even global impact is resource-intensive, takes a long time and can run into many kinds of problems, even to a petty 'not invented here' syndrome when solutions are tried to be imported to other local contexts.

## 7 Conclusions and recommendations

In this report, we have analysed the concept of social innovation and its use in the energy sector based on literature and case studies. Our list of analysed cases attempts to reflect upon several kinds of projects deemed as social innovations in the energy sector beyond the energy communities.

There are several considerations emerging from this analysis. When it comes to the type of performed actions, renewable energy solutions are more prevalent. Few of the case studies specifically address issues of energy efficiency or energy efficiency together with RES. Most cases opt to take advantage of local energy sources and aim at small-scale energy production thus enhancing better overall access to energy, while also socio-environmental goals such as reduction of energy poverty and reduction of greenhouse gas emissions are cited as incentives. Initiatives expect and often harvest local economic benefits including employment opportunities and overall improvement of the local economy both during the construction and operational phase of the projects. Several local innovations have shown potential for scaling up to the national level thus contributing to national energy-sufficiency and energy security. New business models mainly of cooperative structure and establishment of or public-private partnerships have managed to improve acceptance of new technologies and the transparency of energy pricing. Other tangible advances can be seen in the advancement of the circular economy as waste materials have been reused or used in energy production.

Less tangible but very factual positive impacts can be seen in empowerment and participation of citizens in the management of common resources. The cases show that social justice is realised especially in the cooperatives, ecovillages and Earthships which offer democratic and participatory involvement for all members. Gender equality is a significant factor into consideration within several cases which particularly aim at empowering women to be more active in energy matters in general, but also in energy production as labourers or investors.

One main benefit of many of the social innovations amongst the case studies is at the same time one of the main barriers which need to be overcome. That is the regional or even very local nature of the cases. While this entails many local benefits, practice has shown that scaling up fragmented initiatives for a larger national or even global impact is resource-intensive and time-consuming. Similarly, adequate policymaking (legal, financial cultural etc.) is by default a complex task for the sector as it must operate in a setting where tailor-made adjustments and reinventions should be continuous by taking account the local context and dynamics.

The initiatives examined faced and still face several legal, technical, political, financial, organisational, and other types of barriers and obstacles. For example, the biomass project in Hungary had technical and financial challenges as the original fuel was of poor quality and investments had to be made to develop a new improved one. In Bosnia and Herzegovina, the work started in the biomass process needs a new legislative framework, further administrative capacity building at all levels, and more citizens' engagement. The GoiEner cooperative in Spain faced cultural hesitation as it was not considered as a serious market entrant at first while it also had to start its operations in a political atmosphere which was not as favourable to the RES thus experiencing problems accessing credit for new investments. The wind power investments in Wolfhagen in Germany faced political opposition and land scarcity made it difficult for the project to develop.

In general, the evidence gathered from the case studies is normally positively biased because of self-reporting and the lack of a comprehensive evaluation (which often is not really necessary or relevant). Thus, it is difficult to reflect and extract neutral universally utilisable knowledge. Often, social innovations and also energy-related projects are highly context-dependent thus it is naturally challenging to provide general recommendations for overcoming the barriers; while labour intensive qualitative research is necessary for their thorough analysis.

Nevertheless, lessons-learned takeaway are present as we observe that policy facilitation is necessary for such projects to emerge and survive and policy-making has multiple options for supporting social innovations in the energy sector. It can clearly provide financial support schemes but equally importantly develop non-monetary support such as nudging by positive reinforcement. Regulation can be used to remove legal barriers while protecting the empowering and just potential of social innovation, administrations can be restructured across administrative scales, and administrative processes streamlined. All in all, the status quo can be stirred up to give more room for innovation and new initiatives.

Alternative business models like cooperatives and social enterprises have proven to be viable. However, entering markets and competing with large traditional energy companies with abundant financing, and often de facto monopolies, is not easy. Legislation should create at least a level, but possibly favourable, playing field justified by the cooperative benefits. These are multiple ranging from security of supply due to distributed generation based on local and renewable energy sources to alleviating energy poverty, reduction of inequalities, inclusion, and improved cohesion and democratic decision making.

Utilising both bottom-up dynamics and top-down support in parallel seems a logical and most viable setting as it can combine the best features of both. Bottom-up citizen participation from the very beginning creates trust and acceptance while it is at the same time an effective way to identify and respond to people's immediate needs. Top-down support has the potential to address the underlying root causes of these needs and facilitate the emerging of social innovations while helping create extended scales of intervention almost instantly.

Energy efficiency related social innovation projects has limited the growth of energy consumption but are less often and visible. Since further actions is needed to reduce energy use significantly to meet our climate related societal goals; increased support for projects aiming to change lifestyles and behaviour permanently, or a stronger push for the incorporation of such actions in energy production and distribution projects is needed.

Last but not least, beyond processes and frameworks, the human factor and its particular features are a crucial unbound element of successful social innovations. People having a clear vision and skills create more elaborated project plans or business plans. They have the ability to adjust to changing circumstances or to seize opportunities while injecting tolerance to communities or the members of the initiatives themselves that often get demotivated due to slow advancements. Communication, promotion and cooperation skills are necessary for fundraising, awareness-raising, civil participation and solid engagement with policy-makers at all scales and local municipalities. Economic and juridical skills along with manual labour have been in high demand as well. All in all, people working in these case studies possessed a wide set of skills, developed new skills, or identified and attracted more skilled people. They seem to work with quite transparent and open management structures with distributed responsibilities. Courage has been required to challenge the status quo - sometimes even the way legislation is being implemented. Thus, a mix of soft and hard skills, strong commitment, adequate organisation and labour often on a voluntary basis are necessary to create the conditions under which socially innovative activities in the energy sector materialise and thrive.

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## **List of abbreviations and definitions**

BiH	Bosnia and Herzegovina
CzDA	Czech Development Agency
EC	European Commission
EU	European Union
EUR	Euro
GEF	Global Environment Facility
IEE	Intelligent Energy Europe
NGOs	Non-Governmental Organisations
RES	Renewable Energy Systems
SDGs	Sustainable Development Goals
UND	United Nations Development Programme
WiRE	Women in Renewable Energy

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## Annexes

### Annex 1. Projects classification in regard to various typologies of social innovation

Table 5 classifies the cases according to two different categorisations of the type of social innovation.

The first extracted from the SI DRIVE research project which used the following categorisation to indicate the ways in which social innovations interact with the system it is operating in and using it as a lever for social change:

- Transforming: Social innovations change the system radically. Transforming the system through social innovation is often a hidden agenda in the initiatives but not seen as realistic or actively done.
- Modernising: In this type, social innovations are leaving the system's core identity untouched. Modernising the system is looking at the existing structures and is intending to improve the system. Examples include digital solutions developed for existing structures.
- Repairing: This type does not question the system as such but repairs single subunits. These are often grassroots initiatives focusing on specific system gaps or failures and vulnerable groups.
- Separating: These social innovations act completely separately from the system. They can co-exist with the existing system, form a hybrid system or antagonise the system at hand.

The other classification is according to the main actor initiating and governing the particular socially innovative initiative. The categories used are policy/governance innovation, institutional innovation, organisation innovation (inside different pre-existing organisational structures), citizen innovation and innovations by companies (in practice new business models).

**Table 5.** Examined social innovation cases according to various classifications

	Name	Country	Social innovation type
1	Real Pearl Foundation - Against fuel poverty with biomass briquettes	Hungary	New business model / Modernising
2	Earthship Brighton	United Kingdom	Citizen initiative innovation / Transforming, modernising
3	Agrarholz Pilotprojekt	Germany	Institutional innovation / Transforming
4	Wolfhagen BEG	Germany	New business model, organisation structure / Transforming
5	Energy Neighbourhoods (Phases 1 and 2)	16 EU Member States	Municipal innovation / Transforming, modernizing
6	INFORSE International Network for Sustainable Energy	International	Institutional innovation (reform), novel governance arrangement / Modernising
7	"Qvinnovindar" (Women of Wind Energy)	Sweden	New business model (new governance) / Repairing
8	GoiEner Co-operative	Spain	New business model (new governance) / Modernising, repairing
9	Cloughjordan EcoVillage	Ireland	Organization form, new business model, novel governance arrangement / Transforming
10	Robin Hood Energy - a not for profit company	United Kingdom	New business model / Repairing
11	Ēnostra	Italy	New business model / Transforming
12	Farmpower (original language: Farmivirta)	Finland	New business model / Transforming
13	Biomass Energy for Employment and Energy Security in Bosnia and Herzegovina (BiH)	Bosnia and Herzegovina	New business model / Transforming
14	MotiVoittaja - a user-friendly low-energy housing concept	Finland	New business model / Transforming, modernising
15	An Earthship village	The Netherlands	Citizen initiative innovation / Transforming
16	Together4Energy	International	Policy innovation (market activation) / Repairing
17	Energy Co-operative Lug (Energetska kooperativa Lug)	Croatia	New business model / Transforming
18	Energy Awareness Week for second graders in primary schools	Finland	Operational innovation, institutional innovation / Transforming, modernising
19	One-stop-shop for energy advice (PRIS/FAIRE)	France	Institutional innovation, policy innovation / Repairing
20	Sustainable energy awards	Ireland	Behavioural incentive / Separating
21	Introducing teleworking in public administration	Malta	Organisational innovation / Modernising

Source: author's elaboration

## Cases typology from a process dynamics perspective

The Social Innovation Atlas (2018) has identified a typology of social innovation to include company based, entrepreneurial driven, disruptive, temporary niche, community-based, global movement-based, experimental, embedded, and top-down social innovations - with 3 domains (economic, civil society and political). This section explores how this typology can be applied to social innovations in the energy sector based on a collection of social innovation cases. The typology is described in Table 6. and in Annex , and the way the cases of the 21 analysed projects fit in this typology in Table 7. . The purpose of creating such typologies is to help define support measures that can be better targeted to suit specific types of innovation.

On our list of examined projects, the number of market-based approaches appears to be limited only in a few identified cases, mainly company based isolated solutions are observed. In contrast, cases initiated by civil society are numerous. These community-based activities are typically energy-related social innovations. While regarding socio-spatial denominators we can observe that INFORSE is, by definition, a global network, the global movement towards energy-wise more self-sufficient building can also be seen in the number of cases of Earthship buildings and eco-villages. Furthermore, a significant number of cases is driven by energy policy, while a couple can be seen more as experiments (with potential for scaling up), many of which have been running for several years and are likely to continue. Examples are the Energy Awareness Week for second graders in primary schools in Finland (1996-ongoing) and the Sustainable Energy Awards in Ireland (2003). In reality, there are many examples that stand in between these nine types and in the course of development, social innovation activities can move from one box to another. See Annex for definitions.

**Table 6.** Types of social innovations from a process dynamics perspective

Societal Field:	Economy/Market	Civil Society	Politics
<b>Interaction</b>			
<b>Fragmented/Niche</b>	I Company-based	IV Temporary Niche	VII Experimental
<b>Fragmented but partially framed</b>	II Entrepreneurial	V Community-based	VIII Embedded
<b>Societal/Global</b>	III Disruptive	VI Global Movement-based	IX Top-down

Source: Atlas of Social Innovation, p. 81-83

**Table 7.** Selected social innovation cases from the process dynamics perspective

Societal Field:	Economy/Market	Civil Society	Politics
<b>Interaction</b>			
<b>Fragmented/Niche</b>		4/Germany/Wolfhagen BEG (between types IV and V)	1/Hungary/Real Pearl Foundation 10/UK/Robin Hood Energy 14/Finland /MotiVoittaja
<b>Fragmented but partially framed</b>	3/Germany / Agrarholz Pilotprojekt 7/Sweden/ Qvinnovindar 12/Finland/ Farmpower	5 EU Member States/Energy Neighbourhoods 8/Spain/GoiEner Cooperative 11/Italy/Enostra 17/Croatia/Energy Cooperative Lug	13/ Biomass Energy for Employment and Energy Security/Bosnia and Herzegovina 18/Finland/Energy Awareness Week for second graders in primary schools 20/Ireland/Sustainable energy awards 21/Malta/Teleworking in public administration
<b>Societal/Global</b>		2/UK/Earthship Brighton 6/International/INFORSE 9/Ireland/Cloughjordan EcoVillage 15/The Netherlands/An Earthship village	16/International /Together4Energy 19/France/One-stop-shop for energy advice (PRIS/FAIRE)

Source: author's elaboration

Yet another categorisation can be found in the [TEPSIE](#) project which has identified several kinds of social innovations (Caulier-Grice et al., 2012). This kind of typology of social innovation is suitable also for considerations in the energy sector.

- New services and products: New interventions or new programmes to meet social needs (case example 2/UK/Earthship Brighton)

- New practices: New services which require new professional roles or relationships (case example 7/Sweden/“Qvinnovindar”)
- New processes: Co-production of new services (case examples 4/Germany/Wolfhagen BEG, 11/Italy/Ènostra and 17/Croatia/Energy Cooperative Lug)
- New rules and regulations: Creation of new laws or new entitlements (case examples 19/France/One-stop-shop for energy advice and 21/Malta/Teleworking policy for government employees)
- New organisational forms: Hybrid organisational forms such as social enterprises (case example 10/UK/Robin Hood)

## **Annex 2. Mechanisms of social change in energy related social innovations**

Source: Ooms et al. 2017, p. 45-47

**Learning.** The mechanism of learning is reflected in the growing knowledge that consumers and other parties involved in energy have from scientific reports, media and politics regarding the necessity of realising a sustainable system. Next to that they have growing knowledge of technical and legal possibilities relating to renewable energy. They develop capacities needed to produce or save energy which stimulates the start of local initiatives. This makes them more empowered to take action towards realising a sustainable future.

**Variation.** The mechanism of variation implies that collective ideas are the cause and consequence of social change. The need for a sustainable energy system and widespread belief of this necessity are becoming collective ideas and are thus stimulating growth of social innovations in the energy sector. These ideas also lead to questions about whether the current energy system can cover this need and the willingness to take additional action in the form of social innovation.

**Selection.** Selection is about the process that initiatives experience as they grow and decline. Initiatives in the energy sector are mostly growing by expanding their networks. The purpose of this growth is often to achieve a higher impact and/or maintain or improve their position. Most initiatives do not strive for becoming bigger and bigger, but they want to achieve more impact. In many cases imitation takes place because similar initiatives develop in different locations, but mostly these are not directly copied. Also, the diversity in activities and goals between initiatives is significant, although there are commonalities. For instance, there are various energy collectives, but each initiative has their own specific lay-out.

**Diffusion of (technological) innovations.** The diffusion of (technological) innovations is a very important mechanism that influences social innovation in the energy sector. Even, social innovation in energy has become possible because of enabling technologies for renewable production on a regional and local level. Twenty years ago, it was unthinkable that small consumers could produce electricity themselves. But even though technologies for producing renewable energy and saving energy are important enablers, they are only part of the success. Still they need to be implemented in a smart way that takes into account the context such as the users of the technologies and the laws and regulations. Because of a combination of technological innovation and the need to change the system to a renewable system described already, the energy market is changing. Traditionally the energy market was centrally organised, dominated by large players with strong lobbying power in business and government. But because of the growing shares of renewable energy created by both top-down and bottom-up action, this system and the roles of government, businesses and citizens are changing. Incumbents such as large energy suppliers are losing importance because other newcomers (such as energy ) start producing and selling energy as well. Social innovation initiatives become competitors of the incumbents. This leads to businesses reconsidering their business models and adapting their policies.

The government also needs to deal with the newcomers and is looking for new ways to govern the changing system. In the past, governments and energy companies were closely connected because these companies were state owned. Because of the liberalization of the European energy market, these ties were cut. But they are still used to operate the energy market together. Now they need to relate to newcomers.

**Conflict.** The changes in the energy market because of the growing shares of renewable energy are leading to conflict between incumbents and newcomers (such as energy) in the energy market. Partly this is a conflict between a central and a de-central production system. Growing shares of renewable energy and local production decrease the turnover of the incumbents. They force the traditional players to change their roles. Some newcomers are highly critical towards the incumbents because they question whether the current, central system of businesses and established government institutions can address the needs sufficiently. The domination of the incumbents in the energy system and their perceived lack of action creates a conflict between them and newcomers. That makes conflict a strong driver of social innovation initiatives who want to change the energy system. A number of initiatives is driven by the wish to become independent of the traditional energy system and provide an alternative for using the services of the incumbents.

**Competition.** Social innovation in energy is stimulated by competition between the mostly bottom-up social innovation initiatives and the more top-down traditional parties operating in the energy system (incumbents such as energy suppliers). Social innovation initiatives want to provide an alternative for the mostly top-down operating incumbents and boost renewable energy production. However, also the incumbents are adapting their business models to include more renewable energy as they need to compete with newcomers in the market.

**Cooperation.** Cooperation is to a certain extent always happening in social innovation initiatives in energy. This mechanism is most prominent in the practice fields of energy collectives and providing examples and inspiration.



Cooperation is taking place between for instance citizens, civil society organisations, different levels of government, businesses and citizens, system operators and energy companies. In many of the initiatives studied it was mentioned that you cannot operate in isolation.

**Tension and adaptation.** There are large tensions in the energy system because of the increasing shares of renewable energy. This creates space for social innovation initiatives in the before very centrally operated energy market.

**Planning and institutionalisation of change.** Social change in the energy sector is partly driven by planning and institutionalisation. To some extent this encompasses top-down implementation of activities to realise a sustainable energy system. Parts of these activities in some countries are incentives for local production or saving of energy. However, these policies are often not directed at stimulating social innovation. Planned policies, laws and regulations can have both a strong positive and negative effect on the development of social innovation in the energy sector. Also, via this mechanism new formats and organisations for the implementation of RES measures and solutions are established, such as the Energy Model Regions in Austria. Other types of initiatives, such as many energy collectives, are not the result of planning. However, some of them are professionalising to become more stable and are institutionalised in that process.

**External development.** An additional mechanism of social change that is reflected in some previous mechanisms are external developments. These are events or developments that are prior to the occurrence of another mechanism. The mechanism of social change, such as diffusion of innovations or learning, takes place because of this development. In the energy sector the external developments are that it has become widely known that fossil fuels are limitedly available, that by using them we are damaging the Earth in many ways, and that we will feel the consequences of it in the form of climate change. First these developments occur, which sets in motion different activities such as technological innovation. When people are learning about these developments, they can get a motivation to act on it.

**Societal needs.** Another additional mechanism are the societal needs that are driving social innovation. Social innovation initiatives in energy are addressing several societal needs, of which the most central one is the need of a sustainable energy system. However, next to that, initiatives are addressing societal issues such as (energy) poverty, decreasing local liveability, decreasing social cohesion and economic downturn in rural areas, democratization of the energy sector and inclusion of all groups in society in the transition towards a renewable system.

**Intrinsic motivation.** Over the last years, the intrinsic motivation of actor groups such as private consumers, energy, civil society but also businesses and local and national governments to foster the transition towards a renewable energy system has increased. They often have manifold professional or personal reasons why they see the need to change such as the wish to become energy neutral for environmental reasons, independence from politically questionable countries that supply fossil fuels or dissatisfaction with the current system that is mostly interested in maximizing profits and less in societal values. This general increased motivation is a strong driving force of social innovation that is partly addressed in some of the defined mechanisms of social change but was not yet completely covered.

**Culture.** A last additional mechanism is the local culture in a country or region. This is something that also influences other mechanisms of social change since the mechanisms at work can be different in different countries, as the transition towards a renewable energy system develops in various forms and speeds. Also, the type and amount of social innovation differs widely per country, as was shown in the State-of-the-Art report. It also depends on the specific energy resources in the country: nuclear energy and hydro-energy are sustainable resources, which are often centrally organised. Some countries already had a lot of collectives. And some countries have a more centrally organised energy system than others. For instance, in Germany already a lot is organized on a local level.

### Annex 3. Types of social innovation from a process dynamics point of view

Source: Atlas of Social Innovation - New Practices for a Better Future 2018, p. 82-83

#### Three types that are anchored in the economic domain:

**I Company based** social innovations are driven by companies and focus on the internal structure of the company. Patterns of implementation are fragmented, meaning that companies normally implement isolated solutions. Exchange or common platforms are marginal, political support can be found only in very few cases. The driving forces behind such activities are demographic change, shortage of qualified labour and economic pressure. The process dynamic is low, maybe slowly rising, because of ongoing pressure. This type is best documented in the practice field of workplace innovation.

**II Entrepreneurial driven** social innovations are based on a new balance between economic and social goals. They follow professional business models and aim at least at limited scaling. The interaction is competitive, and market driven, however, does not only take place via prices, but also via reputation. In spite of competition, entrepreneurial social innovations are framed by several platforms, associations or networks across geographic boundaries. The dynamic is different from country to country and depends on factors like the welfare system and the traditional division of labour between state, market and civil society, the specific legal frame for social led enterprises, the social innovation ecosystem as well as funding opportunities.

**III Disruptive** social innovations are based on digital business models and are often financed by venture capital. They are typically associated with the mode of the shared economy that is based on sharing and marketing individually owned goods. They are disruptive as they act against given political standards or regulations that are seen as a hindering factor. Interaction is market driven and competitiveness is based on a large community, that renders scaling essential. Because of strong competition the organization of common platforms and exchange between the social innovators is very limited. Competition, partially on a global scale, and digitalization are the driving forces behind a high dynamic, at least at the beginning of the business' activities. In the long run, the dynamic depends on further (de)regulation and the power of established actors. This type is typical for social innovation activities in the practice field of car sharing.

#### Three types that are anchored in the domain of civil society:

**IV Temporary niche** stands for a type of social innovation that is limited in time and space. It is driven by often highly engaged actors who aim at solving a specific local problem. Individual engagement is dominating, personal social networks are used. Pragmatism or muddling through goes hand in hand with a low degree of professionalization and with high support from volunteers. Political support is limited and often remains informal. Interaction with other social innovation initiatives is limited and there is no reference to a global societal trend. In consequence the dynamic is often limited. As far as scaling or upgrading takes place, this type shifts to type two when it becomes marketed or to type seven when it achieves reliable political support. Examples for this type can be found in many practice fields, e.g. in displacement and refugees or new models of care.

**V Community-based** social innovations have a strong focus on self-organization, in some cases they aim at strengthening local communities. They are based on a broader local community and the organization of the network is in need for a certain degree of professionalization. Local politicians are often involved, financial support by government funding is used as far as possible. Action is taking place at local level, however, communication strategies are launched from time to time. Often, they are backed by a global societal trend (e.g. environment, renewable energy, local food) and to some extent; by formal or informal, national or global networks that provide orientation. The local dynamic is high and stable in the long run; spill-over for instance from autonomous energy supply to local food is possible. An overall self-enforcing dynamic is an untapped potential so far and depends on political factors (decentralization or regionalization, funding, regulation, and so on). This type of social innovation is characteristic for practice fields in the area of environment and energy (local production of energy, energy services, repair, re-use, and recycling, sustainable primary production of food).

**VI Global movement-based** social innovation is anchored in civil society. Civil societies differ across countries and the notion of "multiple modernity" takes into account that there is no common global way to modernity. Nevertheless, there are some social innovations that become adapted all around the world. Cooperative modes of car sharing, activities to protect and empower women, local food and local energy supply are just a few examples. Depending on the state of a civil society as well as on regional or national cultures, these activities are implemented in very different ways; however, there is always a common idea behind such activities. Imitation, learning, and adaption are the key modes of interaction. This type of process dynamic differs from

previously discussed types as it does not stand for a single project, but for a group of projects that are receiving increasing attention. So far, the dynamic is growing but still limited in scope. Some impression of the potential of this type can be found in the practice fields of community capacity building and integrated care.

### **Three types that are anchored in the political domain:**

**VII Experimental** social innovations are based on funding programs, are organized as projects, and are limited in time and scope. Those funding programs cover a broad range of activities and a certain degree of professionalization is essential for the initiatives due to formal conditions and terms of the calls. The projects stand for themselves and are fragmented; interaction is very weak as an organized exchange between the different social innovation projects does not occur in most instances. Therefore, we cannot expect widespread dynamics from this type of social innovation. Nevertheless, there are some projects that provide strategies and the instruments for that are embedded in a practice field, implying that this activity shifts to type eight.

**VIII Embedded** social innovation stands for a type of social innovation that is more or less an integrated part of a specific practice field. This type of social innovation is based on financial resources from government. This could relate to specific calls to provide new solutions in a certain practice field, or resources are provided in the context of implementation. In the first step, social innovation activities of this type are fragmented, as in type seven, however, if successful they give impulse to strengthen the welfare system in compensating for its weaknesses. There is a certain dynamic as these social innovation activities have the potential to become an established part of the welfare system. In this context, professionalization and the development of a business model are crucial, and we can expect that there often is a shift to type two (entrepreneurial social innovation). Typical examples can be found in the practice fields of youth unemployment, mobility of vulnerable groups, reduction of educational disadvantages, providing examples and inspiration, and last, integrated care.

**IX Top-down** social innovations are based on central political programs that combine incentives, support, nudging, regulation and prohibitions. The mode of interaction is hierarchical, but the dynamic depends on the acceptance and the active involvement of the people addressed. In some cases policy provides the impulses, a frame for the practice field, and enables the rise of activities from civil society and/or economy. The best-known example for a failed top-down social innovation is the prohibition of alcoholic drinks in the USA in the 1930s, and more recent examples are non-smoking incentives and regulations.

## Annex 4. Case study working template

<b>Social innovation case name</b>	
Basic information	
Interviewee	
Country	
Years	
Local, regional, national, international	
Organiser / responsible party	
Contact information (interview)	
Short description of the main activity ("what?")	
Short description of the objective ("why?")	
<b>Categorizations of the social innovation type</b>	
What makes it a social innovation? (1. Is it created and accomplished by people e.g. network or 2. are there social impacts)	
Type of social innovation (e.g. behavioural incentive, novel social structure, organization form, new business model, institutional innovation, novel governance arrangement, policy innovation)	
"Ideal types" from Atlas of Social Innovation: repairing, modernising, transforming, separating	
Process dynamics classification from Atlas of Social Innovation	
<b>Innovation and planning phases</b>	
What was the problem to be addressed by social innovation?	
What was the unique situation leading to the generation of the innovation and feeding it? (including political support or opposition)	
What are the key causes of the problem to which the social innovation aims to address?	
Budget, finance, support received (Funding source: e.g. national public funding/EU funding/regional public funding/private funding/citizens. Budget breakdown. Impact of competition.)	
Affected energy use / production (e.g. dwellings as energy users, dwellings as energy producers, mobility, appliances, lighting)	
Behaviour type addressed (investment behaviour, habitual behaviour)	
Target group/main social groups empowered	
<b>Implementation phase</b>	
What was the original element in the innovation which allowed to proceed with it to solve the problem? Was the initial solution sufficient or was there a need for altering the course or finding additional solutions?	
What practical activities proved to be possible economically, technologically and culturally? What did not?	
What would have been done differently where there was more financing?	
What have been the promotion needs for the innovation for it to be accepted? Has this been difficult or easy? Did it require a lot/little time and other resources? Would it have worked without promotional work?	
Has there been a need to rearrange or restructure local networks to implement the social innovation?	
Monitoring mechanism used (who, what, when, how)	
External changes during implementation affecting the activity (e.g. competition, political opposition)	
Internal changes during implementation affecting the activity	
Adequacy of capacity and competence to implement the activity (knowledge gaps)	
Actionability (e.g. has it truly been taken into practice)	

**Impacts (effectiveness for the energy transition, other impact)**

Kinds of social impacts (e.g. lifestyles, employment, emission reduction, change in energy production, creation of acceptance to technological innovations, level of trust, local value, involvement of local community, regional impacts, national impacts, etc.)

Impacts in terms of gender (no, why not / yes, what? Why?)

Impacts in terms of social justice (equity, inclusion, etc.)

Other impacts or unforeseen impacts

Cost-effectiveness

Benefits (what, to whom)

Disadvantages (what, to whom)

Next step?

**Scalability**

Upscaling potential (growing, replication, accumulation, transformation)

What could be scaled up and where? (The whole innovation, parts of it, a modified version... In the same country, other countries...)

Are there already plans for upscaling or ongoing upscaling activities?

What are the financing needs for anyone who wants to set up a new similar activity?

**Evaluation**

Evaluation, background information available from Task 1

Type of evaluation (impact evaluation/process evaluation; ex ante/ex post)

Evaluator (self-evaluation, third-party evaluation)

Time and frequency of evaluation (year)

Evaluation framework (evaluation questions)

Evaluation results (KPIs used, impacts, lessons learnt, recommendations)

Use of evaluation results

Self-evaluation on questions 1-8 whether they are a) case specific and/or b) energy specific

**Sources****Links**

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