Development of a Best-Practice Framework for the Introduction of Sustainable Energy Communities in Europe: *Lessons from Initial Field Studies in Denmark and Ireland*

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ABSTRACT

This paper presents the findings from initial fieldwork studies of sustainable energy community (SEC) development methodologies in two islands in Denmark and one rural village in Ireland. This study was undertaken in order to determine the nature of the social and institutional barriers to the development of SECs at local level. The main goals of this study are; (1) to determine the enablers and barriers to the successful development of two SECs in Denmark and one in Ireland; (2) to assess the successful elements of previously implemented SEC development methodologies and (3); to examine how can these successful methodologies be implemented in Inis Oírr island in the West of Ireland (the nominated case study). The evidence presented in this paper indicates that the social barriers are interconnected and often reinforce each other. Nevertheless, the key barriers causing inertia in the development process of SECs can also be used in a positive manner to enable their successful development. This article suggests that a comprehensive understanding of how barriers can be transformed into enablers can support the successful development of SECs at local level in Ireland. The significant contribution of this work is the initial step in the development of a toolkit to aid in the successful development of SECs in Ireland and Europe.

Keywords: Sustainable Energy Communities, Community Participation, Public acceptance

INTRODUCTION

The purpose of this research is to investigate existing frameworks for the motivation, structuring and implementation of Sustainable Energy Communities (SECs). The research consisted of the analysis of two communities in Denmark and one in Ireland in order to determine how their methodologies could be redeployed in Inis Oírr island in Ireland. A SEC is a community that draws its energy from sustainable energy sources [1-4]. The Sustainable Energy Authority of Ireland (SEAI) is Ireland's national energy authority with the mission of transforming Ireland into a society based on sustainable energy structures, technologies and practices. Furthermore, the SEAI defines a SEC as a community *"in which everyone comes together to create a sustainable energy system"* [1]. There are a number of SECs in Europe including: the Isle of Eigg in Scotland, the Marstal community in Aerø island in Denmark, Samsø island in Denmark [5], the region of Güssing in Austria [6] and Cloughjordan Eco-village in Ireland [7] (Figure 1).

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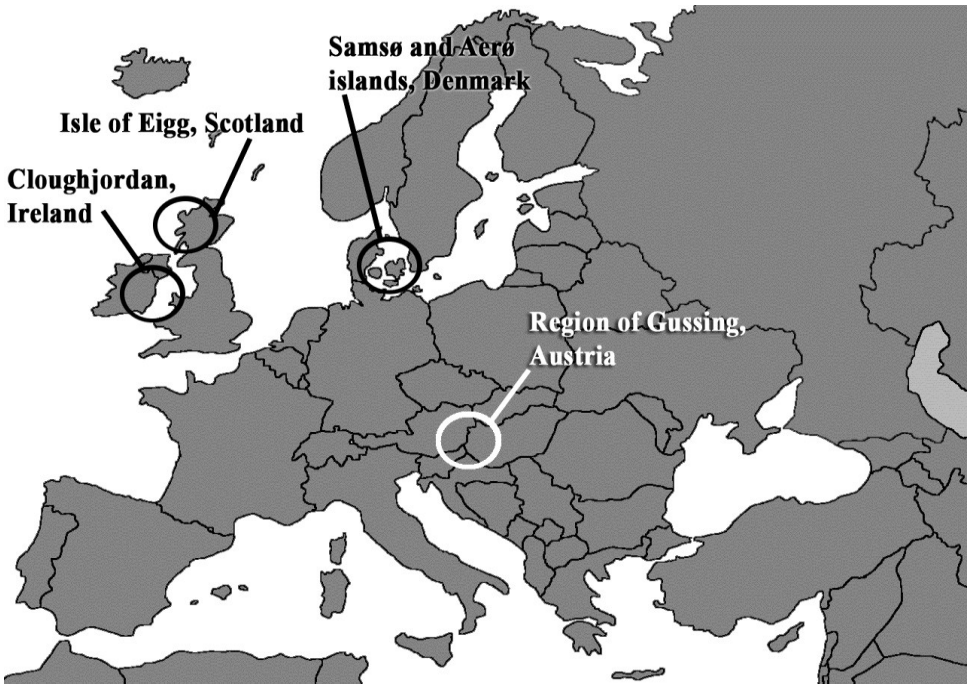

Figure 1. Location map of some examples of Sustainable Energy Communities

Some scholars argue that the successful integration and adoption of sustainable and renewable technologies is rooted in community acceptance and societal integration [8-10]. This paper leverages previous studies undertaken on community based renewable energy projects [10, 11] and builds on them in the context of sustainable communities and the social aspect of energy integration and acceptance. The paper is structured as follows; firstly the context to the research and sustainable energy and communities are described. Next the methodology used for this initial fieldwork and the nominated case-study are outlined. Following this the findings are detailed followed by a discussion in relation to literature studied. Finally conclusions and recommendations for future work are proposed.

CONTEXT

This section outlines the current state of policy in Denmark and Ireland and the relevant literature in relation to SECs and communities.

Energy Policy in Denmark

The European Parliament's *"Energy 2020"* set Europe wide sustainable energy targets including: a 20 per cent reduction in greenhouse gases, a 20 per cent share of renewable energy and a 20 per cent reduction in primary energy consumption [12]. Although many countries in Europe are actively trying to achieve these targets, Denmark is leading the way in the race to increase their share of energy obtained from renewables. Historically, Denmark has been a pioneer in wind energy due to the co-operative nature of its wind energy provision. Denmark can provide useful lessons on the importance of financial incentive and ownership structures for community renewable energy ownership as well as the social, cultural and political aspects of SEC development. Mendonça *et al*. [13] describe how SEC development in Denmark was originally driven from the "bottom-up", beginning with enthusiasts influencing the political process. This forced the government to provide incentives to encourage development of the renewable energy sector [13]. As a result, a combined "top-down" and "bottom-up" approach (which is still favoured by the EU today [4]) was created. In an attempt to continue their past successes, in 2012, the Danish government created very ambitious energy targets with the aim of

reducing greenhouse gas emissions by 40 per cent by 2020. Furthermore they aim to have all their electricity and heating supply completely based on renewable energy by 2035 and have all energy consumption, including the transport sector, based on renewables by 2050 [14].

Energy Policy in Ireland

The Irish government's *"National Renewable Energy Action Plan"* [15] sets out Ireland's commitment to reach 40 per cent renewable electricity, 12 per cent renewable heating and 10 per cent renewable transport by 2020. This would yield an overall national renewable energy target of 16 per cent by 2020. The recently published *"Strategy for Renewable Energy 2012-2020"* [15] stated that Ireland reached only 5.5 per cent renewable energy consumption in 2010. A significant challenge remains to almost triple these penetration rates by 2020. The Irish government white paper on providing a sustainable energy future stresses that security of energy supply is crucial for the economy and the wellbeing of all of society [16]. Ireland's dependency on imported energy is significant and this leaves the country susceptible to increases in the cost of energy or a reduction of energy supply in the future. In an effort to deal with this the SEAI released their *"Guidelines for a Sustainable Energy Community"* [1]. These guidelines imply that a move from a fossil fuel based economy to an economy sustained by renewable energy sources is a societal rather than a technological issue. In order to attend to this issue the SEAI has also set up the SEC Programme [3]. The vision of the SEC programme is to stimulate a national move towards sustainable energy practice through the creation of 6 exemplar SECs by 2015. In the following sections the current state of SECs in Europe and the barriers and enablers outlined in literature are presented and discussed.

SUSTAINABLE ENERGY AND COMMUNITIES

Several studies describe the importance of the technological integration of sustainable energy systems [17-19] but there is a lack of knowledge on the enablers and barriers associated with the social issues surrounding the community acceptance of these technologies. Many academics have highlighted the importance of community engagement in community renewable energy projects [9-11, 20-22]. However little research is available on suitable techniques and frameworks for engaging with Irish communities in order to increase their acceptance of renewable energy projects.

The drivers behind the development of SECs can often have the most influence over a community's acceptance of the project. This can regularly create resentment towards the project very early in the SEC development process. According to Jørgensen *et al.* [5] the driving force behind the success of the Samsø project was the community's need for economic recovery (due to high unemployment rates). Although the reduction of greenhouse gases are often cited by policy makers as drivers for SECs, this is not generally the case at grass-roots level [9, 10]. It is important for SEC developers to discuss with communities the positives of energy autonomy and energy security [23] and ensure that the aims of SECs are aligned with the needs and wants of the communities involved. The early identification of the type of community involved will affect the ease of development of a SEC and can be useful information when designing a development strategy. Schweizer-Ries [2] identifies two types of communities: the "conscious community" (who still have to implement the realisation) and the "realising community" (who have a lack of public consciousness) stating that the methods used for the successful development of each SEC may be quite different. Determining the best method for dealing with different types of communities can lead to differing approaches during the early stages of a project.

In their work Rogers *et al.* [10] outline the barriers to the acceptance of SEC projects and reasons for members of the community's reluctance to participate and support these projects in their areas. These include technical and economic factors and chiefly public opposition to wind farms. Furthermore research indicates that willingness to get involved in projects is often much lower than willingness to support it, possibly due to the "value-action gap" [9]. Value action gaps are the difference between what people say and what people do and arise because of individuals' attitudes and the social and institutional context for change [9]. Studies in England have shown that although the aim of community energy projects may be to involve locals, regularly they are reluctant to take control and look to outsiders for guidance and leadership [9]. This reluctance to engage can often create barriers to the successful development of SECs and foster an environment where opposition to projects can thrive. The negative phenomenon of [*]NIMBYism (Not In My Back Yard) and LULU[†] (Locally Unwanted Land Use) can easily be taken advantage of by opposition parties when participation of locals is not present. Unfortunately, opposition to renewable energy projects is quantitatively different from support for projects and not just its binary opposite [24]. Often in cases of opposition to renewable energy projects, emotion is used by objectors to gain support while supporters challenge objections with facts [24, 25]. This frequently leads to developers dismissing the concerns of communities as emotional, even though some of those concerns highlighted, although emotionally driven, may still count as "valid planning issues" [25].

The insider/ outsider distinctions inherent in small communities [24] often means that emotions involved in the planning process of a SEC are more powerful than the logic that it is assumed is applied to the planning process. The environmental impact assessment (EIA) process currently used in planning in Ireland clouds the ideal nature of the planning process as one devoid of emotion and operating solely on logic [25]. The EIA process operates on an "information-deficit model" and regularly gives opposition parties a clear platform to highlight their emotional ideas of a lack of justice and fairness in the project development [25]. This emotional aspect often leads to what Janis [26] described as "Groupthink" whereby groups norms that bolster (or harm) morale are created at the expense of critical thinking. One tool for overcoming NIMBYism due to LULU's and the power of Groupthink, is to encourage communities to financially invest in part of the renewable energy project. Warren and McFadyen [11] undertook a comparison of public attitudes towards a community-owned wind-farm on the Isle of Gigha with attitudes towards several developer-owned wind-farms on the adjacent Kintyre peninsula. Their findings showed that the Gigha respondents were consistently more positive about wind power than were the Kintyre residents due to community ownership. Although the Gigha residents were more positive it was a difference of positivity of degree and not completely opposing views. The authors suggest that this may be due to communities gaining positive experiences of a wind-farm situated locally. It has been shown that attitudes to wind-farms have a longitudinal dimension, following a U-shaped curve overtime time [11]. When questioned about wind-farms, communities generally have positive initial responses, but these are often replaced by more negative appraisals when a local wind-farm is proposed. Fortunately, these negative appraisals are generally followed by a return to positive attitudes once the community has experienced the wind-farm. This method of developing communities' understanding of sustainable energy leads to more acceptance of renewable energy developments and better support for projects in the future. Rogers *et al.* [10] conclude that a clearer framework and more standardised processes with demonstration to raise awareness of community renewable projects are

[*] According to Cass and Walker (2009) the term NIMBYism is often used to describe the attitude of objectors to LULUs.

[†] A LULU is a land use that is useful to society, but the neighbours or community object to it.

needed. In the next section, the nominated case study is outlined and the methodology used for this initial fieldwork study is described.

METHODOLOGY

Nominated Case Study: Inis Oírr island, Ireland

As previously argued in this paper, little research is available on suitable techniques and frameworks for engaging with Irish communities to increase their acceptance of renewable energy projects. This research aims to address this gap and develop new knowledge and skills at the frontier of this important subject through direct engagement with a nominated case study community [27]. In 2012, Ireland imported 85 per cent of its energy requirements [28] leaving the country susceptible to increases in the cost of energy or a reduction of energy supply in the future. In line with the rest of Ireland, Inis Oírr is under increasing pressure to reduce energy consumption to meet carbon emission targets. Inis Oírr island is one of the Aran islands, is located off the West Coast of Ireland and has a population of 249 inhabitants [29] (Figure 2).

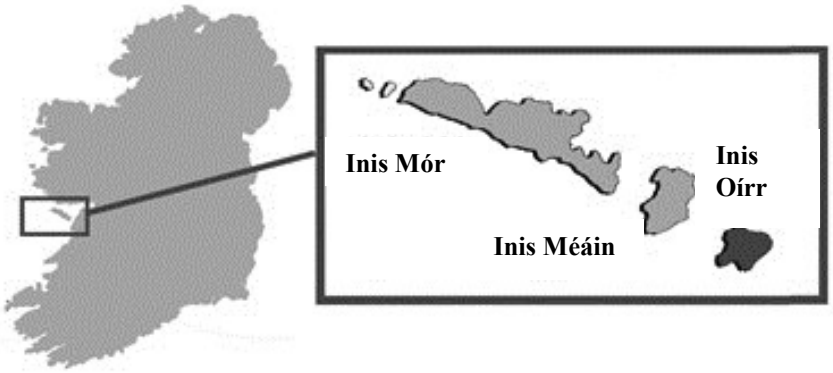

Figure 2. Location map of Inis Oírr island off the west coast of Ireland

Rae and Bradley's [23] notion of "Bioregionalism" as a method of delineation is relevant to how Inis Oirr's remoteness from mainland Ireland gives it a uniquely suitable position as an easily auditable SEC. Inis Oírr is currently completely dependent upon energy imported from mainland Ireland and is dealing with higher energy costs as a result, with islanders paying approximately 28 per cent more for their energy than mainlanders in 2014 [30]. With approximately 100,000 visitors per year to the Aran islands, the inhabitants of Inis Oírr have a vision of converting the island to 100 per cent renewable energy to increase the attractiveness of the island for tourism. Making the move to a 100 per cent sustainable island will also continue the islands history of self-sustainability that is part of its heritage and culture. The purpose of this research is to investigate existing frameworks for the development of two SECs in Denmark and one in Ireland to determine the enablers and barriers to the successful implementation of a SEC in Inis Oírr island through interviewing key persons in the development of these SECs. The next section describes the methodology used for the semi-structured interviews undertaken during this initial fieldwork study.

Initial Fieldwork

Building on the literature and existing SEC frameworks in Ireland, a set of themes were developed for analysis during this initial fieldwork. One framework analysed for implementation in Inis Oírr was the SEAI's *"Guidelines for a Sustainable Energy Community"* [1].

These guidelines define a five step process to the development of SECs and are outlined in Figure 3 below.

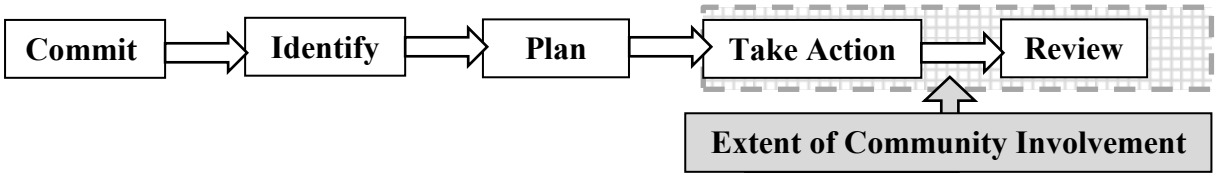

Figure 3. Summary of SEAI's *Guidelines for a Sustainable Energy Community* [1]

As Figure 3 illustrates, the SEAI do not recommend community involvement until late in the development process, when the plans have already been finalised and construction of the project is to begin. As a results the level of community involvement was a key theme for analysis in this initial fieldwork study. The primary research in this initial fieldwork involved the undertaking of semi-structured interviews. Building on the literature several themes were identified for analysis in the initial fieldwork studies and are described in Table 1 below.

Table 1. Themes identified for analysis and the related literature

	Themes	**References**
Section 1	Driver and local concept, previous situation, mission statement and the local concept	[2, 10, 23, 25]
Section 2	Local community involvement and communication	[9, 11, 13, 20-22, 24]
Section 3	Organisational structure	[1, 4, 13]
Section 4	Financing, policy and planning	[11]
Section 5	Unexpected positives and negatives	[11, 25]

Questions for the semi-structured interviews were guided by the themes in Table 1. These interviews were undertaken with project managers from three successful SEC communities, two in Denmark and one in Ireland (Table 2). The study involved extensive semi-structured interviews with the managers of each of the SEC projects and comprehensive site visits of each project. The interviewees who took part in the study were as follows: Lasse Kjærgaard Larsen (Marstal, Aerø island, Denmark), Søren Hermanson (Samsø island, Denmark) and Gregg Allen (Cloughjordan village, Ireland)

Table 2. Communities studied during initial fieldwork

	Marstal, Aerø island, Denmark	**Samsø island, Denmark**	**Cloughjordan, Ireland**
Population	6,669 inhabitants	3,806 inhabitants	116 homes
Area	88 km²	114 km²	0.271 km²
Electricity	Over 80% self sufficient	100% wind power	From national grid
Heating	Over 80% self sufficient	75% from solar power + biomass energy	Distric Heating 100% biomass + solar power
Exporting	None	84 million kWh	None

FINDINGS AND DISCUSSION

This section outlines the findings and these are followed by a discussion in relation to the literature.

Section 1 Findings: Driver and local concept, previous situation, mission statement and the local concept

As proposed earlier in this paper, the driver for the development of a SEC can often create prejudices or good will early in the development process. During the interviews, all respondents stated that their projects were financially motivated, giving the community a clearer understanding of the reasons for their SEC development (Table 3). When questioning what community renewable energy means *Rogers et al.* [10] analyse what stakeholders feel is distinctive about community renewable energy projects and state that the best type of project is one that is both for and by the people. In each of the communities studied in this initial fieldwork, the community perceived that the SEC was being created in order to bolster their local economy and to reduce their energy costs. This led to increased support and acceptance of the project in the long term.

Table 3. Section 1 Findings: Driver and local concept, previous situation, mission statement and the local concept

	Marstal, Aerø island	**Samsø island**	**Cloughjordan**
Driver and Local Concept	The high cost of oil in the 1970's	High level of unemployment economic recovery needed	The Eco-village community wished to create a sustainable village
Current/ Previous Situation	1970's: Completely dependent on imported energy	1990's: Completely dependent on imported energy & high unemployment	1990's: Existing village of Cloughjordan was in decline
Mission Statement	To convert from oil to renewable energy	To create a 100% renewable energy island	To create a sustainable/ eco-village community
Local Concept	Local concept was not an issue, it was important that the cost of heating was reduced	Community input to encourage revival of the local economy and employment kept local	Community input to ensure that the existing community accepted the new residents of the Eco-village

Section 2 Findings: Local community involvement and communication

Moran's [24] highlighting of the problems experienced during expert-lay interactions indicates that communication methods used by those with expert knowledge and those used by members of the community with lay knowledge are often incompatible. This often leads to feelings of resentment and a perceived lack of fairness (as outlined by Hermansen in his interview). All parties interviewed described how difficulties were experienced in the early stages of the project in relation to expert-lay communication. The solution used in all cases was the use of public meetings (Table 4) where the public can voice their concerns as a group to experts and developers. Lund [22] describes how "Discourse Theory" perceives social reality as a linguistic construction and states that different organizations perceive and articulate things differently. As a result, different stakeholders perceive things differently, leading to different ways of approaching the same problem. In this regard, academic institutions can play a lead role in the dissemination

of information in an easily understood manner. All interviewees had academic involvement during the development process and expressed the benefit of this experience in terms of community interaction.

Table 4. Section 2 Findings: Local community involvement and communication

	Marstal, Aerø island	**Samsø island**	**Cloughjordan**
Local Community Involvement and communication	Public meetings, no survey of opinion, opinions voiced at meetings, existing school involved in communication	Public meetings, no survey of opinion, people voiced opinions at meetings	Public meetings, no survey of opinion, people voiced opinions at meetings, existing school was involved in communication

Section 3 Findings: Organisational structure

Both the Samsø and Cloughjordan project successfully used aspects of the "Bottom-up" approach in the development of their SECs (Table 4). Schweizer-Ries [2] outlines how the "Bottom-up" approach should be the basis for any long-term successful community renewable project. A bottom-up process is defined by individual voluntary support and networking within the community in order to realise a certain energy project. Schweizer-Ries [2] concluded that taking social aspects into account increases successful realisation of sustainable energy supply and demand in the future. The attention to the social aspect of both of these projects ensured that they have been successfully integrated into community life in the long-term. A key finding from these interviews was the importance of the "Key Influencer" (Table 5). The key influencers within a community are people that already have the attention of the community as a whole. In the case of SECs, the singling out of a single key influencer can often prove to be of benefit and this was very successfully done in Samsø and Cloughjordan. Cass and Walker [25] state that, when dealing with emotion attached to place (as is very common in small communities), it is better to deal with individuals rather than a group. In this situation, it is often better to deal with a single representative for the group, or the key influencer. Barriers exist as both individual (personal barriers) and external barriers (due to participating in a group dynamic) [18]. The use of the key influencer can be used to combat both individual and external barriers through allaying personal fears and challenging barriers suggested by opposing groups. As support for projects is generally more widespread than a wish to participate [10] the importance of the key influencer as a project manager and instigator is clear.

Table 5. Section 3 Findings: Organisational structure

	Marstal, Aerø island	**Samsø island**	**Cloughjordan**
Organisational Structure	The organisational structure was already defined in the form of the district heating co-operative	The master-plan was sub-divided into different topics and these were dealt with by different sub-groups	Sustainable Developments Limited co-operative was set up and this company was used to organise the project
Key Influencer	Lasse Kjærgaard Larsen, Manager at Marstal District Heating	Søren Hermanson, Director, Energy Academy	Gregg Allen, Project Manager

Section 4 Findings: Financing, policy and planning

In all SECs studied in this initial fieldwork, the funding models were described as "mixed funding" with funding from the government, the community and bank loans (Table 6). This was described as a very successful method, as community investment led to more community action, participation and support for the development of the project. Warren and McFadyen [11] argue that mixed financing is the best model for a long term successful SEC and this was clear from the findings in this initial fieldwork study.

Table 6. Section 4 Findings: Financing, policy and planning

	Marstal, Aerø island	**Samsø island**	**Cloughjordan**
Financing	20% seed funding from the Danish Ministry of Climate, Energy and Building, profits from existing district heating co-operative and loan from Danish green bank (community gave guarantee for the loan).	20% seed funding from the Danish Ministry of Climate, Energy and Building, energy project set up on a co-operative basis and a loan from the Danish green bank (community gave guarantee for the loan).	The company was set up on a co-operative basis, received a loan from Clann Credo ethical bank and €700,000 from the EU through the SERVE project.
Policy and Planning	Given exemptions due to intervention by the ministry	Given exemptions due to intervention by the ministry	Submitted a proposal to the county council to zone the proposed site for sustainable development so there were less planning application refusals

Section 5 Findings: Unexpected positives and negatives

In both the Samsø and Cloughjordan projects (however not in the Aerø project), the interviewees stated that they were pleasantly surprised with the unexpected positives from the development of the SEC. They both had a large increase in tourism and this led to the creation of education and enterprise centres in order to provide sustainable development education (Table 7). Warren and McFadyen's [11] research would indicate that this is commonplace, as tourists in their study stated that the presence of community renewable energy projects did not negatively affect whether they would return or not. The positives that have resulted from these SEC developments are contrary to communities notions that a SEC project may lead to minor benefits for the community in question while there is large local imposition [25]. However, all communities cited negatives that occurred as a result of the projects including inter-community rivalries and a loss of privacy for the residents.

Table 7. Section 5 Findings: Unexpected positives and negatives

	Marstal, Aerø island	Samsø island	Cloughjordan
Unexpected Positives	None cited	Increase in tourism, creation of an education centre, increased pride in the islanders and increased employment	Increase in tourism numbers, the creation of an enterprise centre and a better quality of life for the residents
Unexpected Drawbacks	Consumers of the heat are still not aware where energy comes from as the district heating company just deliver heat at the touch of a button	Complexity of the project, bitterness has evolved between some islanders in relation to certain aspects of the project	Privacy of the residents is compromised by the constant flow of visitors to the eco-village, the residents had to move from their original homes to the eco-village

As can be seen from the findings in this research, each of the SEC communities studied experienced similar barriers and enablers in the development of their SECs. The findings in this research indicate that although each of the SECs studied did not have any specific implementation framework developed for their projects, many of the successful tools and methodologies used across all communities were similar. These similarities and lessons are discussed in the conclusion following this section.

CONCLUSIONS

The semi-structured interview methodology used in this research was chosen in order to gather knowledge on the barriers and enablers to SEC development in two communities in Denmark and one in Ireland. There were similarities in the findings across all communities analysed and the major findings are outlined below:

- The driver for the project needs to be shared with the community and align itself with the wants and needs of the community involved;
- Public meetings are the best method for communicating with communities;
- It is important to use any existing organisational structures or networks where possible;
- The "Key influencer" is often the most important person in the development process and a determined proactive key influencer can mean the success or failure of a SEC project;
- Using mixed methods of financing for SEC projects was cited by all interviewees as the most successful method of financing projects. These should involve funding from government, community investment and bank loans;
- It is important to be aware that unexpected drawbacks to the project may occur and to make the community aware that these may happen as early in the project development as possible.

FUTURE WORK

There is a need for future studies in Ireland in terms of developing a framework for the introduction of SECs. The level of community involvement recommended in the SEAI's *"Guidelines for a Sustainable Energy Community"* [1] are significantly later in the SEC

development process than in the successful methodologies used by both Samsø and Cloughjordan SECs (Figure 4).

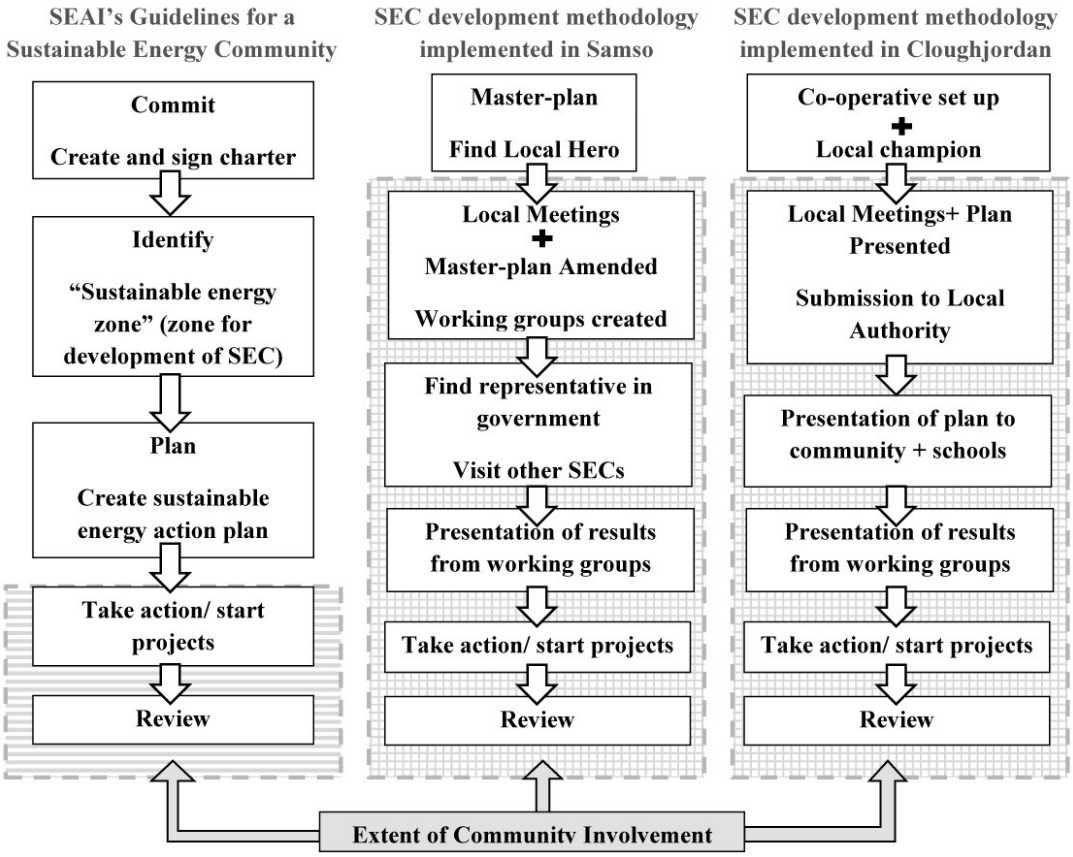

Figure 4. Comparison of SEAI's *"Guidelines for a Sustainable Energy Community"* [1] and the findings from this study of methodologies used in Samsø and Cloughjordan SECs

The findings from this initial fieldwork study would suggest that for a framework for the development of SECs to be successful, community involvement needs to play a larger role earlier in the process. Future work will involve the investigation of methodologies for achieving this. Exploring the following as future research strategies can facilitate the attainment of this goal:

- Assessing a strategy for embedding community involvement into SEC development process;
- Assessing the effect that the participation of communities and the key influencers have on the success or failure of SEC development methodologies.

LIMITATIONS TO THIS STUDY

Although only three semi-structured interviews and site-visits have been undertaken in this initial study, these were comprehensive in nature. The knowledge garnered from this study has led to initial themes identified for future work, which will be built upon over the coming years.

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