This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 837498.

SONNET – Social Innovation in Energy Transitions

Co-creating a rich understanding of the diversity, processes, contributions, success and future potentials of social innovation in the energy sector

Working paper synthesising

'SONNET's insights regarding the cross-cutting issues in sustainable energy transitions'

Deliverable D1.3 | D3

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Work Package: 1

Leader Organisation: DRIFT

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Version: 1.0

May 2022

SOCIAL INNOVATION IN ENERGY TRANSITIONS

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GA#: 837498

Funding type: RIA

Deliverable number (relative in WP)	D1.3
Deliverable name:	Working paper synthesising 'SONNET's insights regarding the cross-cutting issues in sustainable energy transitions'
WP / WP number:	1
Delivery due date:	March 30th, 2022 (extended until May 31, 2022)
Actual date of submission:	May 30, 2022
Dissemination level:	Public
Lead beneficiary:	DRIFT
Responsible scientist/administrator:	Maria Fraaije (DRIFT)
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3	University of Sussex, with its Science Policy Research Unit (SPRU)	UoS	UK	
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11	City of Grenoble	GREN	FR	
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13	City of Basel (Associated Partner)	BASE	CH	

Executive Summary

SONNET's overall aim was to generate novel understandings of the diversity, processes and contributions of social innovation in the energy sector, and critically evaluate and assess their success and future potential towards supporting sustainable transitions of energy systems. After having employed various methods to study social innovation in energy over the past three years, this working paper aims to synthesise selected insights from across the different work streams.

This working paper aims to bring together our insights on two aspects: 1) **the factors influencing (enabling or impeding)** the development of social innovation in energy, and 2) **the contributions** that social innovations make to energy systems.

The literature on social innovation in the energy transition focuses mainly on energy cooperatives. However, in the SONNET project, we have taken a broader take on the concept, defining it as a "*combination of ideas, objects and/or actions that change social relations and involve new ways of doing, thinking and/or organising energy*" (Wittmayer et al., 2020; p.6). Taking this broader approach towards social innovation in the energy transition, we found several **key enabling and impeding factors** of social innovation. Firstly, we found that social innovation in energy is mostly impeded by opposing and locked-in **discourses, regulations and beliefs** within the regime of the energy sector. Secondly, our data highlights the importance of considering the diversity in goals and theories of change associated with various forms of social innovation. Whereas some types of social innovation might be involved with **building up** new ways of doing, thinking and organising (i.e. peer-to-peer electricity exchange), others might be more involved in breaking down and **phasing out** existing institutions (i.e. campaigns against specific energy pathways) (Hebinck et al., 2022). Lastly, we see that there is a **synergy** between social innovations, where the contributions of one social innovation might enable others' success. For example, socially innovative crowdfunding platforms might enable social innovation initiatives by granting them access to the financial system.

Furthermore, we found that SIEs **contribute** to the energy transition in seven ways: 1) they provide alternative discourses and knowledge on the energy transition, 2) they ensure broader distribution of benefits of the energy transition, 3) they increase citizen participation in the energy transition, 4) they change actor roles and behaviour, 5) they reduce fossil fuel extraction, 6) they increase renewable electricity generation, and 7) reduce energy consumption or increase energy efficiency.

This deliverable specifically discusses contributions of social innovation to energy justice and democracy, sustainability (reducing CO_2 emissions) and energy security – all issues high on the European energy agenda. We found social innovation seems to contribute to increasing **energy justice** (i.e. by involving citizens within decision-making and a broader distribution of benefits), increasing **energy security** (i.e. by facilitating storage and networks of electricity exchange to meet the intermittency of renewable energy) and improving the **sustainability** of the sector (i.e. by stopping fossil fuel extraction, reducing CO_2 emissions and generating electricity from renewables).

The deliverable closes with recommendations for **future research**. Firstly, the findings of this study might be validated and extended through the use of primary data. Furthermore, we recommend exploring the linkages between social innovation and energy justice, energy security and sustainability in more detail.

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1 INTRODUCTION

SONNET's overall aim was to generate novel understandings of the diversity, processes and contributions of social innovation in the energy sector, and critically evaluate and assess their success and future potential towards supporting sustainable transitions of energy systems. After having employed various methods to study social innovation in energy over the past three years, this working paper aims to synthesise selected insights from across the different work streams.

This working paper aims to bring together our insights on two aspects: 1) the factors influencing (enabling or impeding) the development of social innovation in energy, and 2) the contributions that social innovations make to energy systems. We use the term 'contributions' to refer to the actual intended and unintended effects of concrete SIE-initiatives in relation to energy systems.

The following research questions are guiding our work:

- What are the factors enabling or impeding social innovations in energy (SIE) to emerge and develop?
- What are the contributions of SIE towards energy systems?

In financing the range of projects of which SONNET is part, the EU was especially interested to learn about the influencing factors as well as the contributions of SIE in relation to four categories: socio-cultural, socio-economic, socio-political and socio-technical issues. We have taken account of this categorisation in this synthesis work.

This introduction is followed by an explanation of our methodology (section 2), before we dedicate one section to answering each of our research question (incl. literature review, SONNET empirical work and discussion) (sections 3 and 4). Finally, we provide some observations and conclusions (section 5).

2 METHODOLOGY

The methodology describes the secondary material used for this paper (see sections 2.1.1 and 2.1.2) and how we analysed this data (see section 2.2).

2.1 Secondary data sources

To be able to identify enabling and impeding factors for the emergence and development of SIEs and their contributions, we collected and analysed **secondary material** for this paper, including:

1. Scientific literature (see section 2.1.1)
2. SONNET research reports (see section 2.1.2)

The type of data selected, sampling strategies and limitations connected to the collection and analysis of the data are discussed in the following sub-sections.

2.1.1 Scientific literature review

We performed a SCOPUS search using the following search string: "social innovation*" AND ("social change" OR "transformative change" OR "transformation*" OR "transition*") AND ("institution*") (in English articles and journal articles) – conducted in November 2021 to January 2022. This resulted in 147 articles. In a next step, we screened the abstracts to single out those articles which explicitly refer to social innovation in relation to social change, transformation, and/or transitions and talked about institutional change processes due to SONNET's focus on transformative social innovation. In addition, we narrowed the search by excluding articles that were not linked to energy (i.e. electricity, heat).

In total, we reviewed the resulting 18 journal articles for this deliverable (see Appendix 2 for an overview) and coded them against the following themes: enabling and impeding conditions (sub-codes: socio-economic, socio-cultural, and socio-political) and contributions (sub-codes socio-economic, socio-cultural, and socio-political).

For the analysis, we focused on those articles that explicitly refer to social innovation in relation to social change, transformation, and/or transitions and talked about institutional change processes due to SONNET's focus on transformative social innovation. In addition, we narrowed the search by excluding articles that were not linked to energy (i.e. electricity, heat). In total, we reviewed and analysed 18 journal articles for this deliverable (see Appendix 2 for an overview).

2.1.2 Review of SONNET reports

SONNET has used different methods to gain insights into the processes and contributions of SIE. For the analysis of this working paper, we focused on the following three SONNET outputs:

1. Six country reports including 18 embedded case studies on the emergence and development of social innovation in energy (Work Package 3);

2. Two reports on citizen acceptance and future potential of SIE (Work Package 5);
3. Two reports on the success of SIE (Work Package 6).

2.1.2.1 Six Country reports (Work Package 3)

In Work Package 3, SONNET researchers carried out case study work (including interviews, document reviews, and participant observation) to describe the history of six SIE-fields in six countries (Hielscher and Wittmayer 2021). The insights were collated in six country reports, in which each country report presents three embedded case studies of SIE-fields within their national context. The country reports formed a key source material for this paper. They were deemed suitable because they summarised the SIE-fields in each country context and provided analytical insight into the enabling and impeding factors and SIE contributions.

The focus of the analysis within the reports have been the summaries of enabling and impeding factors and contributions of SIE in the country reports (see Table 1). This was based on the assumption that the country researchers had summed up the key factors and contributions within these sections, thereby also addressing time constraints. The factors and contributions discussed in the findings sections (3.2 below and 4.2 below) therefore highlight key enabling and impeding factors and contributions of SIE rather than a full list. More factors and contributions could be identified when analysing the whole country report (including the case study reports).

Table 1: Focus of analysis within the Country Reports of WP 3, indicated per research question

Research question	Paragraphs of the country report included in the analysis	Country reports (in-text citation)
What are the impeding / enabling factors of SIE?	5.1.3 What are the enabling and impeding factors for the SIE-field actors and other field actors to conduct institutional work and change the 'outside' institutional environment?	Vernay et al. (2021). 'Country report: Deep dives into social innovation in energy through investigating three SIE-fields and their SIE-initiatives in France'. **(Country report, FR)** Stadler et al. (2021). 'Country report: Deep dives into social innovation in energy through investigating three SIE-fields and their SIE-initiatives in Germany'. **(Country report, GE)** Wittmayer et al. (2021). 'Country report: Deep dives into social innovation in energy through investigating three SIE-fields and their SIE-initiatives in the Netherlands/Belgium'. **(Country report, NL)** Dánkowska et al. (2021). 'Country report: Deep dives into social innovation in energy through investigating three SIE-fields and their SIE-initiatives in Poland **(Country report, PL)** Mueller, L. and Musiolik, J. (2021). 'Country report: Deep dives into social innovation in energy through investigating three SIE-fields and their SIE-initiatives in Switzerland'. **(Country report, CH)** Hielscher, S. and Iskandarova, M. (2021). 'Country report: Deep dives into social innovation in energy through investigating three SIE-fields and their SIE-initiatives in the United Kingdom'. **(Country report, UK)**
What are the contributions of SIE?	5.1.3.6 What have been intended and unintended effects (i.e. contributions) derived from conducting institutional work? What influence have they had on the SIE-field and 'outside' institutional environment? Link back to the 2-4 examples	

2.1.2.2 Two reports on citizen acceptance and future potential of SIE (Work Package 5)

The second SONNET source for this paper were two reports on citizen acceptance and future potential of SIE (Work Package 5). In this Work Package, SONNET researchers undertook a demographically representative citizen survey with more than 6,000 participants across three EU countries (France, Germany, Poland), and then performed statistical-econometric analyses to investigate factors driving citizen investment in renewable energy projects, participation in renewable energy cooperatives, and purchasing of mobile energy applications with gamification components. The two reports are (with their associated in-text citations in **bold**):

1. Guetlein, M. -C. et al. (2021). 'Report on econometric analysis of SONNET citizen survey, incl. cross-country comparison on individuals' perceptions and acceptance of SIE and EU energy transitions' (**SONNET report WP5, citizen survey**)
2. Guetlein, M. -C. and Schleich, J. (2022). 'Report on assessment of future potentials of SIE in Europe: Business models and competitiveness, future policy interventions'. (**SONNET report WP5, future potentials**)

One of the SONNET researchers dedicated to Work Package 5 was asked to provide enabling and impeding factors and contributions of SIE based on their research findings for this working paper.

2.1.2.3 Two reports on the success of SIE (Work Package 6)

In Work Package 6, SONNET researchers aimed at quantifying which SIE-initiatives are aligned with and achieve the highest contribution towards EU goals. They collated their insights in two reports:

1. Winzer, C. and Betz, R. (2021). 'EU and SIE goal alignment map'.
2. Dzukowski et al. (2021). 'SIE evaluation: Characterising successful SIE to enable secure, sustainable, competitive, and affordable energy transitions'.

Similar to the input from Work Package 5, the SONNET researchers dedicated to this Work Package were also asked to provide inputs on enabling and impeding factors and contributions of SIE derived from their work for this working paper.

2.2 Data analysis

Analysing the scientific literature and specific sections in the SONNET reports resulted in 260 unique datapoints for enabling and impeding factors, and 67 unique datapoints for contributions. We then coded the scientific literature as well as the SONNET reports along SONNET's four **research questions** and their respective deductive **codes** (see Table 2). Then, the data was coded according to several **subcodes**: socio-cultural, socio-political, socio-economic and socio-technological that have derived from one of the research foci in SONNET. These have been understood along the following lines:

- **Socio-cultural:** learning, values, knowledge, acceptance, relationships, networks, actor roles, norms, behaviour, etc.
- **Socio-political:** policies, governance arrangements, legislation, participation, etc.
- **Socio-economic:** funding, financing, subsidies, business models, markets, economic practices, etc.
- **Socio-technological:** technology, material aspects, climate, etc.

After coding the documents, a first analysis of the data was presented and discussed during an interdisciplinary dialogue at a SONNET project meeting in March 2022. The discussion during the project meeting revolved mainly around how social innovation contributed to topics of energy justice and energy security. Due to this discussion, we related the open codes of the contributions (see section 4.2 below) to topics of energy justice, energy security and sustainability (see 4.3 below). Before doing so, however, we used **open coding** to cluster the deductive subcodes we found. Here, the aim was to increase the ease of analysis. This resulted into a list of 7 contributions, 27 enabling and 22 impeding factors. For an overview of the enabling and impeding codes, see appendix **Error! Reference source not found.**.3.

Table 2: Questions and codes used for analysis

Research question	Main code	Subcode
What is the SIE in question?	CODE 1: Type of SIE	n/a
What are the factors enabling SIE to emerge and develop?	CODE 2: Enabling factor for SIE to emerge and develop	SUBCODE 2.1: socio-economic SUBCODE 2.2: socio-cultural SUBCODE 2.3: socio-political SUBCODE 2.4: socio-technical
What are the factors impeding SIE to emerge and develop?	CODE 3: Impeding factor for SIE to emerge and develop	SUBCODE 3.1: socio-economic SUBCODE 3.2: socio-cultural SUBCODE 3.3: socio-political SUBCODE 3.4: socio-technical
What are the contributions of SIE to energy systems?	CODE 4: Contribution of SIE	SUBCODE 4.1: socio-economic SUBCODE 4.2: socio-cultural SUBCODE 4.3: socio-political SUBCODE 4.4: socio-technical SUBCODE 4.5: other
What is the type of source of information?	CODE 5: Source type	SUBCODE 5.1: empirical sonnet report SUBCODE 5.2: literature review

3 FACTORS INFLUENCING THE DEVELOPMENT OF SIE

In the following two sub-sections, we present the findings derived from the literature review and analysis of the SONNET reports to better understand the enabling and impeding factors that influence the emergence and development of SIE.

3.1 Literature review

A clear first insight from the literature review on enabling and impeding factors for the development of SIE is that there is a very strong focus on **cooperative energy production and consumption**, with all but one article focusing on this type of SIE. Cooperative energy production and consumption encompasses phenomena such as energy communities and energy cooperatives which have been the focus of much research in sustainable energy transitions (e.g. Dóci, 2021; Hatzl et al., 2016; Koirala, van Oost and van der Windt, 2020; Kooij, Lagendijk and Oteman, 2018; Maher and Hazenberg, 2021; Schaffrin and Fohr, 2017; Soares da Silva and Horlings, 2020; Tingey and Webb, 2020). Being early on framed as a social innovation – cooperative energy production and consumption remains to play an important role next to attempts to diversify our understanding of social innovation in energy.

There is a wide variety of **socio-cultural factors** enabling such cooperative energy production and consumption – many outlining the access to knowledge and networks as a crucial enabling factor (Dóci, 2021; Hatzl et al., 2016; Koirala, van Oost and van der Windt, 2020; Kooij, Lagendijk and Oteman, 2018; Maher and Hazenberg, 2021; Schaffrin and Fohr, 2017; Soares da Silva and Horlings, 2020; Tingey and Webb, 2020). For example, energy umbrella organisations systematically collected knowledge on policy arrangements influencing cooperative energy production and consumption and created a codified model for setting them up and implementing them that allowed flexibilities for local adaptations and enabled further discussion on impeding factors and lobbying for political change (Kooij, Lagendijk and Oteman, 2018). Other enabling factors include the drive of those initiating the socially innovative activities (Dóci, 2021; Hatzl et al., 2016; Koirala, van Oost and van der Windt, 2020; Kooij, Lagendijk and Oteman, 2018; Tingey and Webb, 2020), strategic communication and framing of activities (Dóci, 2021; Hoppe and de Vries, 2018; Kooij, Lagendijk and Oteman, 2018), and an alignment with societal concerns (Schaffrin and Fohr, 2017; Soares da Silva and Horlings, 2020). However, the local community also plays an important enabling factor, especially when there is trust (Koirala et al., 2020), a strong community basis (Dóci, 2021; Hatzl et al., 2016; Hoppe and de Vries, 2018) and a favourable community history (Schaffrin and Fohr, 2017). Stimulating attitude from third parties, such as residents and municipalities, is also helpful (Koirala, van Oost and van der Windt, 2020; Kooij, Lagendijk and Oteman, 2018). In turn, an unfavourable community history (Hewitt et al., 2019; Lavrijssen and Parra, 2017) (e.g. mistrust of cooperative models in former communist areas), misalignment with societal concerns (Schaffrin and Fohr, 2017) (e.g. nature conversation) or lack of knowledge (Schaffrin and Fohr, 2017) can impede the development of cooperative energy production and consumption. An additional interesting factor impeding the development of cooperative energy production and consumption is the apparent lack of monitoring and making the most out of

learning experiences within initiatives (Dóci, 2021; Lavrijssen and Parra, 2017; Maher and Hazenberg, 2021), often due to the lack of resources.

Not surprisingly, political support (Dóci, 2021; Hatzl et al., 2016; Hoppe and de Vries, 2018; Koirala et al., 2018; Koirala, van Oost and van der Windt, 2020; Kooij, Lagendijk and Oteman, 2018; Schaffrin and Fohr, 2017; Soares da Silva and Horlings, 2020) and alignments with policies (Soares da Silva and Horlings, 2020; Tingey and Webb, 2020) are key enabling factors for the development of cooperative energy production and consumption – their lack or misalignment in turn again impedes further developments (Soares da Silva and Horlings, 2020; Tingey and Webb, 2020). Other important **socio-political** impeding factors are the lack of responsiveness to innovation by policy (Lavrijssen and Parra, 2017; Tingey and Webb, 2020) – e.g. unresponsiveness of central policy making to local contexts; as well as legal ruling against innovative practices (Kooij, Lagendijk and Oteman, 2018) or a high involvement of actors with vested interests (Hoppe and de Vries, 2018; Lavrijssen and Parra, 2017). External shocks uprooting the incumbent system in turn act as socio-political enablers (Hewitt et al., 2019).

The final enabling factors are the access to (stable) funding (Hatzl et al., 2016; Hewitt et al., 2019; Soares da Silva and Horlings, 2020) next to the willingness for voluntary labour (Hatzl et al., 2016) and the alignment with market structures (Hewitt et al., 2019) – where again the lack of access to volunteers (Soares da Silva and Horlings, 2020) or to stable funding (Hewitt et al., 2019; Kooij, Lagendijk and Oteman, 2018; Lavrijssen and Parra, 2017; Maher and Hazenberg, 2021; Schaffrin and Fohr, 2017; Soares da Silva and Horlings, 2020) including its unpredictability or insecurity are **socio-economic** impeding factors for the development of cooperative energy production and consumption.

As part of our data sources, there is close to no attention to **socio-technical factors** other than technological difficulties as impeding the development (Lavrijssen and Parra, 2017). This might partly be due to the type of data collection that has been selected and chosen search strings.

Beyond this focus on cooperative energy production and consumption, the only other SIE discussed by the reviewed set of articles is **participatory experimentation and incubation**. Sillak and co-authors (2021) provide a set of enabling factors that are similar to those for the cooperative energy production and consumption. Based on a critical review of co-creation and other selected collaborative approaches across the public sector literature, they consider the following enabling factors: access to knowledge and network, alignment with societal concerns, and ongoing monitoring and learning next to political support and access to funding (Sillak, Borch and Sperling, 2021).

3.2 SONNET Results

3.2.1 Cooperative energy production and consumption

We found that the rise of various national subsidy schemes such as feed-in-tariffs had a large enabling effect on the emergence and development of cooperatives in Europe (Country reports CH, UK, FR). The decline of these financing schemes has, on the other hand, greatly impeded the prolonged emergence and spreading of cooperatives, illustrating that stable financial mechanisms is a key factor to enable the viability of cooperative energy production and consumption. Still, cooperatives have started to create new business models (including financial models) to be able to continue their work.

Our data shows that political support and stable policies are important in enabling the institutionalisation of cooperative energy production and consumption (Country report, CH, DE, FR), but this is also relevant in other countries. For example, cooperative electricity generation became known as a cornerstone of the Dutch energy transition when it became embedded within the national energy agreement (NL: *Energieakkoord*). This agreement was signed by a broad range of actors in 2013 and set out a vision of the future of the energy transition, marking a large role for cooperatively generated electricity.

In the context of our research, we found that cooperative production and consumption thrived within contexts with a historical tradition of cooperative governance models. For example, the long tradition of the cooperative model in Germany led to more acceptance of energy cooperatives and their related goals and benefitted from pre-existing political representation by the German Cooperative and Raiffeisen confederation (DGRV), which facilitated the foundation of a national intermediary for energy cooperatives (Country report, GE). Moreover, our data shows that this SIE-type benefits from targeting potential members, who have a stronger place bound identity, since they were found to have a higher propensity to invest in cooperative energy production and consumption projects (SONNET report WP5, citizen survey).

3.2.2 Local peer-to-peer electricity exchange

Like cooperative energy production and consumption, our analysis shows that local peer-to-peer electricity exchange initiatives benefit from stable funding (Country reports, UK, CH). Additionally, they benefit from local electricity markets (Country report, UK). The lack of access to stable funding and the high demand in time investment by volunteers were found to be impeding factors (Country report, CH).

More so than any other types of social innovation in energy, this type was found to be enabled by technological maturation (Country report, UK). Technological innovations such as distributed ledger technologies (i.e. blockchain) and smart meters and the use of real-time energy consumption data formed a key stimulus for peer-to-peer electricity trading. These technologies allowed, for the first time, simultaneous access and updating of data across decentralised energy systems. Without the need of an intermediary to manage and update the exchange of

information, decentralised actors were able to exchange electricity at a local level (Country report, UK).

Local peer-to-peer electricity exchange benefits from working in a trusting, local community (Country report, CH) and being aligned with societal concerns (Country report, UK, CH). Moreover, it benefits from access to knowledge networks (Country report, CH). For example, *Quartierstrom*, an energy community in Switzerland was enabled to a large extent by another energy community, *Energiegenossenschaft Schweiz*. The latter helped *Quartierstrom* by sharing their know-how on local electricity exchange, facilitating *Quartierstrom* to formalise into a self-consumption community (Country report, CH).

Like cooperative energy production and consumption, local peer-to-peer electricity exchange is enabled by political support and aligning activities with existing policies (Country report UK, CH). In turn, a lack of alignment with the policy landscape impeded this type of innovation (Country report, CH, UK). For example, the Swiss Federal Office for Energy was key in facilitating the exchange of electricity on a local level. They financed pilot projects, published guidelines, market studies to educate potential initiators on founding a self-consumption community and using blockchain technology. Moreover, exchanging electricity locally benefitted from a fast build-up of a lobbying actor community around the topic in Switzerland. Initially, this community existed mainly out of actors related to generating and exchanging renewable energy. However, the collective lobby of the field benefitted especially from the instream of actors from the real estate and housing sector, who put the topic of exchanging electricity locally at the heart of the housing sector (Country report, CH).

Opposition from distributed system operators and local utilities was found to impede this type of social innovation (Country report, CH, NL). We found that these actors often showed little engagement with self-consumption and local exchange communities. This formed a key barrier to the development of local exchange communities, as these were singularly dependent on a local utility or system operator. For example, in Switzerland, energy community *Quartierstrom* was dependent on one energy supplier to formalise into a self-consumption community. After a challenging negotiation process, it was agreed that the energy supplier would manually check the energy meters and provide monthly invoices to the energy bill managing association of the community (Country report, CH). In the Netherlands, the housing association Aardehuizen did not manage to get the local grid operator on board for their local electricity exchange project. As they were dependent on the grid operator to change their local electricity infrastructure and data management system and did not have sufficient funding and knowledge to carry out the exchange themselves, the experiment stagnated (Country report, NL).

Overall, the local exchange of electricity benefits from policies and funding schemes dedicated to cooperative energy communities. Moreover, technologies such as smart meters and blockchain can enable the further decentralisation of the energy sector. However, despite these enabling factors, local electricity exchange initiatives often stagnate because of a lack of funding and knowledge within energy communities to invest in the energy exchange project and lack of engagement from the utility on which they depend (distribution system operator and electricity supplier).

3.2.3 Campaigns against specific energy pathways

Campaigns against specific energy pathways were found to benefit from aligning their goals with societal concerns (Country report, PL, UK, SW). In particular, campaigns benefitted from the emergence of societal awareness around climate change. In Poland, for example, the COP24 conference and the Special Report on Global Warming in 2018 by the Intergovernmental Panel on Climate Change gained considerable publicity. This caused a wider debate about the damaging effects of fossil fuels.

Moreover, campaigns against specific energy pathways benefitted from having access to knowledge networks (Country report, PL, UK). For example, in the UK, activities at the Pont Valley opencast coalmine were supported by the Coal Action Network, a national intermediary organisation (Country report, UK). In Poland, the most enabling factor for Greenpeace, the coalition 'Development Yes – Opencast mining NO' and 'Workshop for All Beings' was having gained knowledge and network in previous protests. There, they gained experience in cooperating and organising protests and built up a network of like-minded actors to organise new protests (Country report, PL).

Furthermore, this type of social innovation was found to benefit from access to strategic actor networks to do collective lobbying, political support, and support from third parties (Country report, PL, UK), whereas the lack thereof impeded it (Country report, UK). The lack of political support often stemmed from historically locked-in institutions around generating electricity from fossil fuels. For example, in Poland, the dominant societal belief is that the mining sector is essential to the country, providing jobs for thousands of miners and associated companies. This belief is upheld by a strong mining lobby, ensuring continued subsidisation for the mining sector. As such, the actors lobbying against fossil fuels faced the difficult task to change deeply rooted, dominant fossil discourses (Country report, PL). As such, dominant impeding factors to this field are dominant locked-in policies and discourses, legislative barriers and opposition from regime actors (Country report, UK, PL).

Lastly, stable funding and voluntary time investment by key actors were found to enable campaigns against specific energy pathways (Country report, NL, UK). For example, in the UK, the protest against open cast coal mining benefitted from the willingness of people (often local residents) to invest resources i.e. spare time and money into setting up and developing the campaigns. Some people even reduced their working hours to more fully commit to the campaigns (Country report, UK).

3.2.4 Participatory experimentation and incubation

Participatory experimentation and incubation benefits from having access to knowledge networks (Country report, PL, NL), and aligning their goals with societal concerns (Country report, NL). Similarly, the lack thereof was found to be an impeding factor (Country report, NL, GE). For example, the Polish cluster of actors working on renewable energy *KlastER* and *ZKlaster* were able to overcome unfavourable legislation through aid of knowledge accessed through actors in their network (Country report, PL).

In line with the other social innovations in this report, political support and changing legislation in favour of the innovation was found to be an enabling factor (Country report, NL, PL) whereas the lack thereof impeded it (Country report, NL). In the Netherlands, for example, Living Lab Buiksloterham was founded because they were given political support by the Amsterdam municipality to set it up. The Living Lab emerged as a citizen-led initiative to take hold of an empty city development allotment, after the city had abandoned their plans for its redevelopment due to the financial crisis (Country report, NL).

Lastly, funding was found to be a key requirement for the development of this social innovation in energy (Country report, NL, GE). For example, Living Lab formats were widely popularised through the Joint Programming Inititiative Europe (JPI Europe) funding calls for Living Lab projects.

3.2.5 Investment and finance mechanisms

Socially innovative investment and finance mechanisms are enabled by access to knowledge and networks (Country report, PL). For example, in Poland, the 'My Electricity' financing programme benefitted from a shifting societal discourse in favour of renewables.

Legislative barriers, a lack of political support and a lack of aligning with existing policies can impede SIE-investment and finance mechanisms (Country report, NL, PL, UK). Similarly, aligning with policies and gaining political support enabled this type of social innovation (Country report, NL, PL, UK). For example, in the UK, crowdfunding struggled at first, as the sector struggled to get authorisation on their financial conduct. However, as the crowdfunding sector matured, and as the financial crisis made the government more supportive of ways to diversify the debt economy, the 'Financial Conduct Auhority' became very receptive to the idea of crowdfunding (Country report, UK).

Lastly, technological developments can enable investment and finance mechanisms (Country report, NL). For example, in the Netherlands, crowdfunding platforms were enabled to emerge and develop through access of the new online payment technology *iDeal*, which eased the decentralization of financial participation by allowing investors to fund crowdfunding initiatives from their own homes without an intermediary party (Country report, NL).

3.2.6 Energy gamification and nudges

Energy gamification and nudges are enabled by political support, access to knowledge and network, access to funding and aligning their activities with societal concerns (Country report, GE). An example of an initiative embodying this social innovation is the Swiss Energiestadt label. This label is awarded "to cities and municipalities that have made above-average efforts in the area of their municipal energy and climate policy" (Local-energy Swiss, 2022). The development of the label was enabled by support on a federal political level, as they embedded the label within the national energy policy (the Energy 2000 Action Programme). This supported the initiative with financial, organisational, and political capital. An impeding factor is the short-lived character

of gamification and nudging activities. Often they last for several months and can make a difference, but once the project stops overall impacts become unclear.

3.3 Discussion

Literature on social innovation in the energy transition focuses mainly on energy cooperatives (see also section 3.1 above). However, in the SONNET project, we have taken a broader take on the concept, defining it as a "*combination of ideas, objects and/or actions that change social relations and involve new ways of doing, thinking and/or organising energy*" (Wittmayer et al, 2020; p.6). When looking across the analysis of the literature on social innovation in energy and selected SONNET reports, the following points become apparent about enabling and impeding factors.

Firstly, our data supports existing literature on energy cooperatives that **political support and access to stable funding, knowledge and networks** are important enabling factors. Moreover, our data supports the findings of previous research (Koirala et al., 2020, Dóci, 2021; Hatzl et al., 2016; Hoppe and de Vries, 2018 and Schaffrin and Fohr, 2017) in highlighting the importance of the **local community and pre-existing relations of trust** between members. This is particularly evident in locally bound social innovations, such as locally oriented campaigns against specific energy pathways, cooperative production and consumption and peer-to-peer electricity exchange.

Secondly, we found that social innovation in the energy transition is hardly impeded by the lack of mature technology. Rather, we can conclude from our findings that social innovation in energy is mostly impeded by **opposing and locked-in discourses, regulations and beliefs within the regime of the energy sector**. For example, Polish campaigns against coal were impeded by a strong mining lobby and deeply rooted societal and political belief in the importance of the mining sector, local electricity exchange was impeded mostly by utilities opposing a change of routines, and socially innovative investment and finance mechanisms faced strong opposition from the incumbent financial sector.

Thirdly, our data highlights the importance of considering the **diversity in goals and theories of change** associated with various forms of social innovation. Whereas some types of social innovation might be involved with **building up** new ways of doing, thinking and organising (i.e. peer-to-peer electricity exchange), others might be more involved in **breaking down** and phasing out existing institutions (i.e. campaigns against specific energy pathways) (Hebinck et al., 2022). In doing so, these various social innovations are faced with different enabling and impeding factors. We could find that **social innovations creating new practices** are mainly enabled by investment security, regulatory sandboxes, legitimising political agreements, knowledge build-up and aligning their goals with societal concerns. **Social innovations actively attempting to break down and phase-out existing practices and infrastructures** are rather more affected by favourable social discourses and collaborative lobbying networks and are impeded by opposing regime forces.

Lastly, we see that there is a **synergy between social innovations,** where the contributions of one social innovation might enable others' success. For example, socially innovative crowdfunding platforms enable citizen-led initiatives such as cooperative energy production and consumption communities through access to financial support.

4 CONTRIBUTIONS OF SIE

In the following two sub-sections, we present the findings derived from the literature review and analysis of the SONNET reports to better understand the contributions of social innovation in energy.

4.1 Literature review

The selected reviewed articles showed that **cooperative energy production and consumption** contributes to an increased social acceptance of renewable energy (Sillak et al. 2021; Soares da Silva and Horlings 2020) and increased support of RES (Sillak et al. 2021). Initiatives engaging in cooperative energy production and consumption open possibilities for citizens to engage and thereby increase citizen participation in the energy sector (Soares da Silva and Horlings, 2020; Hatzl et al. 2016; Hewitt et al. 2019). Their main reported contribution relates to more widely distributing the benefits of energy production; for example, through increasing the possibilities to invest in PV-systems and wind energy (Maher and Hazenberg 2020); and/or through funding local environmental projects for residents living closest to wind power developments (Soares da Silva and Horlings, 2020).

In their analysis on **participatory experimentation and incubation**, Sillak et al. (2021) consider it contributing to learnings and dialogues about climate change and green energy, increasing the public acceptance of RES, to economic growth and local job creation, the replacement of fossil fuels, introduction of energy saving programmes reducing energy consumption and increasing production of renewable heat.

Finally, **energy gamification and nudging** is considered to be supportive to the design of the transition process by helping actors to formulate goals, generate collaborative strategies, and coherent decision making and to reduce energy consumption through serious games (Hoppe and de Vries 2019).

4.2 SONNET Results

In total, we found that SIEs contribute to the energy transition in seven ways: 1) they provide alternative discourses and knowledge on the energy transition, 2) they ensure broader distribution of benefits of the energy transition, 3) they increase citizen participation in the energy transition, 4) they change actor roles and behaviours, 5) they reduce fossil fuel extraction, 6) they increase renewable electricity generation and 7) reduce energy consumption or increase energy efficiency. This section highlights some key contributions of social innovation in the energy transition, rather than providing a full list (as detailed in the Methodology section).

Cooperative production and consumption initiatives engaging in citizen-led renewable energy technology contribute to **increasing renewable energy generation** and **reducing energy consumption**. For example, the energy cooperative *ADEV* in Switzerland generates renewable electricity from hydroelectric power plants, PV, wind turbines, central heating plants and has installed local heat networks and informs their members on how to reduce their energy consumption (Country report, CH). Similarly, initiatives engaging in the gamification of the energy system seem to contribute to **reducing energy consumption** by nudging people to change their behaviour. For example, the *Energiestadt label*, which is awarded to energy efficient cities in Switzerland, made policy makers more motivated in creating sustainable policies (Country report CH). Moreover, we found that gamifying energy consumption through apps led users gain more insights in their behaviour and consumption patterns, which led to a change in energy consumption (Country report, CH). Furthermore, initiatives engaging with campaigns against specific energy pathways contribute to the energy transition by **reducing fossil fuel extraction** and public discourses on the legitimacy of fossil fuels (Country report, UK, NL, PL). For example, the Dutch anti-Fracking movement was able to put a stop to Fracking in the Netherlands before its inception (Country report, NL), and the anti-Groningen gas movement was able to significantly reduce the amount of gas extracted from the gas field (Country report, NL).

Moreover, we found that social innovation in the energy transition contributes to **increased citizen participation** in the energy transition (Country report, FR, CH, UK). In doing so, the initiatives engaging with citizen participation allow the benefit from the transition to be distributed beyond the incumbents of the energy sector, and thereby contribute to a **broader distribution of the benefits**. In the literature, citizen participation in the energy transition is synonymous with energy cooperatives, but we found that other types of social innovation also contribute to citizen participation. For example, as part of peer-to-peer electricity exchange, groups have invited citizen participation within grid operation, campaigns against energy pathways have activated citizens to engage with unsustainable energy discourses, initiatives engaging with participatory incubation and experimentation have invited citizens to be involved in knowledge development, initiatives pertaining to energy gamification and nudges have invited citizens to actively think about their energy consumption patterns, and socially innovative investment and finance mechanisms have allowed citizens easier access to the financial system.

Furthermore, several social innovations seem to contribute to the build-up of **alternative discourses and knowledge**. For example, in Poland, energy production and consumption initiatives educated actors about cooperative energy governance, when the concept of cooperative citizen-led governance was still new to policy makers. In doing so, banks, insurance companies, elected officials slowly learned about this social innovation and considered it more favourably (Country report, PL). Moreover, initiators of the first online crowdfunding platforms were invited repeatedly by the 'Ministry of Economic Affairs and the Authority Financial Markets' to educate them about the workings of this social innovation (Country report, NL). Furthermore, in Switzerland, a peer-to-peer electricity exchange initiative demonstrated the effects of decentralised distribution grids, leading to not foreseen discussions on the future of grid tariffs in Switzerland (Country report, CH). Furthermore, an ecovillage which engaged with participatory incubation and experimentation in the Netherlands allowed local actors to learn about how they could facilitate local peer-to-peer electricity exchange in their community (Country report, NL). And, lastly, we might also see campaigns against specific energy pathways to contribute to the build-up of alternative discourses and knowledge in society, because they activate society to see the extraction of fossil fuels as harmful to the (local) environment. For example, in the UK, the divestment campaign has led to changing public discourse in that issues of investments in fossil fuels have become more prominent on both political and financial agendas (Country report, UK). Social innovations often present new ways of doing, thinking and organising. As such, it is perhaps not surprising that their contribution often lies in **educating policy makers and other actors** about their way of doing, thinking or organising.

Lastly, we found that social innovation in the energy transition contributes to a **change in behaviour and actor roles**. For example, the Swiss *Energiestadt label*, which is awarded to eco-efficient cities, contributed to the fact that municipalities were no longer perceived as passive relays of national policy plans, but rather as active and formative actors in the Swiss energy transition (Country report, CH). Socially innovative investment and financing mechanisms have marked a similar shift in role of the municipality: from owning local utilities before the turn of the millennium, to subsiding renewable energy after privatisation, towards actively envisioning and financing renewable energy (Country report, NL). Furthermore, in Poland, we saw that campaigns against coal mining contributed to new beliefs within wider society about who ought to decide upon further development of the energy sector, shifting the role of citizens from passive to conscious consumers (Country report, PL). In turn, citizen-led social innovation initiatives such as cooperative production and consumption initiatives, have had a large effect on shifting the role of citizens in the energy transition. Due to their work in shaping discourse and policies, citizens are no longer perceived and treated as passive consumers, but rather as active energy **prosumers** (Country report, NL, GE). Lastly, initiatives engaging with participatory incubation and experimentation have contributed to a change in actor roles by blurring the boundaries between public engagement and private interests (Country report, GE, NL). Overall, social innovation initiatives seem to have particularly contributed to a **decentralisation of responsibility** for the energy transition, from the national government, towards local authorities and citizens.

4.3 Discussion

This section will discuss our results derived from the analysed SONNET reports in relation to scientific literature and three key topics on the European policy agenda: **energy justice, energy security and reducing CO_2 emissions**. These three topics are key areas of interest in the '*Clean energy for all Europeans*' package (European Commission, 2019a), '*The European Green Deal*' strategy (European Commission, 2019b) and the '*REPowerEU*' plan. In this discussion, we ask the question: **how does our analysis support (or not) the relevance of social innovation in addressing these goals and issues?**

4.3.1 Energy justice

Energy justice is a call for the consideration of social justice and economic equity issues in energy transitions. It is mainly concerned with the **distributional** ('how are the benefits distributed?') and **procedural** ('who is included in the process?') aspects of the energy system transformations (Burke and Stephens, 2017; van Veelen and van der Horst, 2018). Energy democracy can be seen as a demand for more democratic energy governance (Burke and Stephens, 2017). Energy justice and democracy often relate to more agency and empowerment of citizens in the energy system (Burke and Stephens, 2017; van Veelen and van der Horst, 2018; Szulecki, 2018). Citizens thus play a central role in energy justice and democracy, for example through participation and collaborative decision-making, but also by having access to information, having a say in the way energy is produced and distributed, or even co-owning parts of the energy system (van Veelen and van der Horst, 2018; Ryghaug et al., 2018).

Our findings seem to suggest that social innovation increases energy justice in two ways. Firstly, **procedural justice** is enhanced by increasing the diversity of actors involved in the process of potentially making decisions about the course of the energy transition. Multiple types of social innovation cater to this aspect. Firstly, campaigns against fossil fuel increase the procedural justice of the energy system because they allow citizens, non-profits and other actors to enter discussions on the energy system that would otherwise be held without them. Secondly, initiatives engaging with participatory experimentation and incubation increase the procedural justice by inviting a more diverse set of actors to learn and experiment together about possible changes in the system. Thirdly, in line with Hatzl et al., (2016), cooperative energy production and consumption and peer-to-peer electricity exchange initiatives increase the procedural justice because they allow citizens to decide and take the reins of their (local) energy system. Our findings illustrate that a **diversity of social innovation** seems to increase energy justice, i.e. beyond merely energy cooperatives.

Furthermore, we see that social innovation contributes to **distributional energy justice** because it facilitates a broader distribution of social and economic benefits among participating actors. In line with Maher and Hazenberg (2020), we see that the lower electricity costs in energy cooperatives make it more accessible to lower-income community members to take part and benefit from the transition. However, our findings expand beyond the positive effect of energy cooperatives on distributional justice. For example, participatory incubation and experimentation

initiatives allow **knowledge build-up** within a broader range of actors, online crowdfunding platforms allow for a **broader distribution on return on investment** and campaigns against fossil fuels highlight the necessity to **distribute the burdens** of the energy transition and damaging fossil fuel practices more evenly.

4.3.2 Sustainability and reducing CO_2 emissions

Environmental sustainability and decarbonisation relates to activities that reduce global carbon emissions to limit climate change and the role of citizens therein, for example through a reduced energy demand or increased energy efficiency (Kern and Rogge, 2016; Horstink et al., 2020).

In our analysis, we assess that social innovation in the energy transition has a clear and tangible effect on the **reduction of CO_2 emissions** on three accounts. Firstly, our findings show that social innovation in energy **contributes to an alternative system** in which fossil fuels can be phased out, either by shaping discourses, offering new actor roles and building up knowledge of alternative (renewable) energy technologies. For example, cooperative production & consumption initiatives engaging in citizen-led renewable energy technology contribute to increasing renewable energy generation and reducing energy consumption, initiatives engaging with participatory experiments build up knowledge about a sustainable energy sector, and socially innovative financing mechanisms provide funding mechanisms that facilitate other socially innovative initiatives to thrive. Secondly, different types of social innovation in energy contribute to a decrease in **energy consumption**. For example, we found that energy gamification and nudges can contribute to environmental sustainability and decarbonisation, as energy consumption can be reduced with serious games that nudge a change in energy behaviours, in line with Hoppe and de Vries (2019) findings. Lastly, campaigns against energy pathways stop open-cast coal mines, gas fracking, coal investments which reduces the generation of electricity from fossil fuels. However, as is discussed by Gökgöz et al. (2018), the stopped fossil fuel is **not always synonymous to a decrease in CO_2 emissions.** The fuel might be substituted with other (imported) fossil fuels, such as coal, liquid natural gas, or oil. As this study did not study the linkages between the phase-out of domestic fossil fuel practices and the substitution of them with imported fossil fuels, we are not able to conclude that the stopping of domestic fossil fuel extraction equals the mitigation of CO_2 emissions.

4.3.3 Energy security

Energy security can be explained as the uninterrupted availability of affordable energy (IEA, 2019). In the European Union, the debate is particularly high on the political agenda because it is "*among the most vulnerable countries/unions due to her high-energy import dependency and scarcity in energy reserves*" (Gökgöz et al., 2018; p. 1). Energy security entails the ability of the energy system to react on disruptions and to coordinate the supply of energy with economic and environmental developments. There are divergent perceptions on the role of renewables in addressing energy security (Mata Pérez et al., 2019). On the one hand, renewable energy is seen as a substitute to fossil fuels and therewith can lower import dependence. On the other hand,

renewable energy is seen as too volatile and expensive to replace fossil fuels, and can create new import needs (e.g., critical materials) (Mata Pérez et al., 2019; Vakulchuk, Overland and Scholten, 2020). This can potentially be overcome by having a great variety of renewable energies and by increasing the connections between different sources and energy cooperation (Mata Pérez et al., 2019).

Because of the high gap between energy consumption and production, Europe relies heavily on geopolitically unstable fossil imports (Gökgöz et al., 2018). As sun, wind, water basins and organic matter can provide electricity within the borders of the EU, renewables lie at the heart of energy security policies (Scholten and Bosman, 2016). The need for a secure energy system has most recently become particularly urgent due to Russia's invasion of Ukraine. The invasion has exacerbated the increased energy prices that Europe is facing and makes the supply of energy uncertain (European Commission, 2022), invoking a renewed discussion around the role of renewable energy in Europe. However, renewables are volatile. Thus, the debate about the relationship between renewables and energy security mainly evolves around our ability to solve the intermittency of sun and wind, for example by saving electricity to use at a later time (i.e. through energy storage technologies) and by demand-side management (i.e. automatically distributing electricity to where there is high demand or changing consumer behaviour to use electricity at peak supply).

It is possible to argue that social innovation in the energy transition contributes to energy security on multiple accounts. Firstly, peer-to-peer electricity exchange initiatives contribute to the innovation of the technology, regulation and social norms of systems wherein **smart-grids** match supply and demand automatically. Secondly, socially innovative initiatives that contribute to behaviour change in consumers can aid in **demand-side management**, by convincing consumers to change their consumption patterns, for example through apps engaging with energy gamification and nudges. Thirdly, in particular in Germany, energy cooperatives have increased the level of renewable energy going into the grid. Moreover, some energy cooperatives have been part of trials, creating decentralised grids with, for example, battery storage to make existing grids more resilient.

5 Reflections and Conclusions

The literature on social innovation in the energy transition focuses mainly on energy cooperatives. However, in the SONNET project, we have taken a broader take on the concept, defining it as a "*combination of ideas, objects and/or actions that change social relations and involve new ways of doing, thinking and/or organising energy*" (Wittmayer et al, 2020; p.6).

Taking this broader approach towards social innovation in the energy transition, we found several **key enabling and impeding factors** of social innovation. Firstly, we found that social innovation in energy is mostly impeded by opposing and locked-in discourses, regulations and beliefs within the regime of the energy sector. Secondly, our data highlights the importance of considering the diversity in goals and theories of change associated with various forms of social innovation. Whereas some types of social innovation might be involved with **building up** new ways of doing, thinking and/or organising (i.e. peer-to-peer electricity exchange), others might be more involved in breaking down and **phasing out** existing institutions (i.e. campaigns against specific energy pathways) (Hebinck et al., 2022). Lastly, we see that there is a **synergy** between social innovations, where the contributions of one social innovation might enable others' success. For example, socially innovative crowdfunding platforms might enable social innovation initiatives by granting them access to the financial system.

Furthermore, we found that SIEs **contribute** to the energy transition in seven ways: 1) they provide alternative discourses and knowledge on the energy transition, 2) they ensure broader distribution of benefits of the energy transition, 3) they increase citizen participation in the energy transition, 4) they change actor roles and behaviour, 5) they reduce fossil fuel extraction, 6) they increase renewable electricity generation and 7) reduce energy consumption or increase energy efficiency. In doing so, they contribute to increasing the **energy justice** of the energy transition (i.e. through involving citizens within decision-making and distribution of benefits), increasing **energy security** (i.e. by facilitating storage of intermittent renewables) and improving the **sustainability** of the sector (i.e. by stopping fossil fuel extraction, reducing CO_2 consumption and generating electricity from renewables).

The focus of this research has been the analysis of secondary data: summaries of enabling and impeding factors and contributions of the SONNET Country reports and scientific literature. This approach partly came from the assumption that these summaries capture the highlights of the research. In future research, the findings of this study might be validated and extended through the use of primary data. Furthermore, our inductive analysis resulted in seven contributions of social innovation in the energy transition which we related to energy justice, energy security and sustainability. However, we did not consider these themes during the collection of the primary data: the original SONNET reports were written without considering these analytical codes in mind. Therefore, it might be interesting to explore the linkages between social innovation and energy justice, energy security and sustainability in more detail. The relationship between social innovation and energy security seems a particularly important topic to analyse more thoroughly, especially considering Russia's recent invasion of Ukraine and the renewed debate about European energy security.

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Appendix 1: EC summary requirements

Changes with respect to the DoA

The submission deadline of the deliverable has been extended from the 30.03.2022 to the 31.05.2022. This is because it synthesizes insights from the work across SONNET work packages, some of which have experienced delays mainly due to the pandemic. This postponement has been agreed upon with the EU project officer. There are no other changes in scope and content of the deliverable.

Dissemination and uptake

This deliverable will be uploaded on the SONNET website, and openly shared on the platform Zenodo.

Short Summary of results (<250 words)

SONNET's overall aim was to generate novel understandings of the diversity, processes and contributions of social innovation in the energy sector, and critically evaluate and assess their success and future potential towards supporting sustainable transitions of energy systems. After having employed various methods to study social innovation in energy over the past three years, this working paper aims to synthesise selected insights from across the different work streams. In doing so it brings together SONNET insights on two aspects: 1) the factors influencing (enabling or impeding) the development of social innovation in energy, and 2) the contributions that social innovations make to energy systems. Firstly, regarding influencing factors, we found that political support, funding and access to knowledge networks are key enablers, whereas opposition from the incumbent regime and alternative discourses are key impeding factors. Secondly, we found social innovation contributes to energy justice of the energy transition (i.e. through involving citizens within decision-making and distribution of benefits), increasing energy security (i.e. by facilitating storage of intermittent renewables) and improving the sustainability of the sector (i.e. by stopping fossil fuel extraction, reducing CO_2 emissions and generating electricity from renewables). We found that it is important to consider the diversity of social innovations, whose narratives of change and goals expand beyond the current dominant focus on energy cooperatives.

Evidence of accomplishment

This deliverable and associated documents form the evidence of accomplishment.

Appendix 2: Overview of reviewed literature

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Appendix 3: Enabling and impeding factors

Table 3 Overview of all enabling / impeding factors of SIE

Subcode	Enabling factors	Impeding factors
Socio-economic	• Access to stable funding and/or assets • Alignment with economic status of target group • Alignment with market structure • Investment security • Key actors willing to invest a lot of time • Access to local energy markets • Low financial entry barriers for potential participants	• Initiative requires knowledge and time investment by volunteers • Lack of access to stable funding/pricing • Lack of access to stable funding • Not enough security of investment
Socio-cultural	• Access to knowledge and network • Alignment with literacy of target group • Alignment with societal concerns • Favourable community history and norms • Favourable characteristics of initiating members (enthusiastic, respected and/or entrepreneurial) • Ongoing monitoring, evaluation and learning • Status and legitimacy • Strategic communication and framing of project • Strong community base • Target audience is older • Trusting local community	• Lack of alignment with societal concerns • Lack of knowledge and network • Lack of monitoring, evaluation, learning and clear communication within initiative • Unfavourable characteristics of initiating members
Socio-political	• Access to strategic actor network to lobby for shared vision • Access to funding • Alignment with policies • Landscape shock uprooting regime • Institutional agreements supported by a broad range of societal parties • Access to legal derogation zones • Political support • Support from third parties	• High involvement of vested interests • Involvement of firms • Lack of alignment with policies • Lack of political support • Lack of societal support • Legislative barriers • Opposition from regime parties to niche initiative
Socio-technical	• Technological innovation	• Technical difficulties • Technology too complex for users