EMPOWER2.0

Deliverable 3. A White Book, universal mapping model for roadmaps, with real life examples, to enhance empowerment of citizens in a clean energy transition

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Revision history

The publication has been an ongoing process, collecting data, analyzing processes and conversations through the whole project. Still knowledge is being developed by the many teams, partners and people in the project. The material has been discussed on biweekly meetings. Drafts have been developed ongoing in common Dropbox. The final edition was approved after last input on transnational partner meeting, on-line, the 20-21 April 2021. Responsible for proofreading; Morten M. Westergaard and layout Christof Godderis

Table of content

Table of figures

1. Introduction

The aim of the white book is to investigate and map the barriers in all partner countries. This mapping can be used as a basis for an increased understanding of what drives or hinders the transition towards a renewable energy system with citizens and local civil society as active prosumers. The aim is also to get pro-active advice on how to analyze possibilities to support citizens in the energy transition and make country-specific roadmaps to do this.

By reading this document, you will read about:

- An overview of the best EMPOWER cases from the UK, BE, NL and DK
- Common lessons learned
- A description of a universal model of mapping
- The use of a model in a large survey
- Get insight into likeminded European projects
- Identification of existing available data and resources for retrieving additional needed data.
- Decision-making method and needs for the mapping and completing the mapping in each partner region.
- Development of a flexible data-driven roadmap
- Conclusion and perspectives

The white book has been completed by partners from:

Coöperatie Kennemer Kracht, NL
Stadsgarage; NL
Gemeente Haarlem, NL
Gemeente Zaanstad, NL
Universiteit Gent; BE
Intercommunale Leiedal, BE
Provincie West-Vlaanderen, BE
Southend on Sea Borough Council, UK
Essex County Council, UK
Middelfart Kommune; DK

2. Paving the road while driving – interrelated work

The product of the EMPOWER 2.0 project is developing and implementing real-life pilot projects with the goal of empowering citizens. Furthermore, performing the development of mapping models, roadmaps, tool development and propositions to identify and overcome barriers.

Where this white book sums up many of the activities, a large number of details and related findings can be found on the project website.

To pave the road while driving is a rough ride in a worldwide lockdown. The conditions due to the COVID-19 pandemic has been a part of most of the project. Findings are heavily influenced and possibilities to test ideas, and findings have been challenged, as for all other matters of life in a pandemic.

In general, an intense collaboration has been with the development of pilots, tools and propositions.

The authors have explored and developed a large number of connections and symbiosis with parts and work packages in the EMPOWER 2.0 project. These have been dealt with on a frequent online collaboration amongst partners, supported with biweekly skype meetings.

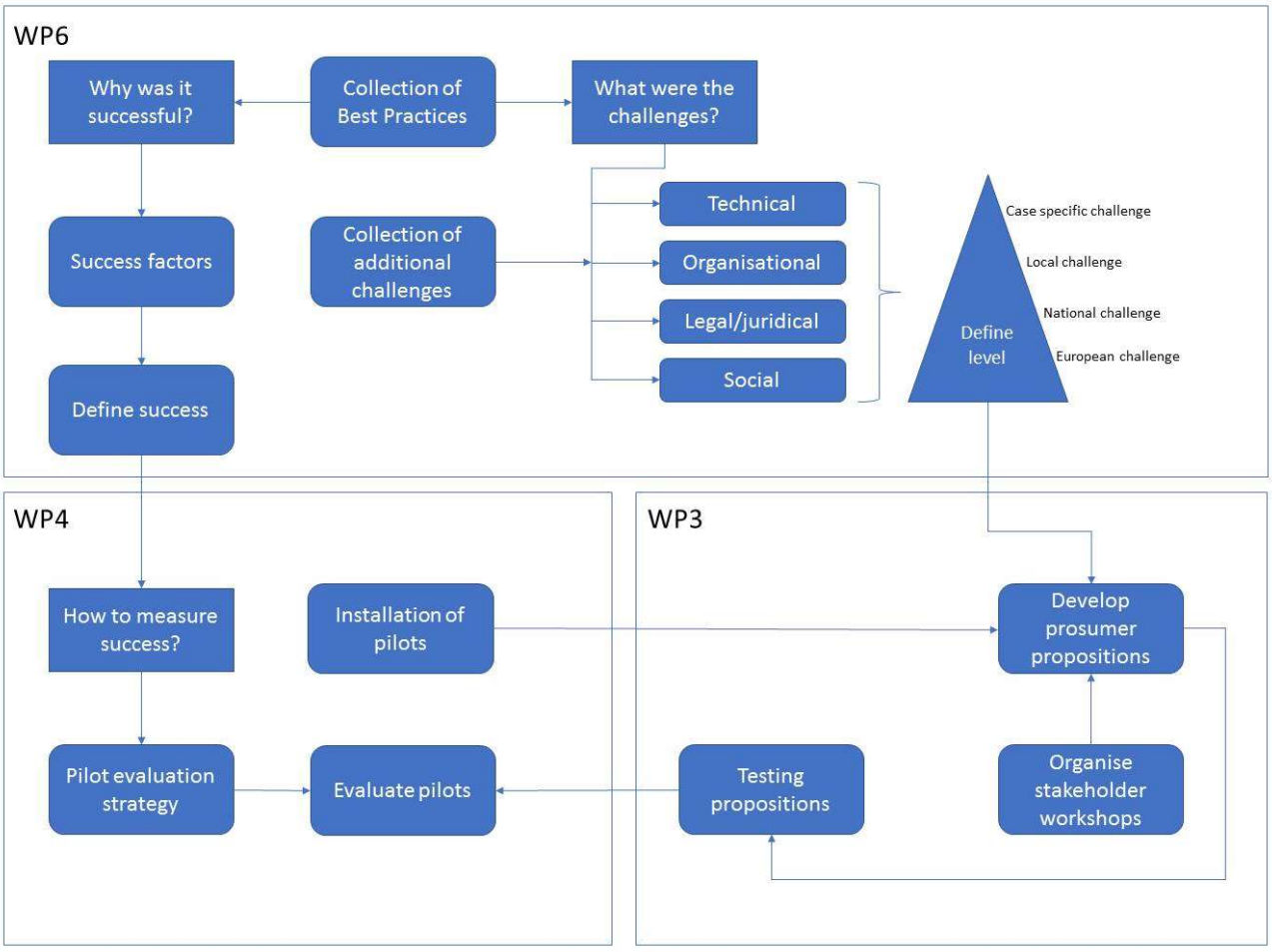

Figure 1 Complexity and interrelations in project

The graphic above illustrates the complexity and interrelations of different work packages in the project that all feed into the white book. The substantial amount of accumulated knowledge from each partner is not replicated in detail in this white book. It can easily be accessed by contacting any of the partners. 3.

3. Best EMPOWERING cases from UK, BE, NL, and DK

The best cases always inspire. They led to new ideas, cooperations, and modification possibilities. Furthermore, it has given the possibility to copy-paste ideas that can ease the citizens' transition to a society where prosumers support the green transition.

Besides "getting inspired", the cases are analyzed and described by a common methodology that supports the development of a universal model for mapping – a mapping methodology that is relevant to Empowering the citizens - Towards European Energy Market 2.0.

Already at the partner kick-off meeting in Zaanstad on the 7th and 8th of March 2019, it was demonstrated that many experiences, ideas and possibilities about mapping exist. Furthermore, it was clear that mapping is a mean to reach the main objective, empowering citizens, and that local context is very different.

Finally, it was clear that partner experiences already rely on knowledge about best cases, content regarding technical issues, as well as legislative, economic, organizational, administrative, human behavioral and cultural preconditions. In other words, a sort of recommendations for roadmaps.

It was a joint decision to learn from the best practices to enhance the development of the best-case universal model for mapping, to understand and learn what factors play a crucial role.

And a comparison amongst the best cases will be conducted to identify important preconditions to map and look for when supporting new "EMPOWER" projects.

This empirical-based information will form the foundation of universal mapping when combined with the existing knowledge.

4. The template for best-case presentations

The following cases are described after a common template. In many cases, the portrayal is not fair to the cases, as they are situated and developed in various contexts and with different purposes. Therefore, the different authors have been encouraged to focus on the important and prioritized issues and maybe even leave out themes that are not the backbone of the cases. This is also to have a curious and explorative approach and let the cases "tell their own story".

The systematic use of the template does serve a higher purpose.

First of all, it allows cases to give input to the development of methodologies for mapping indicators of possibilities and barriers to activate prosumers in an energy transition.

Second of all, it gives an initial understanding of what drivers and indicators that facilitate progress in different countries. This may vary a lot.

The findings are analyzed in a general section, where similarities and differences are derived from a theory grounded approach.

Many of the cases are available as videos etc. on the project homepage https://northsearegion.eu/empower-20/

4.1 CASE from Denmark, municipality of Middelfart

Partner: Municipality of Middelfart.

Case name and point of contact: "Village of Foens", contact Morten M. Westergaard, Morten.Westergaard@Middelfart.dk or the village's energy council http://www.foens-naervarme.dk/

Figure 2 Welcome sign to the village

Figure 3 Areal foto of the Village Føns

Background information:

In December 2009, the United Nations Conference of the Parties (COP15) was unsuccessfully held in Copenhagen. Meanwhile, hoping for international success, 10 Danish municipalities held local variants of the COP 15 with the national Climate Commission and The Danish Society of Nature Conservation. At a point at the local meeting, a villager asked the mayor: "Will you help us become sustainable in the village?". Without a plan or detailed roadmap, the mayor said that the city council, of course, would help the village become sustainable.

Since then, there was a strong cooperation and co-creation amongst villagers, municipality, local businesses and craftsmen in a huge amount of different sustainability projects. From driving and testing car-sharing, driving electric cars, retrofitting and energy renovating houses, as well as common purchases of materials for energy savings to many other activities, went on.

One day in 2012, the discussion fell upon how the citizens were heating up houses – and the idea of creating Denmark's newest and smallest district heating emerged.

In October 2015, the idea had materialized, and the district heating plant was declared open with 47 households and the participation of the climate- and energy minister.

Brief description of what was done:

The project consists of two biomass boilers of 200 kW that produce hot water and heating for 47 households. The project costs around 1 million euro, and the loan taken by the citizens has a guarantee from the municipality, which have approved the project.

Project motivation:

Initially, the whole project started with a genuine wish about becoming sustainable. The project was presented for the mayor and municipality council in 2009 (a local COP15 meeting). However, more than green idealism has motivated the villagers to action. A good business plan was a precondition to obtain the loan. Also, for many villagers, the "comfort" of having district heating motivated many to join the project. It would remove the trouble from having old oil boilers that demand service, are dirty, take up space etc.

However, the citizens are still working on the project and have an ambition of installing a heat pump of approx. 200 kW.

What data and knowledge were necessary to have/derive (address aspects of: legal, economical, organizational, social)?**:**

A huge amount of knowledge had to be derived as the district heating project developed. In many ways, it was an organizational learning process that depended on: How do you apply? What is possible in a nature area from a land-use perspective? How do you obtain a loan? How do you approach neighbors, what is the actual consumption in each house, how well is each house insulated, what is the house worth with district heating, and how are the surrounding society's reactions? Can we follow our own timeline, and how fast can we get help? A rather complex amount of information and a very crucial thing was identifying the "drive"/"grit"/"stamina" amongst the citizens to obtain and become a part of a learning process.

Process model:

In many ways, it was a learning-by-doing model. A model where the villagers fully set the tempo. A model where the municipality adapted to the villagers' wishes. From an organizational perspective, the project followed many models depending on the situation (planning permissions, obtaining loan etc.). The keyword is a flexible approach to each phase.

However, the citizens are still working on the project and have an ambition of installing a heat pump of approx. 200 kW.

Trust in development:

The level of trust in the project was, and is, very high. There has been a limited number of legal documents, process plans etc. That was necessary to realize the project.

Project Champions/actors:

Several citizens are identified as champions or people, which was absolutely necessary. Also, the political engagement from the municipality and some of the local businesses have been absolutely necessary for the co-creating process. All are characterized as very willing to learn and develop when developing the project.

Decision making process/model:

Democratic and very depending on good relations. A flexible approach to each phase.

Ownership Model:

The district heating is now a company based upon a non-commercial model. This is a common model in Denmark.

Financing and economic viability:

The district heating is financed by the citizens, and the municipality guarantees the loan for 1 million euro. This is based upon a feasibility project. Financing the feasibility study was a considerable barrier.

Spinoff:

While installing the district heating, the citizens also installed fiber-optic internet. A massive interest in the model from other citizens in Denmark and abroad also makes the villagers a "proud showcase".

Barriers (address aspects of: legal, economical, organizational, social):

Mainly finding money for the initial feasibility study was difficult. Without support from the municipality, the project could be jeopardized.

Project implementation:

The district heating project was running in the period from 2012 – 2015. However, the citizens are still working on the project and have an ambition of installing a heat pump of approx. 200 kW.

Case relevance (case-specific, local, regional, national, EU-Level):

The case is country-specific as it rests upon a legal framework for district heating. Furthermore, the project is also based on culture because of the aspects of sharing and co-creating.

What did we learn:

Even though many considered it impossible, it was done. Organizational and social competences were in many senses more important than legal and economic.

4.2 CASE Essex County Council

Partner: Essex County Council

Case name and point of contact: Solar Together Essex – Luciana de Almeida (Waste & Environment team)

Background information:

Essex County Council runs Solar Together Essex - a collective purchasing scheme for Solar roof PV systems between June 2018 and March 2019.

Brief description of what was done:

Collective buying works by a large number of people using their collective purchasing power to negotiate discounts from suppliers. Solar Together Essex facilitated the process of buying solar panel systems for homeowners, community groups and small and medium-sized businesses, and they secured an average discount of 20 per cent in relation to market prices.

The first phase was a marketing campaign across Essex in summer 2018 to identify the demand from residents and businesses. Potential customers were asked to register their interest on a website and enter details of their properties. A reverse auction with a pre-agreed framework of solar suppliers was carried out in August 2018 to determine the group purchase scheme's main contractor. Once the price was set, personalized offers were sent to all registrants about two to three weeks after the auction. The registrants had approximately six weeks to decide whether they wished to accept the offer. After this, the solar supplier contacted customers to arrange surveys and schedule installation.

The scheme resulted in 2,000 residents, who were interested in solar purchasing, and over 300 residents invested in and installed solar systems in their homes. Participants saved a minimum of 18% and a maximum of 22% in comparison to market prices. The total installed capacity was 1,010 kW, and these installations will deliver over 7,000 tonnes of carbon reduction over the lifetime of the systems installed. Additionally, the Solar Together Essex scheme delivered a private investment in solar panels of £1,2 M in the county of Essex.

The level of installations achieved by the scheme in 6 months was the same as the annual installation capacity in the previous calendar year for the whole domestic sector in Essex. Feedback during community information sessions was very positive, and these events were very well attended, with participants feeling confident to purchase solar systems. Overall, people value the way the scheme has facilitated the purchase process and offered competitive prices. 79% of the residents rated their satisfaction at the outcome of the scheme at 8 out of 10 or higher.

The scheme was run in partnership with iChoosr – independent experts in group buying schemes. Essex County Council promoted Solar Together Essex through advertising and targeted 230,000 residents with a mail drop. iChoosr supported the council with the production of advertising materials. Furthermore, they ran a website for registrations and a telephone helpdesk for residents to call in with queries about the scheme. Prior to the auction, iChoosr put prospective suppliers through a rigorous qualification process to ensure their suitability for the scheme. A reverse auction was carried out in August 2018 to establish the main supplier for the scheme.

During the installation phase, an independent and specialist third party was commissioned to inspect approximately one in 20 installations throughout the delivery phase of the scheme.

Project motivation:

The market for solar panels is a complex market, and interested consumers find it difficult to navigate. Council-led group purchase schemes stimulate the choice for sustainable energy and facilitate the buying process by providing residents, community groups and small businesses with clear and objective information about solar energy as well as ensuring a high quality, good offer at a competitive price. The role of Local Authorities is powerful because they have an equitable interest in the group purchase scheme: more sustainability and reducing costs for citizens. In addition, because the Councils' reputations are linked to the project, potential customers are reassured that their interests will be safeguarded.

What data and knowledge were necessary to have/derive (address aspects of: legal, economical, organizational, social)?:

Local authorities do not have the skills or capacity in house to run schemes like this, so having a partner with considerable experience in running group purchasing schemes was a key aspect.

Process model:

The process is basically run by iChoosr. However, as the CEO has explained in a telephone interview: "It depends heavily on cooperation with local public authorities". This is important as local public governments have a certain amount of trust in civil society. This trust is important to engage the citizens' curiosity and interest in a community project.

Trust in development:

Council backing created trust and reassurance for residents who may not have considered purchasing solar before or who had considered it but not progressed. 79% of the residents rated their satisfaction at the outcome of the scheme at 8/10 or higher. Scheme managers had a robust process in place to work with residents, the council and the installer to quickly rectify and resolve any complaints that arose.

Project Champions/actors:

Waste & Environment team (Essex County Council) and group buying specialists (iChoosr in this case).

Decision making process/model:

n/a

Ownership Model:

An independent third party (group buying specialist) manages supplier qualification, auction, customer service and overseas delivery of the installations. They also put customers in touch with the qualified supplier that submitted the lowest bid. The process is transparent for all the stakeholders involved with the aim of enabling as many consumers as possible to buy a quality solar panel system at a fair price. The scheme manager, as well as the Council, are not involved in any way in the actual contractual relationship between the consumer and the supplier. Solar panels are purchased directly by residents from the selected supplier, and this supplier provides a full guarantee on systems and installation. The scheme manager receives a fee from the winning supplier for each system installed. The local authority receives a fee from the scheme manager for each installation to cover the costs of promotion and advertising.

Financing and economic viability:

n/a

Spinoff:

Essex County Council is considering a second scheme in spring 2020 once the UK solar market has evolved to accommodate to the end of generation and export subsidies.

Barriers (address aspects of: legal, economical, organizational, social):

Financial constraints – Essex County Council had a limited budget for this scheme. Furthermore, the lack of data to advertise led to selecting a Direct Mail distribution system that was not personalized and less targeted. The best return on investment is a direct mailout (i.e., through the national postal service), targeted as well as possible to the appropriate potential customer base and addressed 'Dear Occupier'. For this scheme, we used a 'leaflet drop' approach – a combination of free newspaper inserts and leaflet distributors – which failed to yield enough demand, resulting in a target-to-install rate of 0.13% only.

Project implementation:

Case relevance (case-specific, local, regional, national, EU-Level):

The case could be replicated in most UK, and EU local authorities and iChoosr has organized solar group purchases schemes in other regions in the UK as well as Belgium and the Netherlands. As of 1st of April 2019, the UK government has stopped Feed-in tariff incentives, which increase the payback period of the solar systems. However, the cost of solar PV systems are also going down, and battery storage systems could be included in future offers if the financial case for householders improves.

What did we learn:

Targeted and efficient direct mail is essential

Suppliers will underestimate the number of queries the scheme will generate and need to be able to manage and respond quickly to high volumes of customer calls and installations

Delays in installations are inevitable, but clear and timely customer communication is the key to keep the customer satisfaction

4.3 CASE Gemeente Haarlem

Partner: Haarlem Municipality

Case name and point of contact: Haarlem Spaarnezaam Collective Solar Roof, Sam de Guchteneire

http://spaarnezaam.nl/index.html

Background information:

Inhabitants in the city center often don't have access to individual rooftop PV installations due to regulations for monuments, limitations due to roof strength, not enough space for PV panels or shade from other buildings.

The office of the Municipality is located in the city center and had available roof space for PV panels. The business case was not very attractive at the time due to low energy prices for the Municipality.

The Municipality aims at 100.000 solar panels owned by cooperative solar roof projects.

Brief description of what was done:

Five residents started the energy cooperative Spaarnezaam. Together with the Municipality, they found that the roof of the Municipality's office was fit for a large number of solar panels.

After an internal decision making and political process, the green light was given by the Municipality to install solar panels owned by the cooperative.

The members invested in 261 solar panels and received a discount on their energy bills in exchange for the proportion of electricity generated by the solar panels.

Figure 4 The team from Harleem

Figure 5 Installation complete

Project motivation:

Local inhabitants with no possibility of individually owned rooftop PV installations wanted to generate renewable energy locally.

The Municipality aims at 100.000 solar panels owned by cooperative solar roof projects.

What data and knowledge were necessary to have/derive (address aspects of: legal, economical, organizational, social)?:

Besides data and information about the technical installation, the local initiators and the Municipality needed information about:

Legal: The financial ruling called the "PostCodeRoos" scheme (full tax name is the Reduced Tariff Scheme) was introduced as a financing option for the joint generation of solar energy, without the solar panels having to be placed on their own roofs. It offers 15 years of exemption from energy tax on the solar or wind energy that the participants in a project jointly generate.

Legal: the solar panels are property of the energy cooperative, but the roof is owned by the Municipality. Several documents had to be developed regarding insurance, contracts, leasing the roof, etc.

Economical: the business case for the members of the energy cooperative needed to be determined, including administration, maintenance, cleaning and insurance of the solar panels.

Organizational: the roof is owned by the Municipality, but the panels are owned by the energy cooperative. Several organizational points had to be figured out, such as insurance, maintenance of the roof, the solar panels, and cleaning.

Social: the initiators needed to recruit additional participants for the energy cooperative.

Process model:

The project had a steep learning curve as the knowledge described above had to be acquired, and several documents had to be developed.

By disseminating these documents, the project can be duplicated in Haarlem and other Dutch cities.

Trust in development:

The trust of Municipality workers in the energy cooperative and the project was quintessential to the success of this project.

Due to the organizational structure of the Municipality, colleagues and managers of several units had to be involved in the project. They also had to be convinced about the legal and contractual possibilities.

Project Champions/actors:

The five initiators of the project and the energy cooperative are the local champions, along with involved Municipality workers that made it possible to get the decision making done.

Decision making process/model:

Due to the organizational structure of the Municipality, colleagues and managers of several units had to be involved in the project and convinced about the legal and contractual possibilities.

Ownership Model:

The Municipality owns the roof and allows the energy cooperative to use the roof space to install the solar panels.

The energy cooperative is a non-profit cooperative and owns the panels. The project is scalable, and the cooperative is actively looking for available roofs due to the popularity of the project.

Financing and economic viability:

The Dutch government has developed a ruling with a tax break for 15 years. After ten years, the members of the cooperative will have earned back their investment, and the panels will continue to supply renewable energy to the members for another 5 to 10 years.

The energy tax exemption is the business case model for the participants. In 2017, this benefit per kilowatt-hour (kWh) generated was €0.123, including VAT. The participants invest in solar parts (the energy generated by 250Wp of solar panel installation) of ca. 300€. At the end of a generation year, the cooperative determines how much of the actual electricity generated can be attributed to each participant's participation in the project. For 225 kWh, this would be ca. 28€, with the sale of energy, also amounting to ca. 7€ (€0.03/kWh). The yearly total for the participant would be ca. 35€.

In other projects, the roof owner can receive a financial incentive per panel.

The cooperative sends a statement to each of the participants in the project to this effect. The participants use this information to go to their own energy supplier, the supplier from whom they purchase the energy at their home address. In that way, the latter can offset the annual tax benefit against them.

The exact business case needed to be figured out for the project, including reserves for insurance, maintenance, removing the panels at the end of the technical lifetime etc.

The project development needs to be financed by the realization: small fee per panel to cooperative members and realization fee. Due to the complexity and innovative aspects of the project, many hours of project development were required.

Local initiators can do this voluntarily, but often professional help is required.

The Municipality made a subsidy available for starting energy cooperatives. It also finances a local non-profit organization that can help local initiators succeed in the development of new cooperative solar roofs.

Spinoff:

The project is scalable, and the Municipality has made a second roof available. Currently, they are (06/2019) investigating all the other roofs in the portfolio to see if they can be made available for energy cooperatives.

Local initiators and the Municipality reach out to local businesses and institutions to find available roofs for collective solar projects.

The legal documents developed by the Municipality during the project can be replicated for other initiatives in the Netherlands.

Barriers (address aspects of: legal, economical, organizational, social):

Legal: the PostCodeRoos scheme is relatively new and, therefore, requires the development of legal documents and contracts.

Economical: the costs of developing a project can be high compared to the income it generates. For the roof owner, there is no (or a small) financial incentive. For the participants, the scheme has a financial result comparable to having solar panels on one's private roof.

Organizational: the PostCodeRoos scheme is relatively new and was therefore unknown to the organization. Besides, several departments were involved, and the project required time from Municipality workers.

Project implementation:

The solar panels were installed on the roof in October 2016, and all the solar panels are producing renewable electricity for the participants.

Case relevance (case-specific, local, regional, national, EU-Level):

The case is particularly relevant for initiators in the Netherlands looking for roofs available for collective solar projects. Municipalities often have available roof space but find it hard to overcome legal and organizational barriers.

Other municipalities or governments in the EU can learn from how the Haarlem Municipality empowered citizens to realize a collective energy project.

What did we learn:

The project group overcame legal and organizational barriers by developing standardized documents that can be reused for future projects. Social skills and contacting the necessary Municipality workers were essential for the success of the project.

4.4 CASE Gemeente Zaanstad

Partner: Gemeente Zaanstad

Case name and point of contact: Zaanse Energie Koöperatie (ZEK), Thecla Graas

Background information:

The Zaanse Energie Koöperatie u.a. (ZEK) was established in 1991 to show that there is a sustainable energy future without nuclear energy and coal.

In 1985, the government wanted a Broad Social Discussion about where in our country the five new nuclear power plants should be placed. In Zaandam, people from Milieudefensie and Milieufederatie Noordholland provided information about the undesirability of nuclear energy and coal via the Energy Discussion Working Group. In 1986 Chernobyl and earlier Three Miles Island made that discussion superfluous, and in 1991, the ZEK u.a. registered with civil-law notary and Chamber of Commerce for the first purpose of installing a windmill. In 1994, around 100 ZEK members raised money to install a windmill, a Lagerwey 18-80. The van der Laan family in Assendelft had a piece of land for 1 guilder for the ZEK, and Zaanstad enthusiastically granted the building permit. Boer van der Laan is also the miller, and if we ask if there is no noise nuisance or so, he says: the sound of the mill is like that of a ruminating cow: it means that it is healthy and... produces!

Brief description of what was done:

The ZEK owns a windmill, the Windpaard, and therefore is a supplier of clean energy. In addition, the ZEK is a source of information for municipalities, companies and individuals who want to know more about sustainable energy in all its facets. To that end, it relies on its own knowledge and extensive network.

Additionally, ZEK owns two solar roofs, White Ranch (441 panels) and Zonneveldt (242 panels).

Project motivation:

The ZEK is a non-profit cooperative that promotes sustainable energy in the Zaanstad region.

The main objective of the ZEK is: "to make every house in the Zaanstad region climate neutral". The ZEK aims to be the focal point for all issues and solutions relating to sustainable energy for the Zaanstad region.

The ZEK stimulates the use of sustainable energy through supporting sustainable energy projects and develops its own initiatives in this area. To this end, the ZEK works together with parties that have the same objectives.

What data and knowledge were necessary to have/derive (address aspects of: Legal, economical, organizational, social)?:

A huge amount of knowledge had to be derived that wasn't available 25 years ago when the ZEK started. On all aspects, knowledge was required:

Legal information of what was allowed (how to share sustainable energy within a spatial area?)

Economic information on what was possible (subsidies, etc.)

Organizational information on how to organize a cooperative (25 years ago, there were no information platforms, how to involve all stakeholders?)

A rather complex amount of information, and a very crucial thing was identifying the "drive"/"grit"/"stamina" amongst the citizens to attract them to invest in ZEK

Information was not available at that time. Luckily the project coordinated with several other projects in the country. Meeting every month gave them the opportunity to learn and share.

Process model:

Learning by doing

Trust in development:

The initiative evolved from the anti-nuclear energy association. This resulted in some support. However, it turned out to be difficult to make a name and to change people's mindset. Especially at that time, when renewable energy was not high on people's agenda.

Project Champions/actors:

The board itself, real pioneers.

Decision making process/model:

n/a

Ownership Model:

The cooperative is owned by the members of the ZEK.

Board works voluntarily.

Financing and economic viability:

Spinoff:

ZEK is also organizing information gatherings for homeowners, and they provide heat scans to see what insulation is required.

Barriers (address aspects off: Legal, economical, organizational, social):

Knowledge and the right mindset to get people involved

Some organizations worked against/slowed down the process. In the beginning, this was mainly because of the Municipality. Due to rotation (more than once) of employees at the municipality, both support and trust were lacking. Also, the DSO slowed down the process more than once due to capacity problems.

Negativity from media, inhabitants and local authority

Project implementation:

ZEK was established in 1991, started with wind, now also solar projects.

Case relevance (case-specific, local, regional, national, EU-Level):

Initiatives like ZEK arise all over Europe. However, some of the barriers are national and local.

What did we learn:

Keep your goal in mind to avoid disturbance from negativity

How to run a "business" (the cooperative is starting to look like a company)

How to get everyone on board

4.5 CASE Intercommunale Leiedal

Partner: Intercommunale Leiedal

Case name and point of contact: Citizens solar power for municipal buildings, Merel.Goossens@Leiedal.be

Figure 6 The Leidal team

Background information:

Intercommunale Leiedal is an inter-municipal company of thirteen municipalities in South-West-Flanders and mainly focuses on regional development. This means that also climate issues are included in the range of duties.

In 2013 the thirteen municipalities signed the Covenant of Mayors as a region. Leiedal acts as coordinator of the project ever since. It is the main goal to gather the representatives of the municipalities to discuss the evolution of the Covenant of Mayors and the (mutual) problems encountered by the municipalities. Leiedal facilitates the regional cooperation and sets up regional projects to execute the ambitions of the Covenant of Mayors.

Partly because of this inter-municipal cooperation, the Minister of Environment rewarded Leiedal with a prize of € 30.000. Half of this amount was invested in the process to set up a local/regional citizens' cooperation.

Brief description of what was done:

Setting up a regional energy cooperative to allow citizens in the region to become more active in the energy transition in the region.

Simultaneously, opening up the potential for solar PV on rooftops of public buildings for citizen participation.

Project motivation:

The lack of initiative to set-up an energy cooperative in the region, lack of participation of citizens in the energy transition, lack of solar PV on municipal buildings, lack of opportunities for citizen participation.

What data and knowledge were necessary to have/derive (address aspects of: legal, economical, organizational, social)?:

Setting up a regional energy cooperative: legal knowledge, knowledge on social marketing, knowledge on the development of business cases, energy/technical capacity

Development of tender: legal and technical knowledge, organizational for inter-municipal cooperation

Process model:

In November 2017, Leiedal organized an info-moment for all citizens who were interested in cooperating in founding this citizens' cooperation. In September 2018, less than one year later, the citizens' cooperation was officially founded as 'Vlaskracht'. The € 15.000 Leiedal invested in this project were mainly spent on the notary fees, the first year's rent of the office in Kortrijk, general communication costs, seeking advice, etc.

In the meantime, Leiedal started in the spring of 2018 with the preparations of a tender for the 13 cities and municipalities. That included the pre-financing, supply, installation and operation of photovoltaic panels on the municipal roofs. In this process, Leiedal acts as the central purchasing body. This tender was based on the one which the Municipality of Kuurne already launched in 2016. Every municipality affiliated with Leiedal was invited and got the opportunity to join the public contract. In the end, twelve of the thirteen municipalities decided to participate and to offer their public roofs for this public contract (Anzegem, Avelgem, Deerlijk, Harelbeke, Kuurne, Lendelede, Menen, Spiere-Helkijn, Waregem, Wervik, Wevelgem en Zwevegem). In addition, the Board of Leiedal and the Boards of several municipalities decided to pursue at *least 50% direct citizen participation*, following the ICA principles, with sustainable energy projects. The main pillars/goals of the tender were:

The municipalities have six years to submit all roofs that might qualify.

The installations are owned by the chosen company for twenty years. After twenty years, the installations become property of the municipality.

The maximal production of renewable energy and the reduction of CO2-emissions

Direct citizen participation according to the seven ICA principles

Decrease in energy costs

The tender was published from the summer of 2018 until the 1st of October. At the end of this period of time, two competitors sent in quotes. Eventually, the public contract was awarded to Vlaskracht (regional citizen cooperative which was founded simultaneously) & Beauvent, based on the following criteria:

Price (40 p)

Price revision percentage (10 p)

Quality guarantee for installation and operation (20 p)

Methodology for direct citizen participation (30 p)

Vlaskracht & Beauvent started their public contract with an info meeting for all the municipalities in February 2019. They baptised the public contract as 'Zonkracht' (= Sunpower) and informed the representatives of the municipalities about the project.

According to the timing, as foreseen (see figure below), the first installations were placed by the end of 2019. Mid–2019, eight municipalities had already submitted their list of potential buildings and Vlaskracht & Beauvent screened these lists. A total amount of 124 buildings were submitted. During the second week of June 2019, all these municipalities discussed the screenings of their buildings with Vlaskracht & Beauvent. 44 buildings are still in the running after the first screening. The next step is for the municipalities to decide whether they want to continue the projects. Once this choice has been made by each

municipality, Vlaskracht & Beauvent can start with a detailed study of the buildings. Only those who have a positive result afterwards will be retained. Thereafter – and after a second decision by the municipality – the installation can get started.

The citizens from the municipalities will get the first chance to participate in the financing of the photovoltaic panels by buying a share at Vlaskracht or Beauvent. The info meetings towards the citizens took place in the autumn of 2019.

Trust in development:

The trust was good in all stages of the process

Project Champions/actors:

Engaged citizens creating an energy cooperative

Leiedal as initiator and stimulator of process

Local authorities demanding citizen cooperation

Mentoring cooperative (Beauvent)

Decision making process/model:

See above

Ownership Model:

See above

Financing and economic viability:

The energy cooperative has developed a sound business case. But a certain scale is needed to reach a good degree of professionalism.

An energy cooperative can easily attract investments from citizens.

PV on roofs of municipal buildings is economically viable.

Spinoff:

The energy cooperative will help speed up the energy transition by seeking good investment opportunities (CHP, PV on businesses, wind...).

Barriers (address aspects of: legal, economical, organizational, social):

The main barrier was the lack of an initiator to bring together citizens to set up the cooperative.

The cooperative needs a variety of expertise on energy, economy, financing, communication, and engineering... (which was luckily found).

The most interesting RE-installations are wind turbines, but it is very difficult to find opportunities today.

Project implementation:

See above

Case relevance (case-specific, local, regional, national, EU-Level):

Local, regional.

What did we learn:

There is a group of citizens "waiting" to be activated to become active in an energy cooperative. Moreover, local authorities lack the capacity to set-up themselves solar PV projects for roofs of municipal buildings. They are happy that citizens invest in solar PV and take responsibility for these projects.

4.6 CASE Provincie West-Vlaanderen

Partner: all Flemish Provinces (steunpunten Data en Analyse, in cooperation with cells climate, welfare, mobility, housing, …); Fluvius (grid operator); Flemish Department of Environment; VITO (Flemish Institute of Technological Research); VEA (Flemish Energy Department).

Case name and point of contact: 'Provinces in numbers' (https://provincies.incijfers.be). Each province has its contact points depending on the subject of data (climate, demographic, welfare, …). For all contact points: https://provincies.incijfers.be/databank?report=project_d_en_a

Background information: Provinces in numbers is a website/tool that disseminates data about climate (CO2-emissions, transport mileages, …), welfare, the state of (public) buildings, private households, demographic evolutions, poverty, economy, …. Within a few clicks, an administrative member of the municipal staff can create a customized report with this data. As such, the tool enables municipalities to steer their energy/climate policy, monitor the outcome of their actions and even compare their results with results of other (similar) municipalities.

Brief description of what was done:

Searching for data suppliers: the data in the tool originates in putting together data from several 'external' databases and made in different formats. A big challenge was to find where the needed data was, and secondly, to standardize this data. All data in the tool was substantive and geographically very dispersed. You can find all sources at this website: https://provincies.incijfers.be/dashboard/Dashboard/Bronnen-2/

Set up an interprovincial operation and partnerships with external partners/data suppliers.

Developing the actual tool (with Swing Mosaic): the database on the one hand; the dashboard on the other hand.

Project motivation:

The database already exists a while (with demographical, economic, welfare… data). With the upcoming commitments within the Covenant of Mayors, more and more municipalities were taking measures or actions to adapt to climate changes or mitigate/lower their emissions. With these actions also came the need to require data to determine policy priorities but also track their progress.

What data and knowledge was necessary to have/derive (address aspects of: legal, economical, organizational, social)?: the data is incredibly diverse. https://provincies.incijfers.be/dashboard/Dashboard/Bronnen-2/

Process model: there was no prefixed process model. The process was, in its most parts, a learning-by-doing process.

Trust in development:

Municipalities are already making good use of it in terms of economic, demographical, social, climate, … data. The usage even extends towards civilians, schools/students in higher education and other organizations.

Project Champions/actors: /

Decision making process/model: /

Ownership Model: Provinces are owners of the data tool. The tool gets updated whenever the data suppliers deliver their data files.

Financing and economic viability: shared costs between provinces

Spinoff: /

Barriers (address aspects of: legal, economic, organizational, social): especially legal and organizational barriers; tensions between data and GDPR (privacy).

Project implementation: the tool has already existed for several years (I think 5-8 years). Recently the database was supplemented with extra data about climate and energy. And is still being updated and supplemented with extra data.

Case relevance (case-specific, local, regional, national, EU-Level): see above. The most positive effect of this project is that we took information and data that was scattered geographically, databasewise. Furthermore, we collected it onto one site to create an easily accessible and easy-to-use and understand the output. An output that can easily be used for empowering, in this case, mainly policymakers. A similar effect should be reached with our Empower-tool.

What did we learn: the need for comprehensive but easy-to-use data is big (within municipalities, educational institutes, civil organizations). When giving the right informational tools, municipalities (and, to its extend, also civilians) make good use of those tools.

4.7 CASE Southend on Sea Borough Council

Partner: Southend-on-Sea Borough Council (SBC), United Kingdom

Case name and point of contact: Temple Sutton Primary School, Elo Knight Project Officer Energy Team (SBC)

Background information: Temple Sutton School is a primary school which was built in the 1940s. The school still had many of its original Crittall windows, which did not fit well, were very draughty, and did not meet current safety standards.

In 2013, the school consumed 231,610 kWh electricity and 1,025,187 kWh gas (excluding kitchen and pool usage) at the cost of £56,533, which excludes standing charges. In addition, the school used 130,085 kWh gas to heat the pool.

In 2013, SBC secured European funding for the CREST project, which seeks to establish a 'living lab' for deep retrofit energy reduction projects. Temple Sutton School was chosen as part of this site.

Partly as a result of the windows, the teaching environment in the school was less than optimal, with control of temperature in the school being difficult. The solar heat gain in south-facing classrooms was significant whilst north facing classrooms were cold. Staff regularly opened windows in classrooms, releasing the heat while radiators were still on, whilst in other areas, draughts prevented rooms from heating up properly.

Brief description of what was done:

241 kW solar utilizing most south, east and west-facing roofs

199 kW biomass boiler installed into the existing boiler room to provide the baseload heating requirement

The 199kW Biomass boiler was built into the current boiler house requiring small modifications to accommodate fuel deliveries. The boiler has been designed to provide baseload heating, working with the current gas boilers providing top-up heat when required. The gas boilers will also act as a backup if fuel deliveries should fail.

A variety of other energy efficiency measures were also included, such as insulation and lighting.

Project motivation:

The primary motivation is based on the expected 264t CO2 per annum carbon saving. In addition, due to the age and condition of the buildings, there was a surrounding requirement to carry out some improvements in order to create a safe and comfortable learning environment for children. The running costs of the school were high, and there were considerable heating losses due to poor insulation and equipment.

The proposal is currently thought to reduce Carbon Reduction Commitment (CRC), a UK-enforced energy policy, costs by £1.6k per annum (included in project revenues). CRC savings are only generated by true energy reduction measures, and CRC is still payable on CO2 saved through solar generation and biomass. The CO2 reduction represents 1.5% of the CO2 for which SBC is responsible and 0.033% of total CO2 emissions for the entire borough.

The school benefited from new windows providing an improved learning and educational environment and meeting current safety standards. The renewables generation now assists the school by providing an example of systems covered within the curriculum.

Classrooms have reduced draughts and improved control of heating. Where this reduces window opening when heating is on, a direct saving accrues.

The project is a visible example of the Low Carbon Zones proposed through the Low Carbon Energy Strategy. SBC benefits from a reduction in future capital requirements for the window replacement. SBC was also able to fulfil its safety obligations in respect to the windows, which were below standard.

What data and knowledge were necessary to have/derive (address aspects of: legal, economical, organizational, social)**:**

In order to test the viability of the proposal, full data on energy consumption, building usage patterns, and the current state of the building in terms of energy efficiency had to be assessed. Initial surveys were carried out by SBC Energy team staff, who have previous experience in energy efficiency audits. Based on their findings, basic calculations were carried out, and potential financial costs and returns calculated. As the data produced looked as if the project would benefit the school and local borough, industry specialists carried out professional surveys to confirm the findings. Companies with specific knowledge were tendered for, and they then carried out their own surveys that determined the final scope of the project.

DNO approval was necessary. Due to local grid constraints, limiters were installed on solar PV system that would shut down if the export reaches 100kW.

There are further improvements that could be made to the buildings, for example, alternative means of heating the swimming pool. However, at the time of installation, this was not viable due to a lack of funding.

Process model:

No formal process model was used during this project. Broadly the process was dictated by demands of the UK policy environment. Due to the Feed-in tariff reducing quarterly, it was essential to complete solar PV installation on time in order to maximize financial returns. This meant that the decision making on the project and seeking funding had to be done as fast as possible. During the process, individual needs of the school had to be taken into consideration. Especially school holidays had to be considered, as this was the best time for the project to be carried out in order to follow Health and Safety guidelines and to minimize disruption to school lessons.

Trust in development:

Solar PV installation has begun to have a questionable reputation in the UK due to the lack of understanding and bad press with rent-a-roof schemes. Those barriers had to be overcome, through stakeholder engagement, in order to seek approval of both the school and local authority committee members. Successful project delivery has increased confidence in the technology both with the subject school and also with other schools in the area.

Project Champions/actors:

Temple Sutton Primary School, Southend-on-Sea Borough Council

Decision making process/model:

Such a project would always need forward-thinking and good cooperation between local authorities and benefiting the school's staff. An advisory board consisting of specialists in each technology and regulatory advisors would be beneficial.

A flexible approach and open-mindedness for alternative solutions would be an advantage.

Ownership Model:

Temple Sutton School is the owner of the solar PV system and will repay the loan to SBC over the course of 20 years.

Financing and economic viability:

Micro-generation from renewables can generate free electricity, whilst also generating revenue from Feed-in-Tariffs (FiTs) whilst renewable heat can attract revenue from the Renewable Heat Incentive (RHI). These are linked to direct energy

reduction measures to generate savings and revenue to repay the cost of the investment in the school. The buildings' energy bill over 20 years is estimated to be £77k lower.

Spinoff:

The case with Temple Sutton Primary School has created interest from other schools in the area. Several projects have been carried out or are in the process of completion in nearby schools that have partially replicated the sample case. Schools have installed Solar PV, upgraded lighting and made improvements to heating systems and building fabric. Further improvements to Temple Sutton and other schools in the borough are expected.

Barriers (address aspects of: legal, economic, organizational, social): It has been difficult to find companies that are able to integrate several technologies to create a uniform system where technologies complement each other. A lack of knowledge in the local industry for alternative solutions to DNO barriers exists. However, there are also not many obvious solutions to managing such minor constraint issues instead of using export limiters.

Project implementation:

Further improvements are required with a biomass storage unit mechanism that has broken down due to the weight of the sliding roof. Further improvements can be made in the boiler room to reduce heating losses by improving the insulation of the pipework.

As a separate add-on project, solar PV excess energy could be diverted to preheat water for the swimming pool, and as a result, provide further savings on the gas bill. As an alternative, excess energy could be stored in batteries to cover the cost of electricity when the solar PV generation is not sufficient enough.

Case relevance (case-specific, local, regional, national, EU-Level):

The case could be replicated as a whole or partially in most UK and EU public buildings, both new-builds without solar PV and older buildings that require energy efficiency improvements or wish to make savings on their energy consumption. Funding options may vary depending on institution or locality. However, with carefully planned technologies, the return on savings would make the project worthwhile.

As of 1st of April 2019, the UK government has stopped Feed-in tariff incentives. However, due to the cost of solar PV being lower than ever before, battery storage availability and other technology prices lowering, projects of such scale are viable Europe wide.

What did we learn:

It is essential to consider the integration of technologies and to maximize benefits where possible. There are usually alternative means of diverting energy rather than curbing production. Installing such technologies at a later date could be more expensive and create further disruption for the customer.

Due to the complexity of the Feed-in tariff and RHI applications, the council should have enlisted professional help to ensure that the forms are filled out correctly and create the most benefit for the school. In the current case, the application process went smoothly. However, there have been many cases in the industry where minor mistakes have invalidated the application process and, in worst cases, have either reduced or caused a customer to miss out on government incentives completely.

4.8CASE Universiteit Gent

Partners: Provincie West-Vlaanderen, Intercommunale Leiedal, Gemeente Zwevegem, Fluvius

Case name: Microgrid@Transfo

Contact: Provincie West-Vlaanderen: Stijn.Vandamme@west-vlaanderen.be ,Intercommunale Leiedal: Dominiek.Vandewiele@leiedal.be,Universiteit Gent: JanJ.Desmet@UGent.be

Background information:

Transfo Zwevegem is an old thermal power plant in Zwevegem and is located nearby the Channel Kortrijk-Bossuit. The power plant has been built just before World War I. Besides the power plant, there were also administrative buildings, concierges and greenfield zones. In 1962 the electricity production stopped, and the plant was producing only steam for the industrial processes of Bekaert and for a district heating net.

After a while, the power plant became a reserve power plant. In 2004 the city (Gemeente Zwevegem) and Intercommunale Leiedal bought the site with the aim to transform it into a new social-cultural zone. In order to conserve the architectural value of the buildings, they have been classed as a protected heritage. Nowadays, Transfo Zwevegem is in full expansion (see figure below). For example, a number of new (social) houses and apartments are planned, parts of the existing buildings are transformed into banquet halls and offices, but there is also the possibility for various adventurous activities.

Figure 7 Transfo Zwevegem - impression

Figure 8 Transfo Zwevegem - impression

Figure 9 Transfo Zwevegem - impression

Figure 10 Transfo Zwevegem - impression

Figure 11 Transfo Zwevegem - impression

One of the goals of the transformation of the zone is to make it Zero-Impact (see figure below). This will be realized by using innovative sustainable techniques and the production of renewable energy. A local energy network will be developed with solar panels, wind turbines, and hybrid storage systems.

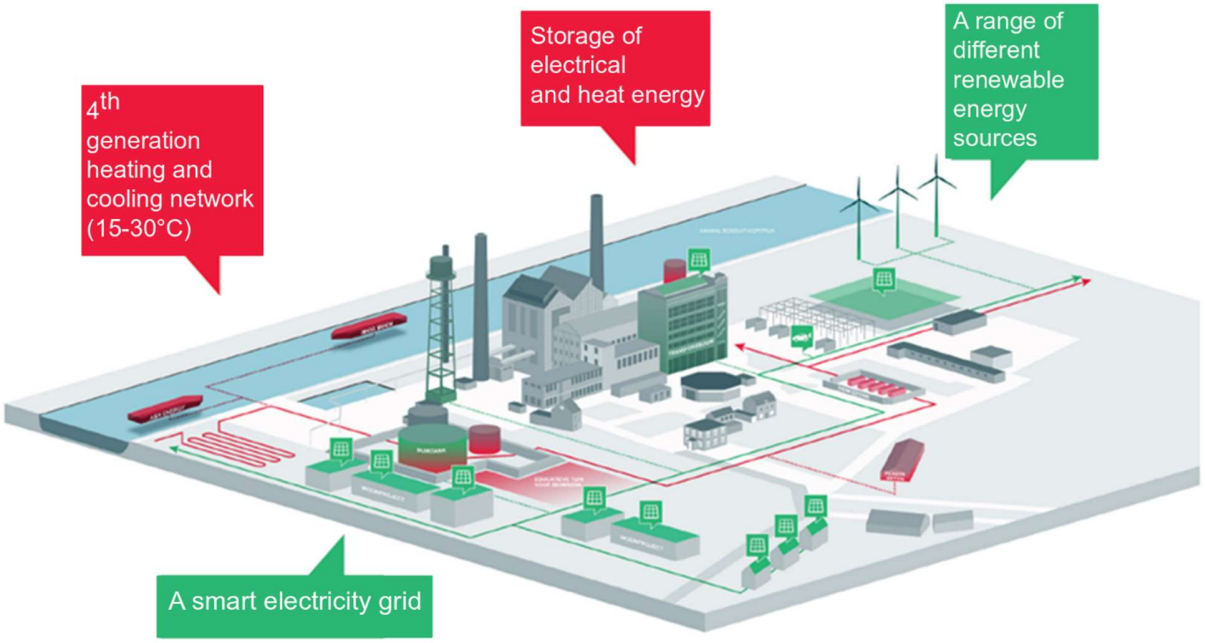

Figure 12 Principle scheme

Local energy network will be named 'microgrid' from now on. The exact definition of 'microgrid' is provided by:

- EC Microgrids (ENK5-CT-2002-00610) & MORE MICROGRIDS (PL019864) :

  Microgrids are electricity distribution systems containing loads and distributed energy resources, (such as distributed generators, storage devices, or controllable loads) that can be operated in a controlled, coordinated way, either while connected to the main power network and/or while islanded.
- IEEE – US DOE:

  Microgrids are localized grids that can disconnect from the traditional grid to operate autonomously. Because they are able to operate while the main grid is down, microgrids can strengthen grid resilience and help mitigate grid disturbances as well as function as a grid resource for faster system response and recovery.

Brief description of what was done:

There have been meetings between the authorities (Gemeente Zwevegem, Provincie West-Vlaanderen en Intercommunale Leiedal), the Flemish DSO (Fluvius) and UGent. Different ideas and concepts came up:

DC-backbone for common connection of RES and storage

Heating net, fed by a CHP or other heating buffers

Use of existing water tank as Pumped Hydro Storage

RES: Wind, PV

Hybrid storage systems: electrochemical, hydroelectricity, flywheel, hydrogen, V2G…

Furthermore, a first analysis has been made of the consumption profiles of the two EANs. The potential renewable energy on the site has been calculated, and the storage capacity has been determined according to UGhent's developed method. A calculation of the power flow has been performed in order to design the cable of the DC-backbone. This study is delivered to the DSO (Fluvius).

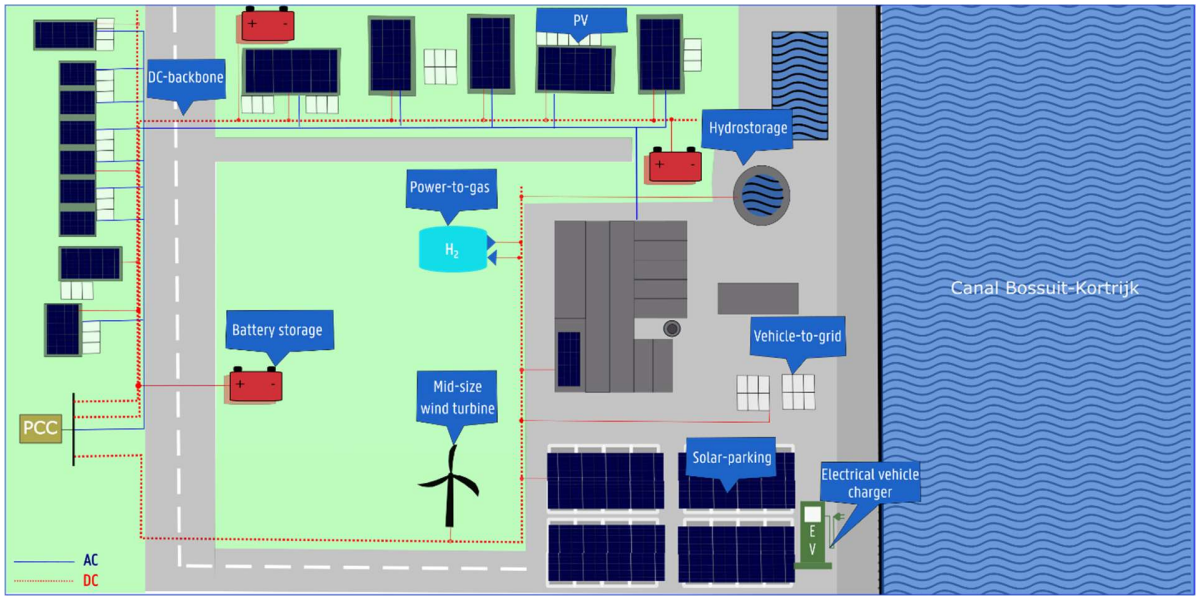

Figure 13 Overview of scheme

Project motivation:

One of the pillars for the transformation of the site is sustainability. In order to bring people closer to innovative sustainable techniques, the development of a microgrid could be very illuminative.

What data and knowledge were necessary to have/derive (address aspects of: legal, economic, organizational, social)?:

As the microgrid will consist of a few apartments that are not yet built, a prediction analysis of the consumption is needed. Therefore, all details of the building have to be known as, e.g.: insulation, orientation of the roofs, and surface of the house. The consumption profiles of the existing EANs are already obtained. Furthermore, knowledge and data about, e.g. RES, storage, and EV are essential.

There is nowadays no Legal Framework in Belgium for microgrids. How will the legislation evolve? Who will manage the microgrids? What about the grid tariffs? The most important issue is that one cannot develop a public microgrid since the

laws on energy distribution and the freedom of choosing your own energy supplier are quite strict in both Belgium and the EU. Setting up a regulatory sandbox is a solution for that, and this procedure is currently still ongoing and at an advanced stage.

To conclude, a lot of research has to be done with concerning, e.g. the sizing of RES and storage, the DC-grid, congestion and unbalance of the grid, and placement of the storage.

Process model:

Analysis of the consumption profiles

Optimal sizing of the hybrid microgrid

Challenges of the microgrid: DSM, congestion, flexibility.

Study Legal Framework

Trust in development:

There is a great goodwill among all partners of the project to create a microgrid, to stimulate people, and to achieve attractive results. There is a high political engagement from the responsible authorities, which is crucial for a favorable outcome.

Project Champions/actors:

Of course, the responsible authorities who, as already mentioned, are absolutely necessary. Especially, for the set-up of the regulatory sandbox which is a difficult process. Further, the willingness of the DSO to cooperate is crucial, without them this project would not even be possible!

Decision making process/model:

A workgroup "Energie Transfo" has been created in order to bring the different local partners together. Meetings are/were held on regularly basis.

Ownership Model:

There is not yet defined who will take the operation and the management of the microgrid. This is still a point of discussion. Will it be the DSO? Will it be a third party? Or will it be done by a cooperation of members within the microgrid?

Financing and economic viability:

The RES, the hybrid storage systems, the control and energy management systems, EV-chargers, and other needed infrastructure will be financed by the local authorities (province and/or intermunicipality). The microgrid lines will probably be exploited/owned by the Flemish DSO.

Spinoff:

The microgrid has a dual purpose. Firstly, it creates a self-sufficient and climate-neutral energy grid. Secondly, it should increase the acceptance of RES. This is done by making the microgrid very demonstrative.

One of the ideas is to create at a central point on the site a demonstration set-up with different technologies of RES, storage, EV-chargers, and DC-backbone. A site-in-site approach will give the visitors the opportunity to get in touch with these technologies on small scale.

As many new and innovative technologies will be used, this will also contribute to the current research topics of the Ghent University.

Barriers (address aspects of: legal, economic, organizational, social):

Of course, the legal framework is a barrier, as there is currently no framework for such communities. Secondly, the organizational aspect, who will manage the microgrid? And what will be the benefit for them? How will the price setting be? Especially, considering the fact that there will be a DC-backbone with aggregated RES and storage. What about the social tariffs? What about the ODV's (public service obligation) for the DSO in such a system?

Project implementation:

The project is currently in a study phase. The goal is to exploit the microgrid by 2024.

Case relevance (case-specific, local, regional, national, EU-Level):

The principle of microgrids is widely known in Europe and described in the EC directives. Although, there are a few local aspects playing a role in this project. The water canal 'Kortrijk-Bossuit' for example creates opportunities for hydro storage or thermal storage.

What did we learn?

The financial aspect is very important. As soon as there is the needed financial support the project can evolve, and the different stakeholders can learn from it. Without money, the project stagnates and the possibilities of implementing new and innovative concepts are then not possible.

However, like any form of energy investment, community and local energy projects have significant financing requirements and need consistent policy support. If these are not in place in the relevant structure, the success of community energy projects can be jeopardized.

5. Preliminary conclusions from the best cases

Partner cases are some of the best cases found by the EMPOWER20 partners. Besides describing them in a uniform way that makes them comparable to some extent, they also put light on the empowering task in a wider European context.

The methodology of the preliminary conclusions is derived from an analysis based upon comparing the cases features and characteristic using Leavitt's model for change as well as Tuckman's model on development.

Both models are widely recognized in literature and are universal models, suited for analysis in a European context with many differences as well as similarities between countries. The models are briefly described in the following.

5.1 Best cases examined through Leavitt's model1

The model is also known as the diamond model and can in many ways be used as a practical tool to understand changes in organizations. All the EMPOWER20 cases can be seen as emerging organizations or ways to support change in society. This organizational tool was conceptualized by Dr. Harold Leavitt, who served as a professor at two universities, Claremont University and Stanford University.

Leavitt's diamond proposes that every organizational system is made up of four main components: People, Task, Structure and Technology. It is the interaction between these four components that determine the fate of an organization.

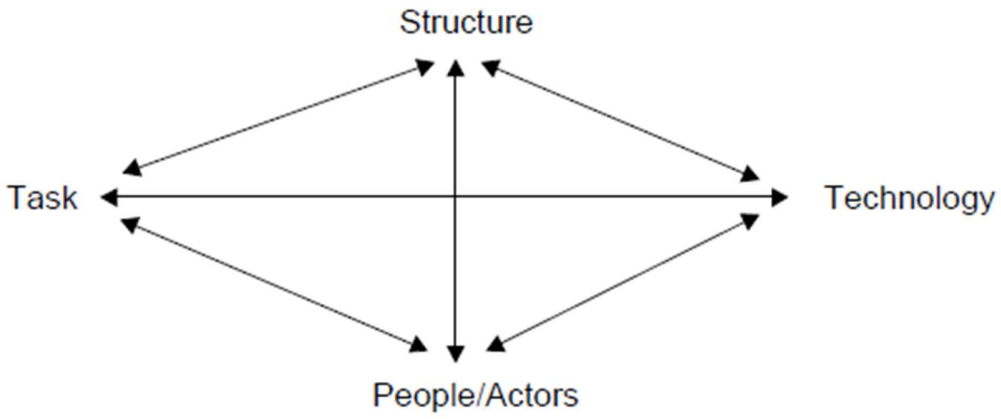

Figure 14 Leavitts model

Leavitt emphasized that any change in one of these elements will directly affect all the other elements. Thus they will also need to be tweaked to accommodate the change.

Let us look into each part of the model.

The **people** are the employees of the organization or people in the project. When using this approach, you don't just look at employees like accountants, receptionist, managers of European projects, etc. Instead, you also look at their skills, efficiency, knowledge and productivity. In projects of innovation, this can be difficult to describe as fast-emerging projects can be

[1] https://www.brighthubpm.com/change-management/122495-a-look-at-the-components-of-leavitts-diamond/

depending on pioneers, who constantly are adapting to change and new situations in, e.g. the electricity market. Now let us take a look at how this component will need to be modified concerning changes in the other three components.

Change in Tasks: Changes in how things are done. If you are planning to change the tasks, you will have to educate and train the employees to make them familiar with the new methods.

Change in Structure: Change in structure would imply changing job roles. Here again, the employees would need help to learn about their new job duties and responsibilities.

Change in Technology: Shifting to a new technology requires extensive training so that the employees can handle the new technology efficiently – without causing any damage to themselves or the technology. This may even involve hiring new skilled employees to handle the new technology.

Tasks: This component can include goals in addition to tasks. Thus, this component would include looking at two things – firstly, how things are being done, and secondly, what are you trying to achieve. Here again, you must focus more on the qualitative aspects of the tasks and goals rather than the actual tasks and goals. When looking at tasks, think about their relevance and their benefits. When looking at goals, think about the yield and productivity. In project-based organizations, tasks can be connected to "moving targets" that can "blur" the picture. However, let's see how tasks are affected by a change in other factors.

Structure: The structure component of Leavitt's Diamond includes not only the hierarchical structure but also the relationships, communication patterns and coordination between different management levels, departments and employees. This would also include how authority and responsibility flow within the organization or project. The structure needs to be altered when changes are made to any other component of the diamond.

Changes in People: If you are hiring more skilled and more qualified people, you will not need the same kind of supervision as is needed for less skilled and less qualified employees. This would mean cutting down the number of supervisory posts. Now, it is not just about hiring afresh. The same would be true if you empower your existing employees through training. As we mentioned earlier, the approach is more focused on the qualitative aspects of each factor. Therefore, if you are simply replacing your receptionist with a new one, it does not count – and surely that would not require any changes to the structure.

Changes in Tasks: Let's say you decide to make your company more customer-centric. For this, you will need to set up a new customer support department, or you may need to have more people out in the field. That explains how the structure may need to be changed, with a modification in goals. When business processes are reengineered, the need for some of the job posts or even management levels may completely perish.

Changes in Technology: Computerization or automation often requires revamping the organizational structure to benefit from the technology upgrade. New job posts may be created, and old ones closed down to benefit from the new technology. And even if no changes are needed in the job posts, changes may be needed in interdepartmental coordination or the communication pattern.

Technology is that component of the organization which aids or facilitates the people to perform the tasks. Computers, equipment, LAN lines, barcode readers, software applications, etc., are all counted under technology. Technology, too, like all the other components of Leavitt's diamond, will need to be changed when modifications are made to any other component.

Changes in People: If you are hiring computer literate employees, you cannot ask them to work on typewriters. Similarly, if you're hiring engineers instead of mechanics, the old tools and equipment may not be enough. So, to take full advantage of your manpower, you'll need to change the technology in accordance with the change in the knowledge, qualifications and skills of your workforce. Even if you want your employees to handle additional tasks, you may have to provide them with technology that helps them in this direction. For instance, if you want your programmer to make field visits to clients, you need to equip him with a laptop and a wireless Internet data card to help him perform the added task.

Changes in Tasks: Changes in tasks or goals may also compel you for a technological change. For instance, if you want to use your customer support center for order processing as well, you will need to replace your existing software with a new application that has customer service and order processing integrated into one.

Changes in Structure: If you want to cut down staff from a particular department, you will have to automate some processes to maintain the same level of production. Whether you are trying to shrink your organization structure or expand it, technological changes will be needed to support the new structure.

5.2 Best cases – lessons learned through Leavitt's lens

The following scheme gathers essence from the cases, and the main findings will be concluded under the scheme.

	People	Task	Structure	Technology
Denmark, Middelfart	The people attending have a wide variety of competences, and many are truly pioneers, willing to learn fast and shift roles while working. Many can be seen in a volunteer perspective. Many are working and contributing for other purposes than "just money". Curiosity, saving the planet and social aspects are important. In the case there is an ongoing cooperation between private companies, the citizens and the municipality and interest from the surroundings (media attention).	The qualitative values are dominating the tasks. The tasks are carried out in a trial-and-error way, and an overall masterplan did not exist from the beginning. However, when the "big" wish occurred the work was framed in a professional setting. A lot of tacit knowledge, phone calls and simple processing was guiding the project. This made the project a fast-forward moving process.	An organigram on the project structure as a hierarchy is not possible to draw. Instead, relationships based upon mutual trust and dependency was important to establish and implement the project. Almost a spaghetti organization evolving to an official district heating organization with volunteers. When the "big" project emerged (DH) the frame and cooperation did become more structured. A key word could be	The technology is rather uncomplicated and has been seen as a vehicle for further development. Therefore, the risk of technology failure has been almost zero.

	It could probably not be done without public support.		matching the structure to the task.	
Coöperatie Kennemer Kracht				
Essex City Council	A cooperation, public-private, with citizens. The collecting purchase power used benefits with the best elements from the private, public and civilian sector in a symbiose. It could probably not be done without public support.	The tasks – connecting, supporting, sharing efforts, and scale possibilities were merged in a holistic way and structured for this. All tasks were performed by the partners with optimal skills, possibilities and interests. Each task interconnecting in a supporting matter.	The structure is based upon an emerging market, combining the best possibilities from each sector to provide possibilities for a common goal.	The technology is rather uncomplicated, solar PV. However, the tools that enable a smooth process are likely to be easy and reliable access to data
Gate2Growth				
Gemeente Haarlem	The people attending are 5 engaged citizens and staff from the local municipality. It could probably not be done without public support – from the local municipality.	The project was not following a pre-made scheme and demanded that all participants made an effort in the project.	The structure is the learning by doing cross sectorial spaghetti organization. The Dutch government has developed a tax-break for 15 years for these type of projects. The payback time of the project is 10 years. This gives each participant approx. 35 Euro each year after payback. The life of the project, after payback, is 10-20 years.	The technology is Solar PV and rooftops. However, the tools that facilitate identification of rooftops, citizens etc. are sparser.
Zaanstad	Again, we see a cooperation between citizens and public authority. However, the Zaanse Energie Koöperatie (ZEK) is based on a bottom-up approach for anti-nuclear and anti-coal goals. Today there are	The mission is clear: promote and implement measures for climate neutrality. Heavily depending on volunteers.	Structures as a union or a club, heavily based on community structure with a council board and membership working for overall goals. Set-up with own rules and regulations and also	Clean energy technologies where they are suited and possible to realize. Renewable energy, energy savings, efficiency, training, art, and many other issues are a part of

	350 members who pay 10 Euro pr. Annual. It is non-profit relying on citizen engagement.		NGO' status in consulting processes.	the recently used technologies.
Intercommunale Leidal	Basically, a top-down initiative to support and promote bottom-up initiatives. In many ways, a public initiative depending on the citizens' and companies' participation.	Promote and realize solar PV on public rooftops. Citizens should be able to purchase at least 50% of the installations.	Intercommunale Leidal is an important facilitator and the built-in structure with citizen purchase possibilities would probably not happen without a political context.	Solar PV and tools for analyzing possibilities.
West-Vlanderen	Basically, a top down professional set-up. Aiming to train and demonstrate.	Promote and elaborate a website/tool that disseminates data about climate.	Cross Municipality setting (public setting realm)	Information technology tool (website based)
SouthBourogh Council	City Council driven.	Reduce carbon emission, save money and be a "living lab".	Operated by council. Limited information on school homepage.	Solar PV and biomass boiler.
Stadsgarage				
University of Gent	Basically, a top-down professional set-up microgrid. Aiming to train and demonstrate.	Research and development of microgrids.	The ownership structure is not yet developed.	Technology in advanced combination (microgrid).

In conclusion, we see a very diverse landscape of "best cases".

From approaching single citizens by support mechanisms to supporting the evolving of a community's projects, from single technology approach to advanced system set-ups. Combined with different financial conditions, social context and very different use of time and organization.

One single issue is to some extent uniform: *The public sector's policymaking is still a precondition to enable the citizens' participation in clean energy*. This may be in the form of advice and support, but also setting up financial, organizational or physical structures for citizens to participate. The "dose" of support within the different project reflects social, cultural, political and economic context.

So, the task of finding a universal mapping model that takes this context into account asks for a broader perspective, including learnings from other European projects.

These learnings are integrated into the universal mapping model.

6. EMPOWER partners – context-based experiences and investigations of possibilities and barriers

At the EMPOWER meeting in Kortrijk[2], the 7th-8th of October 2019, several workshops were organized for the partners to contribute interactively to the different work packages. The partners gave valuable input to the universal mapping model, as well as longlists, and the advisory board also attended the workshop.

Figure 15 Creative brainstorming

Figure 16 Partner meeting - pitching

Figure 17 Co-creation with advisory board

[2] https://northsearegion.eu/empower-20/news/partner-meeting-in-kortrijk-be-on-7-8-october-2019/

The workshops were semi-structured enabling possibilities for "open-minded inputs" and "spontaneous thoughts" as well as organized topics to capture the essence for a universal mapping model.

The workshops revealed a complex landscape of drivers and barriers. These are described in detail in the "Longlists" that can be found on the project webpage. A large number of detailed barriers and drivers within the field of legal, technical, social and economic are presented in the "longlists".

These learnings are a part of the universal mapping model, where we also integrate European Lessons in a common model for developing country-specific roadmaps.

7. More knowledge to develop universal mapping model and roadmaps - What do research and other cases suggest?

There are nuances, enlarging action possibilities, suited for local context, to be integrated into a universal mapping model. It is these tips and tricks that nuance and support the possibilities of empowering the citizens. And the field of sharing knowledge with tips and tricks are increasing.

First, we will examine the available research and literature and then look into concrete recommendations from empower-related projects.

The following graph demonstrates an expanding research field and consists of scientific peer-reviewed articles indexed in the "Social Sciences Citation Index of Web of Science". The search words were "Community Energy" & "Community Renewable Energy" & "Renewable Energy Community" & "Citizen Energy" & "Energy Citizen" & "Energy Citizenship".

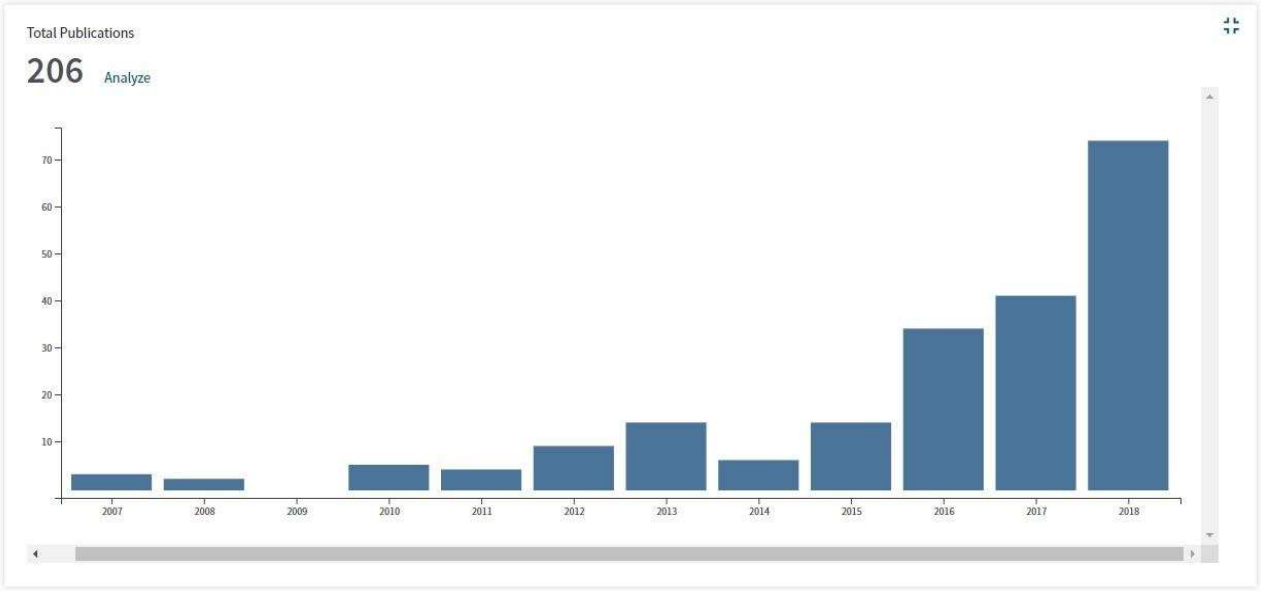

Figure 18 Expanding research field in empowerment research

The research, done by the European Interreg project "Co2Mmunity"[3] is not specific in the search for words on "Empower". The subjects are, however, so interrelated that the picture is parallel.

First of all, the graph shows an increasing amount of research and knowledge sharing. Looking further into the figures, in Figure 2 and 3, although research on CE has appeared in numerous journals, most of it has been published in a limited number of journals, with Energy Policy as one of the most influential, in terms of both overall number of publications and number of citations.

[3] http://co2mmunity.eu/wp-content/uploads/2019/01/co2mmunity-working-paper-No.-2.1-v04.pdf

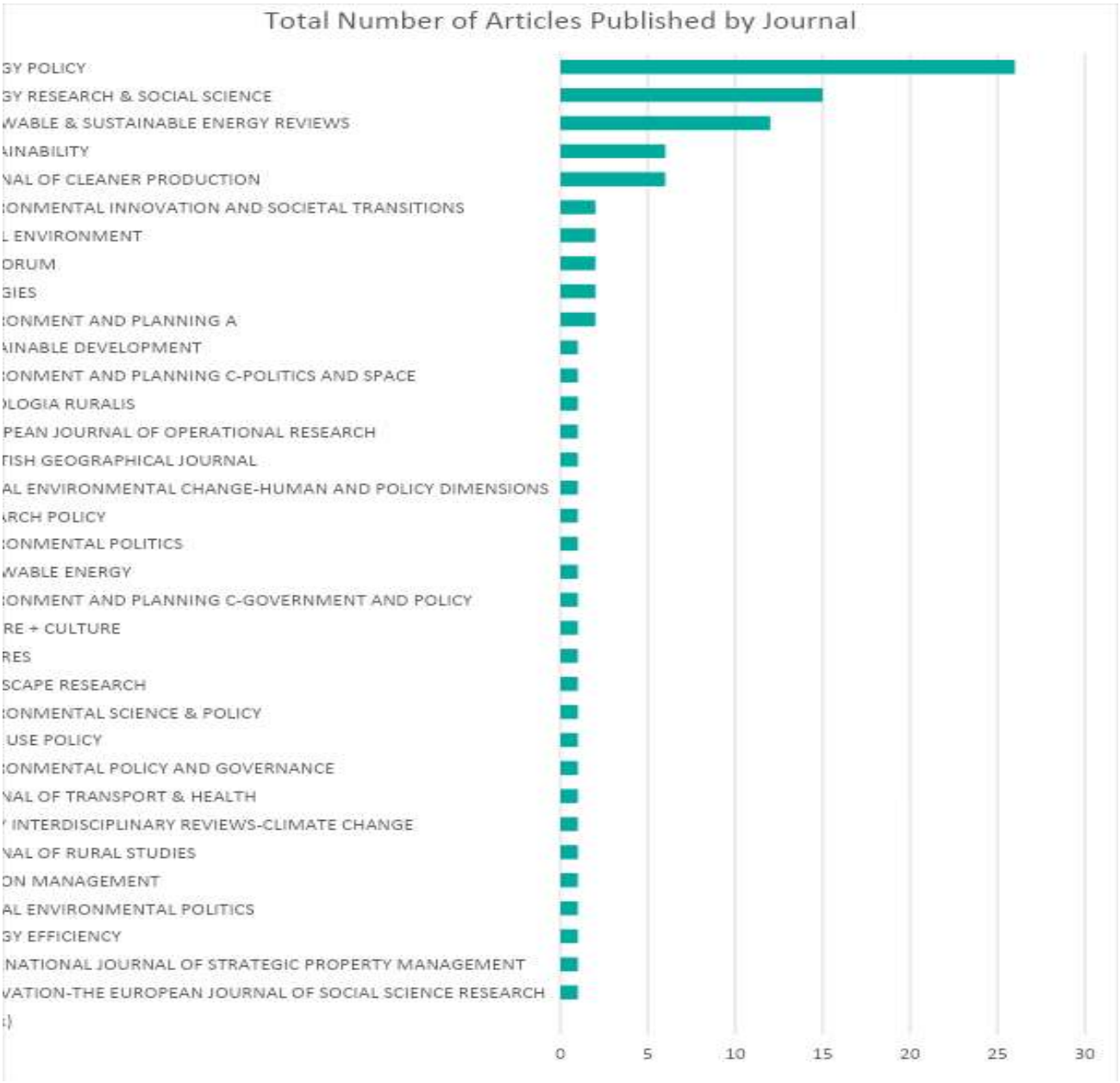

Figure 2. Number of articles per journal published in the period 2008-2018

Figure 3. Total number of citations for articles published in these journals (2008-2018)

Figure 19 NUmber of citations pr. journal

This does point out that even if the trend is upward going, the knowledge and research is still limited.

7.1 Learning from case to case – project to project

With limited existing literature, the Empower project is somehow left to explore the wild west to produce a "universal mapping model".

In the EMPOWER2.0 project, a large number of interviews and literature studies have been made. This includes meetings in real life as well as webinars.

7.2 COBEN project

COBEN, **Co**mmunity **Be**nefits of Civic **En**ergy, is on the learning list of EMPOWER2.0. A mutual learning meeting was therefore held to share knowledge.

The Transnational Knowledge Sharing on engaging citizens in the green transition was a success when representatives from EU project #COBEN met up with representatives from EU project #EMPOWER2.0.

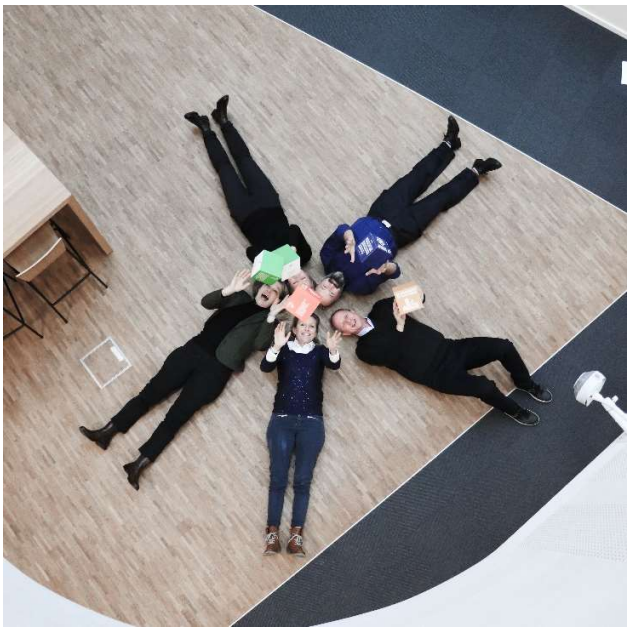

Figure 20 Learning from other European projects

From #COBEN project leader Henning Donslund remarked: "Delivering **Co**mmunity **Be**nefits of Civic E**n**ergy has pretty much to do with **E**nabling **More P**eople's **Ow**nership in **E**nergy t**r**ansition. So today we changed ideas and knowledge and agreed to keep in touch – and maybe even Co-Create."

One of the main outputs was that a bottom-up approach showcasing concrete results to citizens is a valuable approach. Examples of how citizen groups have visited the village of Foens as well as energy Island Samsoe has demonstrated possibilities of project dissemination. Learn more on https://civic-energy.eu/ . The COBEN project relies on its Civic Energy Cycle, which is taken into our effort for a universal mapping model.

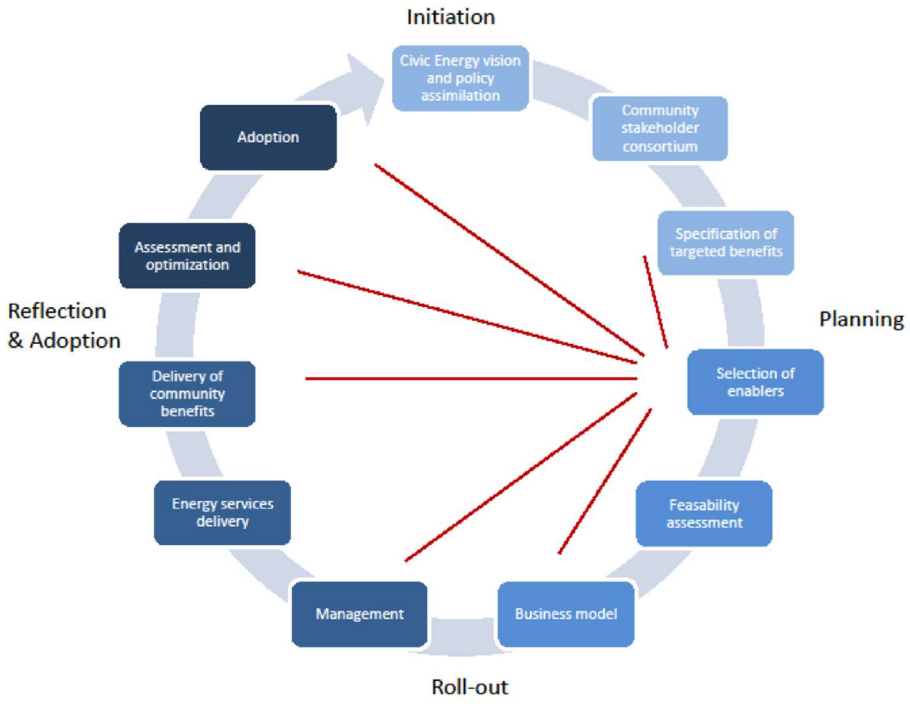

Figure 21 Civic Energy Circle

7.3 REScoop

Meeting with Dirk Vansintjan from REScoop.eu on the 11th of March 2020 has given insight in https://www.rescoop.eu/.

Basically, RESCoop represents 1,000,000 European citizens, in different groups, who cooperate in the field of:

Renewable energy or energy efficiency

Clean production

Supply

Distribution

Storage

Service

E-car sharing

REScoop is a Legal entity working after ICA principles.

REScoop has made a tremendous amount of research that demonstrates how much context matters
https://www.rescoop.eu/community-energy-map.

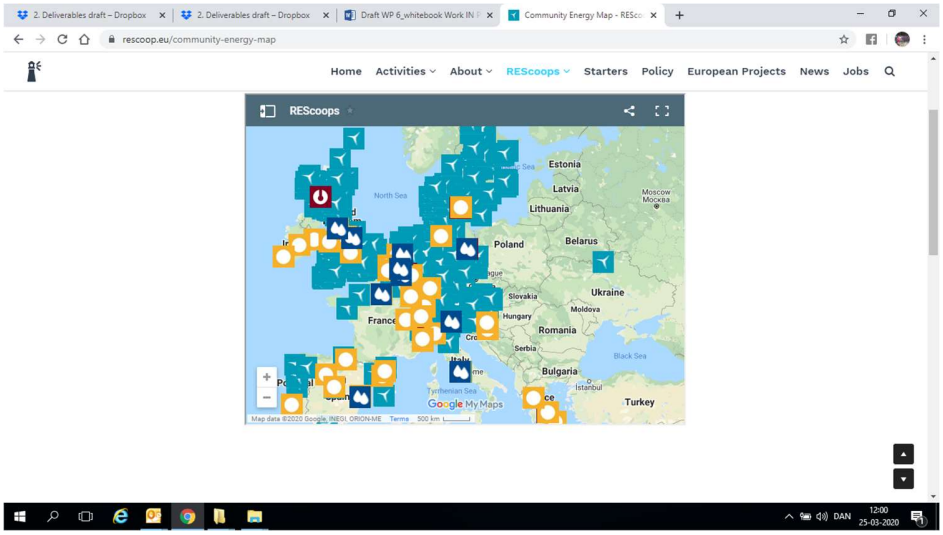

Figure 22 Online mapping of community energy projects

If interested in real life contacts, REScoop is recommended.

8. Preliminary conclusion of data until now – caution about universal mapping model

Before we dive into the outline for a universal mapping model, there are three main points to address regarding EMPOWERING people to energy.

There is no silver bullet. As researcher Salvatore Ruggerio puts it: "*...a community energy approach is not something that can be simply copy-pasted from other contexts. It has strong cultural foundations that might not necessarily be shared across countries. Therefore, much adaptation work and flexibility is required when working with this approach.*"[4]

Carbon emissions must be linked to taxes and tariffs and must appreciate renewable energy produced by citizens.[5]

Structures to train and support citizens in engaging in renewable energy and climate must be institutionalized.

Regarding point 1 & 3, an illustration from the Baltic Sea Region demonstrates a tremendous difference in citizen participation in renewable energy projects. While countries like Denmark, Sweden, Germany, and Finland all have registered projects, almost none are found in eastern Europe. This research[6] that corresponds with lessons from REScoop[7] indicates the truth in the saying that "Culture & Context eat Strategy for breakfast". Therefore, universal models must prepare adaptation to local conditions.

http://www.lei.lt/co2mmunity/

[4] Ruggiero, S. 2018. People power: the role of civil society in renewable energy production. University of Jyväskylä. Available online at: https://jyx.jyu.fi/handle/123456789/56457.
[5] Professor Henrik Madsen, CITIES, qoute from conference 100%climateneutral, Sønderborg, 1. october 2019. https://smart-cities-centre.org/
[6] http://co2mmunity.eu/
[7] https://www.rescoop.eu/community-energy-map

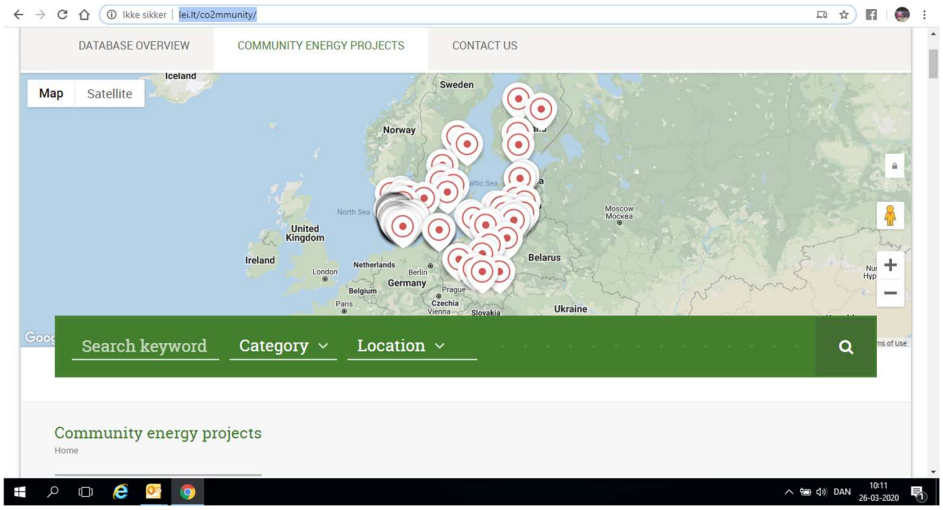

Figure 23 Number of CE projects in Baltic Sea Region

9. Roadmap by universal mapping model – the backbone of country-specific roadmaps to support prosumers in specific technologies

A "universal mapping model" will now be presented. The model produces specific roadmaps for supporting prosumers to act within any given technology. It is dynamic and country-specific, and utilization requires frequent data updating.

The approach that "one size does not fit all" derives from the best cases that demonstrate that roadmaps must be adjusted to local contexts. Therefore, a roadmap model that shows how to commence a country-specific roadmap can be carried out in real life.

The model is developed from the question "How 'easy' is it to become a prosumer?"

The model takes the citizens' perspective. Depending on wishes regarding production and/or consumption, the model will illustrate if important data is accessible prior project start.

Through the work and analysis in EMPOWER2.0, a number of parameters, dataset, have been identified to play different roles in different contexts.

The model's main performance is, therefore, to support the understanding of the local contexts: Strengths, weaknesses, threats and opportunities.

This is to be done within the spheres of major importance. Based upon the already done research, these are defined as: Technical, economic, social and legal.

Access to all data will be regarded from the partner perspective and from a citizen perspective as much as possible. The underlying question is: As a citizen, is this easy or is this very complex to access?

Basically, the model is built on the following scheme, produced on answering relevant and thematic questions. The model was developed in the EMPOWER2.0 project as an independent piece of specific innovation work amongst partners.

The model is based on a surveying approach that seeks to build a bridge between public, private and civilian realms.

The bridging work consists of demonstrating the gaps to be overcome in attempts to empower citizens in energy-related issues.

Since all technologies, citizens, organizations, needs and demands etc., in the North Sea region vary to some extent, the model is suited for examining different contexts to produce the most relevant analysis . Furthermore, the model can support the empowerment of the citizens in the preferred area of technology, economic schemes, legal issues and/or social possibilities.

Data is not only hard data that is quantified like kWh, amount of square meters, cost in Euro etc. But also information, knowledge and how easy it is to access this.

The subject for data analysis will be "simple" prosumer subjects like solar PV on rooftops, multiple projects where many rooftops are used for solar PV, and solar PV on fields.

TO BE ANSWERED BY EXPERTS AND CITIZENS – mapping survey - metamodel

	Really easy	Some effort	challenging	Difficult	Needs an authorization to do	Do not know
Technical data						
Economic data						
Social data						
Legal data						

Each theme has more concrete sub-elements and details.

Each questionary is to be answered by both citizens as well as people who are searching to empower citizens. Then the answers are compared.

9.1 Testing the model in real-life – country roadmaps on Solar PV.

To work concrete, the partners in EMPOWER2.0 tested the model. First, we rediscovered the model developed by the partners.

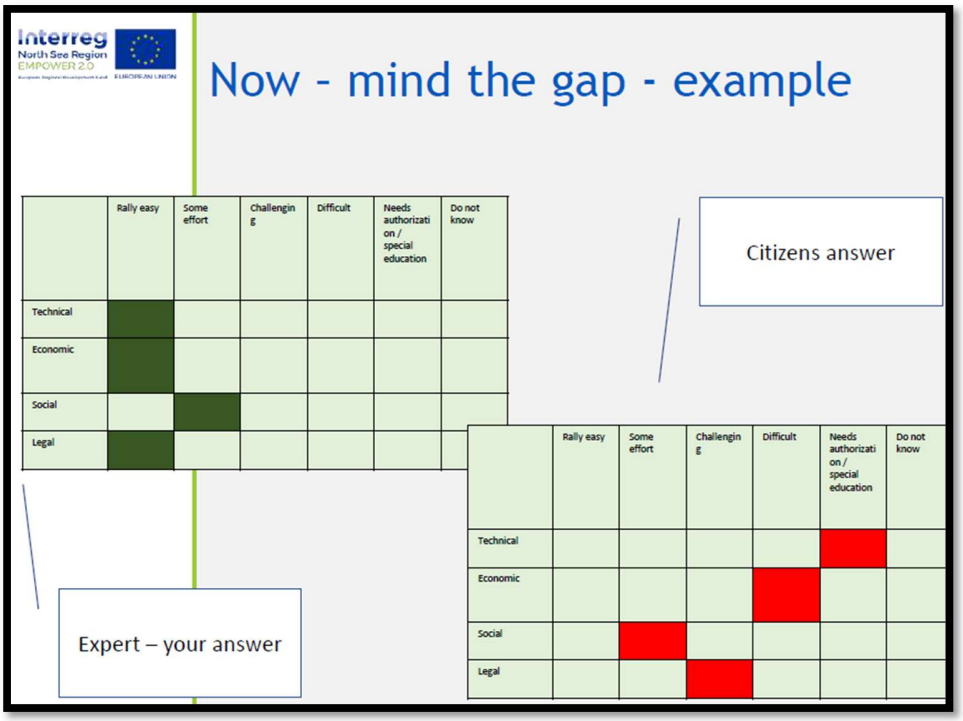

Figure 24 Making country roadmaps specifik

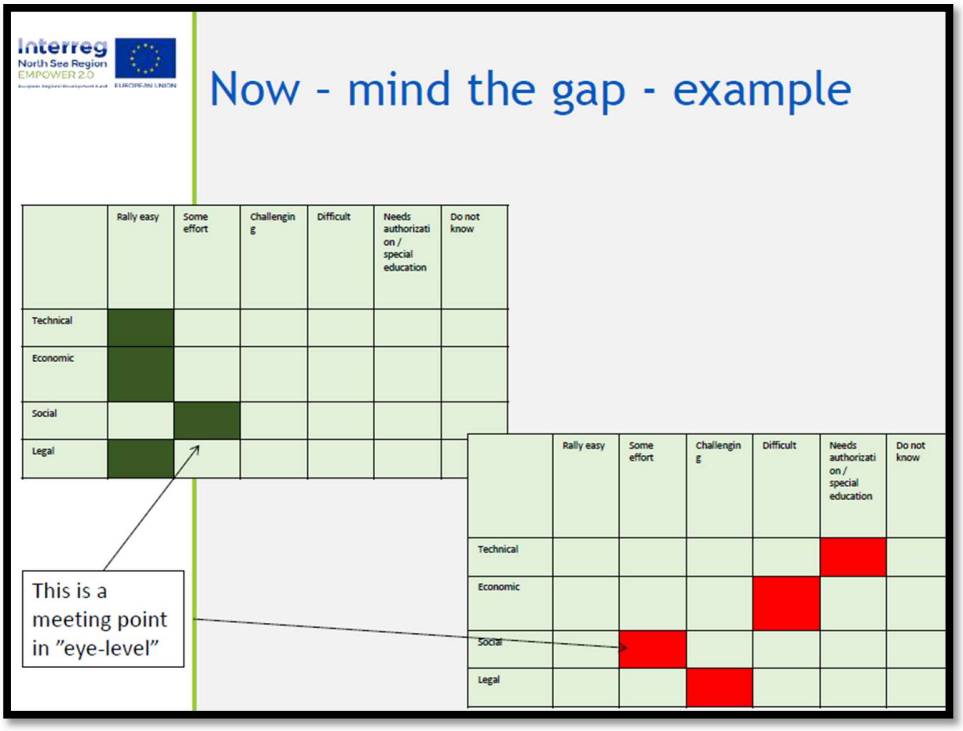

Figure 25 Making country roadmaps specifik

The "test" is on identifying the knowledge and understanding the gap between experts and citizens. The graph above illustrates an expert survey and a citizen survey on any given subject.

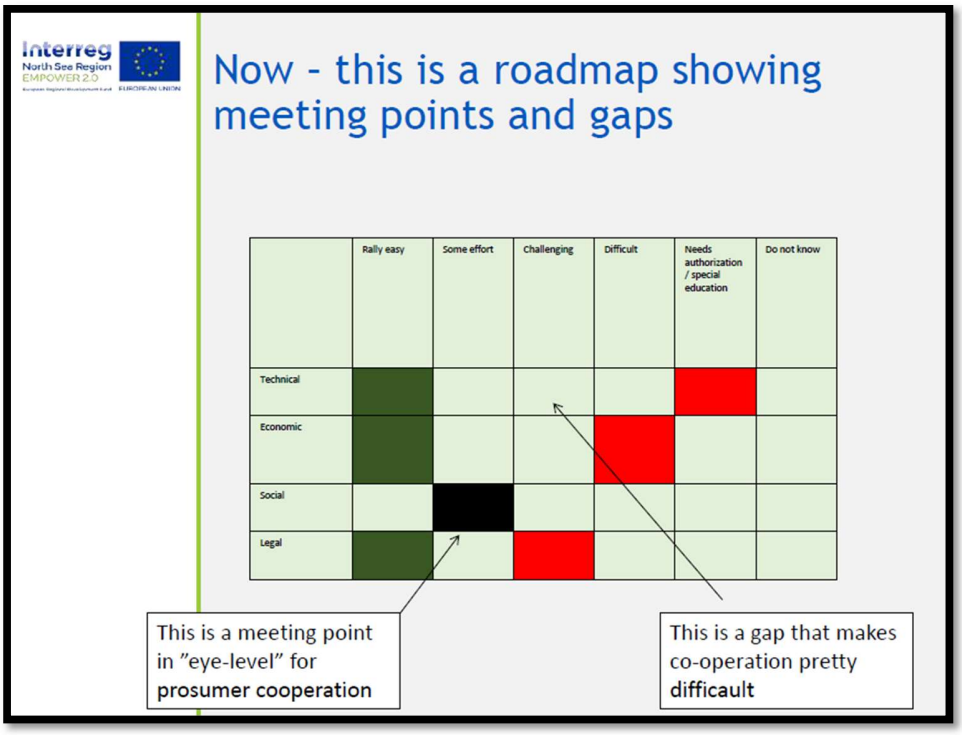

Figure 26 Making country roadmaps specifik

In this specific case the EMPOWER2.0 team is making a road map on solar PV in households.

The initial questions are respondent details:

- Age:
- Gender:
- Family situation: (living alone; in a couple; young children; children in secondary school/college; children left home)
- Own home or rental?
- Is it a house or an apartment within a block?
- Does it already have PV?
- Country

The prosumer-related questions are based upon multiple-choice questions (MCQ).

They are composed of two parts: a stem that identifies the question or problem and a set of alternatives or possible answers. In this case, the answers consist of ratings on how confident the respondent is in solving the problem.

Technical questions

How confident are you that your home is suitable for PV?

How confident are you that you could obtain all the necessary permissions and approvals to install PV?

How confident are you that you could choose the right technology, e.g. type and size of panels, way to connect them to the home, etc.?

How confident are you that you could find a trustworthy installer to design and install the system?

Financial questions

How confident are you that you can afford to install PV, e.g. that you have enough cash or that you can obtain a loan or grant?

How confident are you that you could sign up for the right energy tariffs or other deals to get the most from PV?

How confident are you that it would be a good investment, e.g. that it will pay for itself in energy savings and improvement to the value of your home?

Social questions

How confident are you that installing PV would give you more control of your energy consumption?

How confident are you that installing PV would be seen by your friends and neighbors as a suitable, smart thing to do?

How confident are you that you could find a trustworthy advisor to handle your queries about installing and using PV?

Objectives

How important do you think it is to install PV in order to help the environment?

How important do you think it is to install PV in order to improve the comfort of your home?

How important do you think it is to install PV in order to reduce your energy costs and make a financial return?

Real-life EMPOWER2.0 survey – roadmap data

In a COVID-19 free situation, it would be optimal to ask people the questions face-to-face. The survey was done by partners under lock-down January-February 2021. It was done via e-mails and online surveys.

The goal was 20 answers from each country (aim for 80).

The total amount of respondents were 210. The answers were divided in the following manner.

Netherlands: 32

United Kingdom: 40

Denmark: 50

Belgium: 88

The data are not fully representable for citizens in each country. They do, however, promote possible departure points for specific roadmaps in a local context. It is the overall model and its findings that support more general roadmaps.

The data is answered in a Covid-19 lock-down. It is expected that this highly influences the answers in some way. It does not affect the EMPOWER2.0 innovative model to develop a questionnaire that will help make very specific roadmaps to empower citizens in a local context within specific technologies.

9.2 Scrutinizing data from Denmark – roadmap recommendations

The Danish survey contains 50 participants.

Technical findings - DK

Overall, 32% already have Solar PV on the roofs, suggesting that the topic is not a stranger to the Danish population. This can have been influenced by periods of subsidy that eliminated technical barriers because installers learned to make technical applications for the homeowners. This is supported by the finding that 24% are not confident that it is an easy task to get permission to install solar PV on the roof.

There wa a rather large number, 24%, who answered "I do not know" in technical questions.

Financial findings

Almost half of the participants in the survey find the financial overview difficult, or they answer: "I do not know". This corresponds with the 34% who have some level of confidence in using the produced electricity in a financially optimal way. It is 58% who do not know or have little confidence in their ability to calculate payback time.

On the other hand, 48% believe solar PV will increase the value of the house if it is to be sold.

Social findings - DK

First of all, 60% believe that solar PV on the roof is an important climate action – it is a "feel-good action". These figures are supported by the fact that 32% believe that neighbors and friends will think it is a good idea with solar PV on the roof, while 30% state that surroundings (friends and neighbors) will be indifferent if solar PV is installed on the roof.

Asking if the respondents have solar PV on their roofs, a total of 32% have solar PV on their roof.

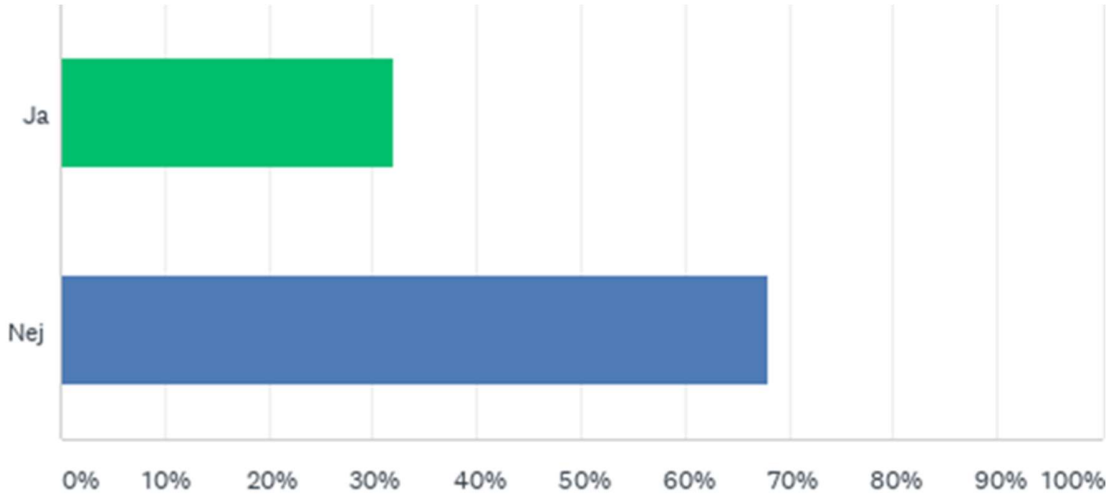

Figure 27 Own questionare for roadmapping

This means that a rather substantial amount of participants actually have experience and knowledge of the process.

Against the assumption that so many are in favor of solar PV on the roof, it is noticeable that 14% think surroundings (friends & neighbors) will be against installations. A rather large "dark number" shows that 20% do not know what the surroundings will think.

From a social perspective, a total of 34% are not confident that there is a social acceptance of solar PV on the roof.

Objectives

Most respondents agree that solar PV is good for the environment and socially accepted. At the same time, they have lower confidence in the ability to make financial calculations. Between the two possibilities and difficulties, a rather large amount simply "Do not know" how to get a permission.

Data suggestions for Denmark

As the social findings indicate a driver for installing solar PV on roofs, and financial data are available, it is suggested to focus on the knowledge gap regarding permissions. Roadmaps could support indicators of houses suited for permissions to install solar PV. An issue that could be dealt with by local municipalities.

9.3 Scrutinizing data from the Netherlands– roadmap recommendations

The data from the Netherlands contain 40 participants.

Technical

In the data from the Netherlands, 75% were living in rented homes. In the question *"How confident are you that you could obtain all the necessary permissions and approvals to install PV?"* 65% answered that they had little confidence or simply did not know how to answer the question. It corresponds with the large number of residents who do not own their homes.

Financial

A very surprising finding is that 95% of the respondents are confident or a bit confident that solar PV would be a good investment, e.g. that it will pay for itself in energy savings and improvement to the value of the home. Asking how confident the respondents are that they can afford to install PV, e.g. that you have enough cash or that you can obtain a loan or grant 55% answer they "do not know how to answer" or have less confidence.

This discrepancy between seeing a good financial deal and not knowing how to finance it may very well have to do with the fact that so many respondents are tenants. Therefore, they have limited rights of disposal over roofs on buildings.

Social

The Dutch respondents do favor solar PV as a good thing from a social perspective – it could even be seen as prestigious.

Answering "How confident are you that installing PV would be seen by your friends and neighbors as a suitable, smart thing to do?" 90% feel "very confident" (35%) or "confident" (45%), or a "bit confident" (10%) in that solar PV is a good thing to do.

The remainder mainly answered that they do not know how to answer the question.

Objectives

Answering "How important do you think it is to install PV in order to help the environment?" it is 85% who think that installation of solar PV is important or very important for the environment.

Combining these data with answers from the 20% who "do not find it important to install PV in order to reduce energy costs and make a financial return", it is still 10% who think it is good for the environment. This could indicate that a few respondents are very dedicated to the environmental aspects.

Data suggest for the Netherlands

The data suggests that a meeting point between developers, energy entities, regional stakeholders, NGO's, local authorities, and citizens are the social objectives where a very solid base of interest is found. With this common ground, an empowering process to overcome financial issues, as well as technical issues, would be a recommendation for a roadmap. This is, in fact, more or less, what the Dutch empower partners are doing. The Dutch work from Haarlem is worth replicating.

9.4 Scrutinizing data from United Kingdom – roadmap recommendations

From the UK, the data was 40 responding citizens.

Technical

Responses were largely conservative: interestingly, and perhaps unsurprisingly, confidence around the suitability of solar, achieving the relevant permissions, identifying installers, etc., largely correlates to being in a rented property, particularly an apartment. Owners of housing were more positive but still self-reported a lack of confidence overall.

Interesting issues were also identified. Some respondents indicated reasonable technical aptitude and interest but lacked the corresponding financial power to realize it. Another response that indicated an overall positive view of solar but suggested reluctance to pursue owing to concerns at neighborhoods opinions. Only one respondent responded very positively regarding their technical confidence; they already had solar panels.

Financial

Responses were also conservative and preserved the patterns of responses in the Technical portion of the questionnaire. That is, confidence in having the financial power to consider or implement solar was lower amongst tenants, particularly those in apartments. Most of those respondents, who considered themselves financially confident to implement solar, also indicated a lack of technical aptitude. Interestingly, some respondents were conflicted by question seven. They agreed solar is a good investment in terms of paying for itself but did not think that solar would necessarily increase the value of a property (and, in fact, might reduce it).

It would be interesting to perform this questionnaire again post-COVID: the economic and social impact of COVID has very likely skewed or distorted the market of potential solar consumers.

Social

Again, most answers indicated a lack of confidence (or, in some cases, a complete lack of knowledge) about the potential social impacts of installing solar. Perhaps the most interesting part is the prevalence of a lack of confidence in the opinions of friends and neighbors: even those who were more confident of positive social impact demonstrated a lack of confidence in neighborhood opinion. Anecdotally, this comports with one of my bigger worries about stimulating the uptake of energy technologies locally: that is, being seen as 'different' in a neighborhood.

Objectives

Most people agreed about the importance of solar in helping the environment and achieving lower energy bills, which shows that there is potential for social hurdles to be overcome if this message is emphasized. There was, however, quite a convergence in opinion about how solar would not improve the comfort of the home. My understanding is that respondents thought solar would have no effect on the comfort of a home as it simply provides an alternative means of providing electricity; thus, it would not change anything in respect of comfort.

Data suggest for the UK

Data shows a mix in levels of confidence in several matters. This supports the strategy from the group purchase scheme (Essex), where the county is examining technical possibilities of installing solar PV prior to campaigning. This empowers the citizens simply because it reduces the technical barrier. A roadmap would therefore focus on these empowering possibilities, thereby bypassing barriers. The mythology of Essex county also supports the financial barriers. It is suggested to develop this model.

9.5 Scrutinizing data from Belgium – roadmap recommendations

The data from Belgium consist of 90 respondents.

Technical

It seems as if the installers of solar PV have an important role to play in Belgium as 22% prefer expert advice in choosing suitable solar PV for their roofs, and 42% are not very confident in the ability to make the right decision without effort.

Financial

The majority do not find initial investments as the main challenge. It is 14% who are not very confident in their ability to finance a solar project.

Social

A majority of the respondents, 62%, are confident that friends and neighbors will be in favor of a solar PV installation. And 12% simply do not care what their neighbors think. It corresponds with the data showing that 60% of respondents have solar PV already.

Objectives

In the data from Belgium, a ranking of objectives showed that the priorities are listed with:

Climate and environment as "very important" for the installation with 50%

Economy as "very important" for the installation with 29 %

Home comfort as "very important" for the installation with 1%

As mentioned before, solar PV does not do much for "home comfort" unless it is combined with a general roof renovation. The question has the most value when combined with other energy technologies where empowering is important (heat pumps, for instance)

Data suggest for Belgium

Much like the UK data, the larger dataset suggests that a meeting point between developers, energy entities, regional stakeholders, NGO's, local authorities, and citizens are the social objectives as well as climate, where a very solid base of interest is found.

With this common ground, an empowering process to overcome financial issues, as well as technical issues, would be a recommendation for a roadmap.

This is, in fact, more or less, what the Belgian project is supporting, but regarding home renovations. Therefore, a similar survey could be conducted with energy renovation in focus. Findings from this survey a contact point could be climate regarding renovations, and from there focusing on supporting and empowering citizens with technical and legal barriers.

9.6 Expert answers and common findings and recommendations – not all homeowners are alike.

For all countries, experts tend to find the different issues as something they have confidence in. Other would also be strange. Experts from Empower have been listing quite a number of barriers (longlists, workshop material, online meetings, seminars, etc.)

However, it is a new finding that there are areas where the citizens are already empowered or feel confident. It is a clear recommendation that empowering citizens, depart in these findings whether you are developer, NGO, financial expert, local authority, or energy utility.

Starting with addressing *the citizens'* main barriers may not be motivating for an empowering process. However, the motivation is in different fields when addressing citizens. For some, social aspects do mean a great deal or even environment.

This is not the same as saying that difficult matters such as financial barriers are not relevant. On the contrary. In order to engage the citizens, you must be able to ease the number of obstacles and barriers while starting the empowering journey from a common platform.

A roadmap to empower begins at the easiest and most desired point from a citizen's perspective. This is exactly what the model provides.

Figure 28 Working and empowering in clean energy transition

These points of departure on the empowering journey shift constantly and must be mapped frequently to stay on track.

In other words, stay in touch with the citizens, and you do not necessarily need to see the whole stairway to take the first steps.

Other studies suggest the same approach. Significant differences are found between the groups on the perceived characteristics of the residential photovoltaics such as perceived complexity and aesthetics and the amount of previous practice with other energy measures in their home.

Accordingly, these insights can be used by policymakers and the public and private sectors to promote residential photovoltaics more effectively by targeting the segmentation groups more adequately. The different groups will be drawn to different aspects. Therefore, a broader pallet of benefits must be presented; a mix of different communication channels must

be used; objective and non-technical assistance in the decision-making must be offered, and different kinds of products must be provided.[8]

This is supported by big data from the European Union.

10. Big data supporting the roadmap model for empowering citizens

The special Eurobarometer report 490 from April 2019 maps the European citizens' perception of challenging factors, focusing on climate change.

The message is clear:

"Climate change is one of the most serious challenges facing our world today."

What also is very important is that this general perception has some details to pay attention to when facilitating Empowerment amongst citizens in a local context.

First of all: The citizens' concerns and motivations are rather different.

Second: The concerns and motivations are moving rapidly.

This supports the suggestion of mapping and adapting roadmaps while empowering projects are running. Exactly as the EMPOWER2.0 surveys, discussions, and study work are proposing.

The survey in the Eurobarometer states that climate change is increasingly considered not only as a very serious problem but as the single most serious problem facing the world today. In the survey, 27,655 European respondents from different social and demographic groups were interviewed face-to-face at home in their mother tongue on behalf of the Directorate-General for Climate Action (DG CLIMA). The methodology used is that of Eurobarometer surveys, as carried out by the Directorate General for Communication ("Media monitoring and analysis" Unit).

In the context of EMPOWER (UK, BE, NL, and DK), there are differences, as already found.

When asked in 2019:

"Which of the following do you consider to be the single most serious problem facing the world as a whole"?

Following numbers pointed at climate as the most serious problem.

Country	Climate

[8] Not all homeowners are alike:

https://link.springer.com/article/10.1007/s12053-021-09937-0#Abs1

Belgium	23%
Netherlands	27%
United Kingdom	29%
Denmark	47%

These numbers are more typical for northern European countries when compared to southern European countries like Romania (11%), Greece (11%), or Bulgaria (10%).

The most important finding is the shift of concerns over time: Since 2017, it has been measured that 11 countries have increased with more than ten percentage points regarding climate.

The change is seen in Denmark (47%, +18 pp) and UK (29%, +15 pp). In Belgium (23%, +6 pp). The exception is the Netherlands, where there has been no change.

These are rather sensational changes and should be noted. The factors that motivate and concern citizens are shifting rapidly. Previous rounds of this Eurobarometer survey on climate change were carried out in 2008, 2009, 2011, 2013, 2015, and 2017. They indicate the same increasing concern amongst Europeans.

Over 60% of the citizens in EMPOWER find that climate change is one of the most serious problems facing the world (DK 84%), UK (64%), BE (64%), and NL (69%).

This big-data study supports the EMPOWER2.0 recommendations.

11. Conclusion, perspectives, and recommendations with mapping and specific roadmaps

The results demonstrate that ongoing mapping is essential to target and empower the citizens. Certainly, money plays a very important role. However, it is not always the initial driver, but may, of course, be the final showstopper.

The model of road mapping clearly illustrates that citizens have to be targeted in different ways to make policies, communication, and marketing campaigns more effective. The different groups will be drawn to different aspects in a campaign, and therefore, a broader pallet of solar PV benefits must be presented (e.g., environmental and financial benefits).

The specific aspects that trigger certain people are not mutually exclusive. Therefore, the attention must be devoted to all those aspects, so that people can select for themselves which criteria are relevant for them. The potential solar PV adopters with a technical background can be specifically targeted. The targeting can be done by sharing technical information and reviews in technical magazines and by means of information stands at local hardware stores.

Existing social networks can be used to promote clean energy projects —for example, neighborhood and music associations and sport and recreation clubs. This has been demonstrated in the cases. The findings reveal that this is especially effective

for people with no technical or financial-economic background, as they put more trust in their local authority when making a decision. For instance, local governments could make it possible for people with a technical background to advise others on renewable energy possibilities in their social networks. In addition, people without a technical background could be unburdened by offering them objective assistance in the decision-making process - particularly with the comparison of offers and by giving a clear, less technical explanation about the operation of the clean energy system.

A local government or non-profit organization could offer such a service. In all cases in the EMPOWER project, there is an enabler supporting the process.

Furthermore, communication campaigns could reach out to potential adopters who already have adopted other energy measures in their homes. Lastly, the uptake by people with a financial-economic background could be enhanced by offering aesthetically more attractive photovoltaics.

Perspectives

It is advantageous to digitalize the universal mapping model that guides the development and implementation of a flexible road map. Utilizing digital platforms that can combine and analyze different preferences amongst citizens can reduce costs and increase value

An enhanced focus on this approach, developed by EMPOWER, could very well be combined with behavioral science. From a critical perspective, it could be argued that this project has demonstrated a very effective way of mapping a context, demonstrated how to commence a context-based flexible roadmap. This should then be utilized in campaigning, policy development etc.

The main issue about adding behavioral science to datasets is also to identify which “micro-actions” can easily be introduced to the citizens. These actions might encourage the citizens to take the first step before taking larger decisions like purchasing solar PV. This recommendation is based on the main outcome of this project's roadmap work; you do not need to see the whole staircase to take the first step.