THE COMMON IMPACT MODEL: A STANDARDIZED METHODOLOGY FOR COMMUNITY ACCEPTANCE OF DECARBONIZED MULTIVECTOR LOCAL ENERGY SYSTEMS

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ABSTRACT

Today, cities, towns, and villages can increasingly power their electricity, heating, and mobility needs using clean and local energy sources. However, the successful and long-lasting adoption of clean and local energy solutions requires acceptance from different local stakeholders and community members. Our work presents the Common Impact Model (CIM), a structured hands-on methodology to facilitate community acceptance of Decarbonized Multi-vector Local Energy Systems. The CIM is designed for urban planners, energy managers, and those interested in establishing local energy systems and local energy communities. Underpinned by academic literature on the governance and social acceptance of collective energy solutions, the CIM comprises of 3-steps. In phase one, inputs are collected from key stakeholders using a community scoping questionnaire. The community's core values, priorities and practices are identified, as well as local stakeholders' rational and emotional reactions to proposed energy solutions. In phase two, data are analysed to visualise the different criteria that guide inclusive energy infrastructure planning. In phase three, engagement recommendations are co-created with the local partner using a tactical workbook. The CIM has been piloted in different contexts, including a harbour in Norway, a technological park in Spain, a township in South India. Based on the field experience, we provide recommendations for participatory planning of local clean energy solutions. The CIM is part of the E-LAND toolbox, a set of tools to establish, optimise and control multi-vector local energy systems, developed by the European founded Horizon2020 project E-LAND.
Video abstract available at: https://youtu.be/BFY0zzxaJvc

Keywords: citizen engagement; community acceptance; renewable energy; energy communities; local energy systems

1. INTRODUCTION

1.1 Relevance and Problem Statement

Distributed renewable energy sources and smart grids allow generating power close to where it is consumed. Using these technologies, cities, towns, rural villages or industrial districts can become local energy systems (LESs), where local renewable energy sources power local most of the local electricity, heating and mobility needs. Local and clean energy generation helps communities mitigate climate change, support their local economy and increase the energy awareness of their members ([1]; [2]). In the European Union, LESs can be established and operated by an autonomous entity, known as "renewable energy community". This entity manages the local collective energy assets and shares the output of local energy sources among its members, who are located geographically close to the energy production facilities ([3]).

Local energy systems and energy communities are regarded as a cornerstone for a just and inclusive energy transition, as they promote citizens' participation in the energy transition and can accelerate investments in decarbonisation. Establishing LES, however, presents challenges ranging from selecting an optimal set of technological components, selecting an optimal business model, and settling conflicts of interest among the different stakeholders involved in the implementation ([4]). A techno-centric approach that ignores local and community acceptance can impede the realisation of energy projects and prevent the successful uptake of innovative energy solutions. Identifying local stakeholders and addressing their needs in an early stage is a success factor for establishing local energy systems ([5]).

With this work, we propose a structured process to design clean and local energy solutions that are compatible with local stakeholders' views, values, and priorities. The Common Impact Model is a hands-on methodology for urban planners, energy managers, local authorities, and those interested in establishing decarbonised local energy systems and energy communities. It is a structured 3-step process to facilitate long-lasting acceptance of planned and existing energy innovation in a local energy system. It is based on the participatory energy infrastructure planning approach and uses an engagement strategy to facilitate local acceptance. The rest of this work is structured as follows. The rest of this chapter clarifies the definitions and features of local energy systems and renewable energy communities; Chapter 2 presents the theoretical framework of the CIM and, more specifically, reviews the literature on the drivers of social acceptance of local energy systems; Chapter 3 illustrates the methodology and reports on its recent applications; Chapter 4 concludes by providing recommendations for participatory planning of local clean energy solutions.

1.2 Definitions

A **local energy system** includes a group of geographically-close energy users that share locally produced power, as well as the soft and hard infrastructure required to generate, store and dispatch clean and locally produced energy ([6])[i] (**Table 1**).

Table 1: Typical and Distinctive features of a local energy system (LES)

Collective use	The energy infrastructure (RE generation units, infrastructures, storage units) is of joint use to a group of individuals
Geographical proximity	The members of a LES are geographically close to each other
Common good provision	A LES provides for a common good, namely energy and the avoidance of negative climate impact
Subtractability	One member's consumption of the resource units makes those units unavailable to others: every kWh used by one consumer is not available to others.
High level of self-organisation	A LES typically features a dedicated governing institution. One type of governing institution is the "renewable energy community".
Multi-vector	A LES typically requires the integration of many different energy vectors (electricity, heat) and technologies: renewable sources, energy-storage, active demand-side management solutions, smart grids
Citizen participation	Citizens and local organizations in a LES are typically involved in key decisions through different channels: information, consultation, direct or indirect decision-making power, financial participation.
Energy autonomy	A LES typically allows for a high level of energy autonomy for its members, defined as the share of local consumption met by local production..

A "**renewable energy community**" is a new legally autonomous entity that was defined in the latest EU energy package ("Clean Energy for All Package" [ii]) and has been transposed in Member States' national laws [3]. The renewable energy community develops, owns and manages a local energy system. The renewable energy community shares the output of the generation facilities in the LES among its members, located geographically close to the energy production facilities. Its members can be private citizens, SMEs, local authorities, whereas traditional energy companies cannot be among its members. The renewable energy community should not be purely profit-oriented. Its main goal should be to provide environmental, economic or social benefits at community level to its shareholders or members or to the local areas in which it operates.

2.THEORETICAL FRAMEWORK: DRIVERS OF LES LOCAL ACCEPTANCE

Establishing and operating successfully a LES requires a functioning technology, a sustainable business model, and acceptance of the energy technology among multiple local stakeholders, such as potential energy users and producers in a LES, or financing actors for LES's assets. Energy technology for LESs includes hardware and software solutions that satisfy people's energy needs using local and renewable energy sources. Examples of such solutions are small or medium-scale renewable energy production assets (solar PV panels, wind turbine, biomass plant, heat pump) to be built for collective consumption of a group of stakeholders, a new local electricity distribution grid (microgrid), a demand-response scheme for the heating, ventilation, and air conditioning (HVAC) of a building used by multiple users, a new energy storage system or a charging facility for electric vehicles for collective use.

Depending on the desired energy configuration of the LES, successful implementation requires local stakeholders' passive and/or active acceptance of energy technologies (**Table 2**).

Table 2: Two types of acceptance of energy technologies for LESs

	Definition	Examples of the phenomenon	Example of a metric to assess the phenomenon
“Passive” acceptance	Positive appraisal of the energy technology, whereby local stakeholders give one-off support to the project and do not oppose to it, while their energy-related behavior (how much/when/how they consume or pay energy) is not affected by the project.	Tenants living in a multi-apartment building vote for/do not oppose the realization of a new solar plan on their common roof	Adoption intention Likert-type scale, e.g.: “I will use e-car sharing in the future. I can see myself using e-car sharing in the future.” (answer options: I fully agree, I rather agree, I rather disagree, I fully disagree)
“Active” acceptance	Willingness to actively support the energy technology, whereby local stakeholders change their energy-related behavior to support the project	LES users change their consumption pattern, change their transport-fueling or mobility habits, invest in new energy equipment, co-finance the project, share data on their own consumption, lease their real estate property or land for hosting a new energy equipment	Attitude Likert-type scale, e.g.: “Generally speaking, e-car sharing services are a great idea. E-car sharing services offer a lot of benefits. (answer options: I fully agree, I rather agree, I rather disagree, I fully disagree)

We review the literature on governance of commons and social acceptance of energy projects to identify factors that influence stakeholders’ passive and active acceptance of LESs. Insights from the following behavioural theories and conceptual frameworks have been integrated: Theory of Planned Behaviour ([7]), Ostrom’s principles for managing a commons ([8]), the framework for acceptance of renewable energies and smart grids ([9,10,11]). We categorize acceptance factors into: LES community’s features and LES stakeholders’ features. By “LES community” we mean the group of local stakeholders (either citizens or organizations, or both) that should either approve the energy technology or actively participate in it for the LES to be successful. The rest of this chapter summarises these factors.

2.1 LES Community features

a. Local ambassadors. Key committed individuals or entrepreneurs or organisations in a community, referred as “local ambassadors”, can be essential to success in establishing collective energy projects, such as energy communities ([12]). Distinctive features of local ambassadors are: high interest in the project, strong social bonds within the community, trusted by community members, knowledge of the local context, competence in the project, availability to provide information and ongoing communication on the project ([5]). Recruiting new members into a LES and winning support for it, in fact, depends upon personal contacts and neighbourly relations, as shown by the importance of “neighbourly appeals” in US community energy initiatives ([13]). Local ambassadors help build a common and understandable language, divert doubts and fears, advocate the project among other local stakeholders ([14]).

b. Easy conflict resolution and effective enforcement. Easy and low-cost resolutions of disagreements and conflicting interests between LES community members is one condition that facilitates the effective governance of common resources property, and therefore their long-lasting acceptance ([8]). In a LES the energy infrastructure is of joint use of a group and one group member’s consumption of the resource units makes those units unavailable to others. When subtractability exists, then collective use of resources could raise conflicts. Hence it is of foremost importance that a conflict resolution mechanism between LES community members exists, is easily accessible and low-cost, and allows enforcement of the rules. The conflict resolution mechanism and resource governing rules have to match local conditions. In particular, they may be different depending on whether the LES is decentrally operated (many members owning assets and sharing energy, i.e. residential prosumers) or centrally operated (one professional actor owning and managing energy resources and sharing energy to others).

c. Community identity. Robust governance of localized resources requires a clear definition of the boundaries of common resources and their users ([8]). A strong community identity facilitates a clear definition of who LES users are. Strong community identity translates into a sense of attachment to the group, a feeling of taking pride in the community, and having friends within the community ([15]). The stronger the citizens’ social identification to a group, the higher is their willingness to contribute to the community and actively support community energy projects (([15]).

The importance of community identity in the successful establishment of an energy community is also supported by empirical network theory studies, which show that similarity in individual characteristics ("homophily") causes the formation of network ties ([16]).

d. Relatedness / Mutual trust between community members. A sense of trust is needed to achieve a high acceptance and willingness to participate in community energy projects ([17, 15])**.**

e. Connectedness. Network theory studies suggest that ties in one kind of network favour ties in other kinds of networks ("multiplexity") ([18]). Citizens/companies who already had a close interaction (e.g. shared association, joint project), are more likely to be happy to be grouped together in a LES or energy community. Early work on energy autarkic regions already suggested that an increase in interactions between people, is perceived as desirable by consumer-citizens and could become a driver of decentralized energy systems (([19, 20]).

2.2 LES stakeholders' features

We identify three individual-level factors that influence acceptance of LES, based on the Theory of Planned Behaviour ([7]), which has been already successfully applied to explain the adoption of energy-related innovation (see amongst others: [21,22]).

a. Perceived behavioural control. In the case of active acceptance of energy technology, the final decision to participate in the energy technology implementation hinges on whether the stakeholder feels capable of participating. In the context of a self-consumption scheme, for example, the fact that one stakeholder does not have (or perceives not to have) decision power on the choice of their energy supplier impedes active participation. Financial and knowledge-related factors typically influence perceived behavioural control (e.g. adoption cost perceived as too high, offer considered too complex to understand).

b. Subjective social norm. Whether a stakeholder perceives social pressure from his/her peers to accept the energy technology or not, matters for acceptance. Stakeholders' acceptance of the energy technology depends on whether they believe that important reference groups/peers approve or disapprove it. In the context, for instance, of a ground-mounted solar power plant built for the neighbourhood's electricity consumption, feeling that neighbours would like to join in the self-consumption scheme may increase individual acceptance. Endorsement from trusted sources could be very effective in fostering acceptance, as well as visible support from influential members of the local social network, such as local ambassadors.

c. Attitude towards the technology. Stakeholders' attitude is formed by:
- a rational evaluation of the new energy technology and the related project's attributes (e.g. location, financial model);
- emotional reactions to it;
- individual values ("worldviews").

The rational evaluation follows from **stakeholders' views on the solution**: perceived benefits/positive effects, perceived adoption costs/drawbacks/negative effects, perceived risk, perceived barriers, perceived cost/benefit distribution (fairness). Such views are mediated by individual stakeholders' features, and in particular: **knowledge and salience** of energy topics, and **familiarity** with energy technology. Energy knowledge and energy literacy allow informed evaluation of the technology. As stakeholders often display limited mental processing capacity, salience of energy topics increases interest for the energy technology and the likelihood that the stakeholder considers participation. Familiarity reduces perceived risk and can explain why often local acceptance vary over time, and in particular before, during and after implementation of an energy project, due to a learning effect ([23]; [9]).

Furthermore, stakeholders' views depend on technology features and the related **project's attributes** (location, financial model, developer, procedural and financial participation level, etc.). In particular, procedural and distributional justice aspects matters for social acceptance of renewable energies ([24]) and LES ([4]). Procedural justice is ensured by fair participatory planning processes, while distributional justice is ensured by a fair allocation of costs and benefits of the technology. Different increasing degrees of stakeholders' involvement are possible in the technology planning process: information, consultation or public hearing, delegated power, referendum (representing the highest degree of participation, including a veto right) ([25]). An improvement in perceived distributional justice, for example through shares of local co-ownership and/or local benefits (e.g. new jobs) for the community, tend to improve the acceptance of distributed energy infrastructures ([4]). Studies on the governance of common resources, however, show that there is no single type of local financial participation and asset ownership (government, private or community) that uniformly supports good resource management ([10]). The suggested approach is context-specific, one that matches ownership and governance constructions with local stakeholders' procedural and distributional justice preferences ([10]).

Emotions towards energy technology influence attitude. In particular, studies have investigated both the cognitive underpinnings of energy-related preferences, as well as affective factors (see amongst others:[26]. According to the affect heuristic proposed by Slovic et al. [17], people base their judgments and decisions on the positive and negative feelings that arise in relation to a stimulus.

Finally, **individual values (or "worldviews")** could lead to a positive attitude towards LES energy technology: collectivism (or "societal interest value orientation", defined as a preference for being a member of the group rather than apart from the group), environmental concern, climate change awareness, positive attitude towards technological innovation, willingness to pay for renewable energy and/or local energy, place attachment. Particularly when local stakeholders have strong emotional and cultural connections to a place (i.e. display high place attachment), a new energy technology is more likely to be accepted when it is not perceived as something "out of place", something that does go not against the local values: an acceptable technology does not ruin the place distinctiveness and historical continuity ([28]).

3. THE COMMON IMPACT MODEL METHODOLOGY

The CIM is a structured process designed for urban planners, energy managers, and those interested in establishing and/or operating local energy systems and local energy communities. The CIM is the community tool of E-LAND toolbox, a modular set of tools to establish, optimize and control multi-vector local energy systems[iii]. The goals of CIM are to:

1. Identify the local stakeholders who matter for successful implementation of new energy solutions and/or who are affected by a new way of operating existing energy infrastructure.
2. Assist a local partner in designing energy solutions in a way that is compatible with local values and priorities, taking into account perceived benefits and concerns of local stakeholders
3. Help the local partners develop a strategy to engage local stakeholders and hence facilitate long-lasting acceptance of new energy solutions.

Through community engagement and dialogue with stakeholders, the CIM builds acceptance for local solutions for the energy transition, including collectively shared renewables, local energy communities, energy islands, citizen co-financing of local renewable energy projects, energy peer-to-peer trading schemes. The analytic deliberation principle inspires the CIM approach: a well-structured dialogue involving scientists, resource users, and interested institutions, and informed by analysis of key information about environmental and human-environment systems ([8]). Analytic deliberation provides improved information and trust, builds social capital, and can deal well with inevitable conflicts ([8]).

The CIM comprises of 3 phases, each phase is matched with a tool that helps scalability and replicability to different contexts (**Figure 1**). An intermediary takes the lead for the application of the methodology. The intermediary works in close collaboration with a local urban planner, energy manager or another type of local private or public actor interested in establishing and/or operating a local energy system that is compatible with local stakeholders' needs, priorities and values.

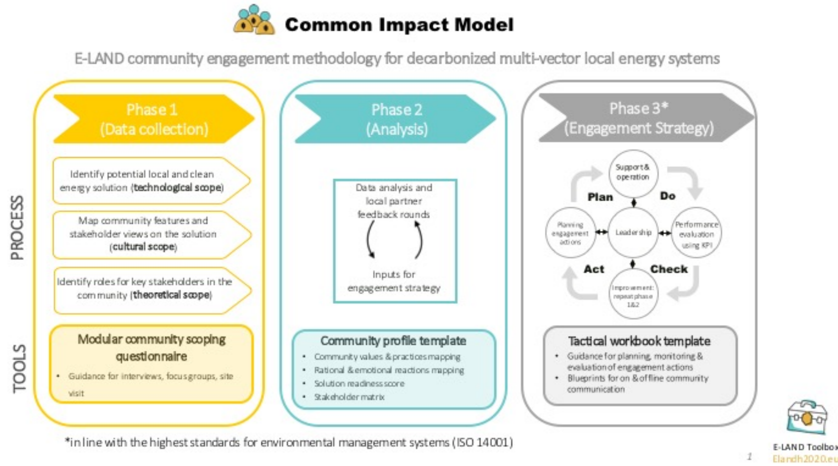

Figure 1: Common Impact Model

Phase 1 is about collecting inputs from key stakeholders and the tool associated is a modular community scoping questionnaire template, made up of 3 main modules. Module 1 (**technological scope**) identifies the clean and local energy solution to focus on and it is conducted with a local partner (Table 4). Module 2 (**theoretical scope**) identifies the relevant stakeholders and uses a stakeholder analysis method ([29]) to map them according to their interest in the solution and influence in its implementation (Table 5, Figure 2). Module 3 (**cultural scope**) maps the community and stakeholders' features that influence acceptance of the solution identified in Module 1 (Annex 1). These features are based on a review of the literature on governance of commons and social acceptance of energy projects (see Chapter 2). In Module 3 the community's core values, priorities and practices are identified, as well as local stakeholders' rational and emotional reactions to proposed energy solutions.

Table 4: Template for Module 1 of community scoping questionnaire (technological scope)

Discussion guide text/survey text to local partner
The aim of this section is to identify and briefly describe a project where to focus our engagement efforts at XXX. The project has the following features: 1. your organization would like to start to implement the project in XXX 2. for successful implementation of the project, your organization need approval or active participation of other individuals/organizations (e.g. other companies in XXX, building owners in XXX, people living in XXX, local authorities in XXX, financing bodies) We understood that your organization would like to *[establish an energy community, install a wind turbine generating power for the nearby village, install a solar PV system on a common roof for collective use of a group of energy users…]*. Did we understand this right? Can we focus on this project?
Image you have to present the project to your local stakeholders. How would you describe it (2-4 sentences)? *[Note: after this section the "solution" (or "project") is identified, the rest of questionnaire will refer to it.]*

Table 5: Template for the Module 32of community scoping questionnaire (theoretical scope)

Discussion guide text/survey text to local partner
Next we'd like to identify the stakeholders who might be important for the successful implementation of [solution]. Please name the relevant stakeholders for the implementation of [solution] and then position each actor in a matrix, defined by two dimensions: 1. Influence on other stakeholders and in the decision process (someone whose advice has great influence would score high on influence) and 2. Interest in solution (someone who is enthusiastic about the solution would score high, someone who is expect to oppose score low). [*After placing each stakeholder, ask "why?" to get qualitative insights.]*

Let's look back at the stakeholder matrix that we compiled together.

- Which stakeholder do you meet or talk with at least once a week?
- Which stakeholder do you meet or talk with at least once a month?
- Are you and other stakeholder part of the same association, organization, board, club?
- Which stakeholders do you have a good relation with?
- Do certain stakeholders have a close relationship with some of the others?

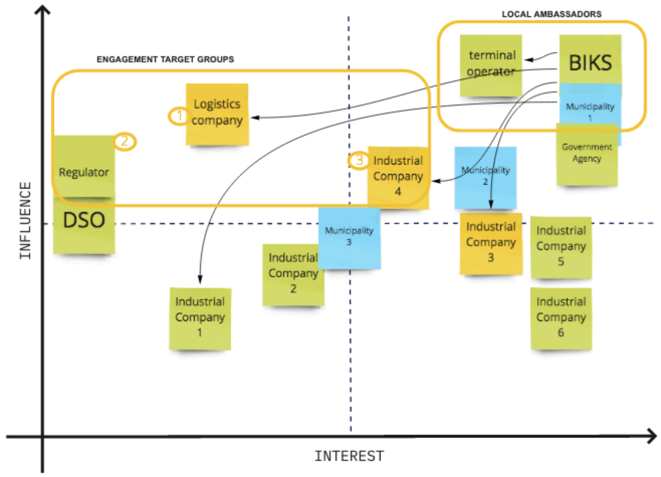

Figure 2: Stakeholder matrix compiled for a pilot application

In **Phase 2**, inputs from Phase 1 are summarised in the community profile template (**Figure 3**). This template visualises the different criteria that guide inclusive energy infrastructure planning:

- The **readiness score** measures community's readiness to accept local and collective clean energy solutions, it is average score over the score assigned to 10 key community values: environmental concern; climate change awareness; willingness to pay for renewable energy; willingness to pay for local energy; attitude towards innovation; collectivism; community identity; place attachment; mutual trust; connectedness: It helps choose the types of engagement actions: high score suggest to focus on deployment (recruit leaders/governing body, share results and disseminate impact); a medium score suggests to focus on development (co-creation workshops); a low score suggests to focus on exploration (build basic knowledge).
- The **measure for attitude towards the solution** assesses the starting point of acceptance (baseline). Engagement strategy can be evaluated by comparing this measure before and after the engagement actions.
- **Ranking of perceived benefits and concerns** help choose a message framing for communication campaigns and design the solution in a way that maximise positive aspects and addresses concerns. Information on perceived benefits and concerns help frame messages in a way that addresses concrete consequences for stakeholders.
- **Ranking of barriers** helps design engagement actions, one engagement action for each major barrier can be designed.
- The **stakeholder matrix** helps segment stakeholders. Local stakeholders can be divided into proponents of the solution (high interest), those with weak preferences for the solution (low/medium interest), opponents of the solution. Different actions can be targeted to each of them. Typically, a top-priority target for engagement actions would be composed of highly influential stakeholders who are not interested in the solution. Local ambassadors are stakeholders with high interest and high influence. They should be recruited as partners for engagement actions. Local ambassadors could be the local trusted contact persons/organisations. They establish from project start to project end (and at best beyond this) an ongoing communication with energy users interested in/affected by the project.
- **Emotional reaction mapping**: a sense of emotional connectedness with the new energy infrastructure is one of the success factors for successful implementation of energy projects and local energy systems ([4]), so leveraging on positive associations with the technologies, as elicited using the questionnaire, help build acceptance.

- **Procedural and distributional justice preferences' assessment** helps design ownership and governance constructions for the LES that match local stakeholders' preferences.

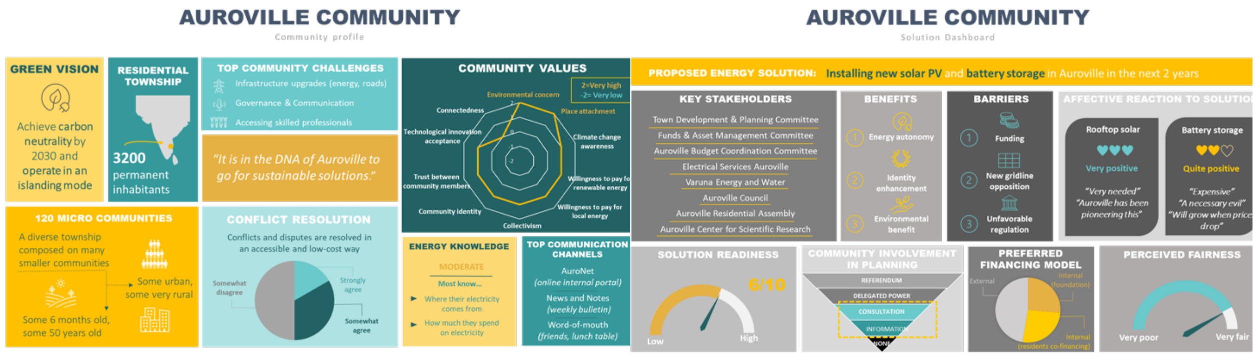

Figure 3: Community profile compiled for a pilot application

In **Phase 3,** with the help of the tactical workbook (**Table 6**), engagement recommendations are co-created with the local partner.

Table 6: Tactical Workbook Template (compiled for a specific action of a pilot application)

Barrier #2: Opposition to new gridlines	**Action**: Educate residents about *why* local grid connections are needed and *how* it will impact Auroville as a whole. Invite residents to communicate their opinions and ask experts for more information.
Objectives	The barrier is largely due to a lack of awareness. Address knowledge gap and build acceptance of local grid connection and get an overall buy in from the community for a carbon-free electricity sourcing. Connect homes to local grid.
Description	Provide educational resources by sharing information in small, digestible chunks in internal intranet. If possible, bring the discussion to the target group by arranging/promoting it around an existing event (e.g. monthly steward meeting)
Target audience	Residential Assembly; Town Development Council
Materials	Communication package
Timeline	The winter/rainy season is the best time to address these topics
Key Performance Indicator	willingness to join the local grid (measured with survey), pre/post action; number of off-grid homes
Cost	To be defined by Auroville Consulting
Leadership	Auroville Consulting
Local ambassador	Expert 1

The CIM is dynamic model - and therefore, phases 1 and 2 could (and maybe should) be repeated overtime after phase 3 to ensure the changing dynamics of the community are captured and factored into future engagement recommendations. This feature of the CIM is inspired by the plan-do-check-act cycle, in line with the highest standards for environmental management systems (ISO 14001).

The CIM has been piloted by the E-LAND Community Building team in different contexts, including a sea port in Norway, a technological park in Spain, a residential township in South India (**Table 7**)

Table 7: Pilot applications for the Common Impact Model

Pilot site	Location	Proposed energy solution	Local partner	Local partner evaluation

Auroville, small township-based community with 3000 residents powered by a mix of grid and on-site renewable energy [iv]	southern part of India	Installing new solar systems and battery storage in Auroville	Auroville Consulting, unit of a local non-profit organization	3/4("Rather satisfied") Favourite features: stakeholder matrix, engagement
Port of Borg, sea harbour in an industrial area, hosting diverse companies, incl. recycling plants, district heating, food industry	Norway	Shifting from fossil-fueled heavy trucks to electric trucks at the port, leveraging on local e-chargers	Borg Havn IKS, a small organization and owns and operates many buildings, along with the harbour itself	Not yet available (application in process)
WALQA technology park, an initiative run by regional government and the local city council. It hosts about 1000 workers and 60 companies, mostly small tech companies or start ups	North East of Spain	Establishing an energy community at WALQA technology park	Inycom, a large technology company with several offices throughout Spain	Not yet available (application in process)

4. CONCLUSIONS

Today, cities, towns, rural villages or industrial districts can become decarbonized local energy systems (LESs) and renewable energy communities, where local renewable energy sources power most of the local electricity, heating and mobility needs. Successful and long-lasting LESs and energy communities require a functioning technology and a sustainable business model, and acceptance from different local stakeholders and community members.

With this work, we propose a hands-on methodology to facilitate the acceptance of LESs and solutions that generate energy close to where it is consumed. Underpinned by academic literature on the governance and social acceptance of collective energy solutions, the Common Impact Model adopts the inclusive infrastructure planning approach. It helps design clean and local energy solutions that are compatible with local stakeholders' views, values and priorities. The Common Impact Model is structured in 3 phases, each matched with a tool that helps scalability and replicability: a scoping questionnaire for Phase 1 (data collection), a community profile template for Phase 2 (analysis), a tactical workbook template for Phase 3 (engagement strategy).

Based on the experience in designing and piloting the CIM at different locations, we conclude by summarising its five recommendations for participatory planning of local energy systems and energy communities:
1. Identify and map local stakeholders. Sorting them according to interest in the solution and influence in its implementation allows identifying local ambassadors and the main engagement target groups.
2. Understand local stakeholders' values, priorities and practices. Solutions compatible with local values and addressing community priorities are typically successful.
3. Understand local stakeholders' views and emotions towards energy technologies and solutions. It helps adapt accordingly project design and communication.
4. Develop an ongoing engagement strategy with dedicated resources and leadership. The strategy consists of a limited number of specific engagement actions that overcome barriers, are designed for the main engagement target groups and involve local ambassadors. The strategy should not stop once the construction permit is granted or the technology is operating, it should be adjusted after monitoring its impact using pre-defined key performance indicators
5. Facilitate accessible and low-cost conflict resolution mechanisms. This mechanism addresses concerns, prevents negative spill-overs and mitigate the risk of facing strong opposition, which usually comes from vocal minorities.

ANNEX I Questionnaire items used in Module 2 of community scoping questionnaire (cultural scope)

Community features	
Factor	**Questionnaire Item(s)**
Easy conflict resolution and effective enforcement.	Conflicts and disputes in … are resolved in an accessible and low-cost way (^)
Community identity	Organizations working in …often talk about … as being a great place to be and work/ People living in…. often talk about … as being a great place to be and live (*)
Relatedness / Mutual trust	Companies working in … in general trust each other / People in general trust their fellow community members in …(*)
Connectedness	It is common to talk to each other when people meet in …(*) People often spend time with other people working/living in …(*) How often do you/your company interact with other organizations/people in…[alternative:] How often do you interact with [+ list of stakeholders]; are you part of the same board, association?
Stakeholders' features	
Factor	**Questionnaire Item(s)**
Perceived behavioral control	Your organization/You can substantially influence/can decide on the approval and implementation of this project/can participate in this project (^)
Subjective social norm	In your opinion, how many groups/organizations/people in … would support this project?
Attitude (general)	Your organization/you would be motivated to invest time and financial resources to support this project (^)
Perceived benefits/positive aspects	What would be the main benefit(s)/positive aspects of this project in your opinion?
Perceived adoption costs/negative aspects	What would be the main downside(s)/negative aspects of this project in your opinion?
Perceived fairness	In your opinion, would some groups/organizations in … benefit from this project significantly more/less than others?
Perceived risks	What would be the main risk(s) to this project in your opinion?
Perceived barriers	What would be the main barrier(s) to this project in your opinion?
Knowledge	1. People in … know how much they spend on their electricity (^) 2. People in … know how much they spend for cooling their buildings (^) 3. People in … know how much they spend on their transport needs (^)
Salience	How would you describe the amount that you/your company pay for electricity / cooling/heating own building/ transport fuel?
Familiarity	How many people in … are used to seeing the following in their immediate surroundings:[list of relevant technology components of LES]
Emotional reactions	What is the first word or phrase that comes to mind when you read …:[list of relevant technology components of LES] Can you tell me whether the word(s) or phrase(s) you indicated has a (very) positive, (very) negative or neutral connotation?
Environmental concern	Looking after the environment, caring for nature, saving resources is important to you/your organization (*)
Climate change awareness	You/Your organization is ready to recommend friends & colleagues /colleagues & workers activities that will help reduce global warming or to live a clean and green life (*)
Willingness to pay for renewable energy	Your organization/you would be ready to pay more energy produced from renewable energy sources compared to energy produced from fossil fuels. (*)
Willingness to pay for local energy	Your organization/you would be ready to pay more for energy produced from local energy sources compared to energy from the transmission grid (*)
Attitude towards innovation/technical affinity	You/People in your organization are reluctant to try new technologies (*)
Collectivism	Your organization often does joint initiatives with neighbouring companies/ You like sharing little things with their neighbours (*)
Place attachment	People in your organization/you feel a very strong sense of belonging to …
Procedural participation preferences	According to you, how should you/your organization and [other LOCAL STAKEHOLDERS] be involved in the project? Please select one or more options * informational action (e.g. event, brochure) * consultation /public hearing * through the work of elected representative bodies * referendum (including veto right) * direct involvement of [LOCAL STAKEHOLDERS] is not necessary * Other ____
Financial participation preferences	According to you, how should this project be mainly financed? Please select one or more options * external donations * government money * internal funding * Involving [LOCAL STAKEHOLDERS] (e.g. fund-raising from individuals) * Other ____

(*) the respondent has to assess how well, according to him/her, the description matches him or her/his or her organization. (^) the respondent has to assess to what extent he/she agrees with the following statement (s)

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[i] Local energy systems are also known as "local distributed energy systems", "local energy hubs" or "integrated multi-energy systems" or "smart grids for distributed generation".

[ii] Key legal references: "Clean Energy For All Europeans", COM(2016) 860 final, November 2016; EU Directive 2019/944; EU Directive 2018/2001.

[iii] More information on E-LAND Toolbox can be found at: https://elandh2020.eu/

[iv] For a non-technical summary of CIM application at Auroville, refer to: https://elandh2020.eu/news/making-green-energy-aspirations-a-reality-in-india-how-the-e-land-community-engagement-methodology-is-supporting-the-development-of-energy-communities/.