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Developing the Potential of Community Energy Action Groups in the Transition to a Low-carbon Society

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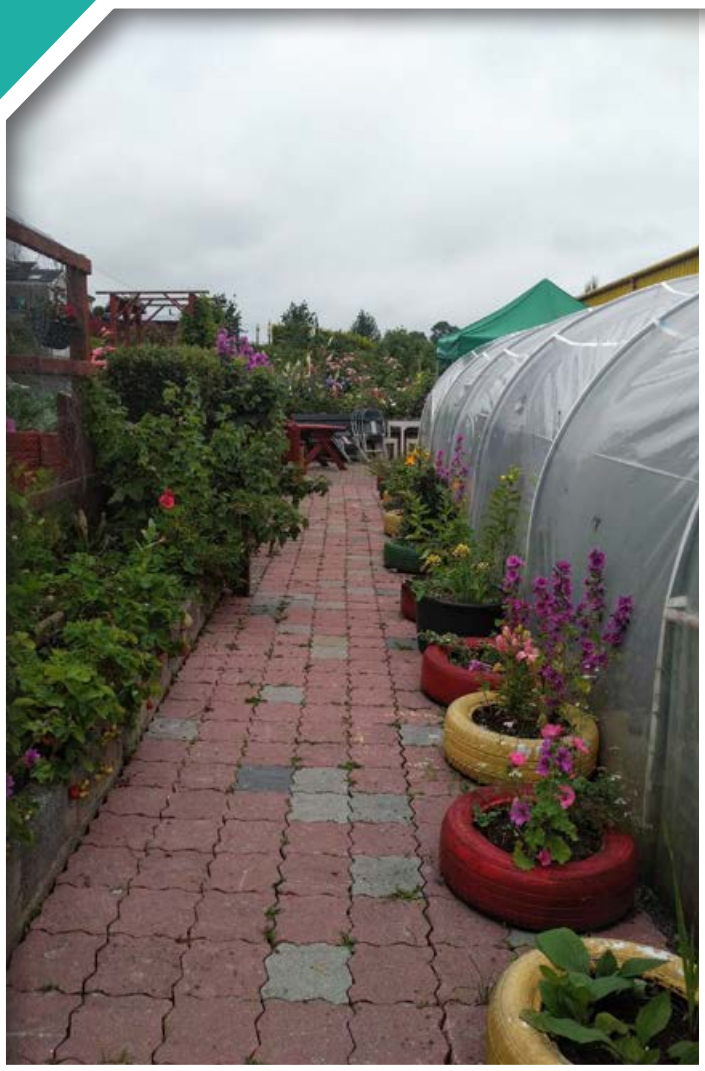

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Developing the Potential of Community Energy Action Groups in the Transition to a Low-carbon Society

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DISCLAIMER

This report is based on research carried out/data from September 2017 to October 2019. More recent data may have become available since the research was completed.

The EPA Research Programme addresses the need for research in Ireland to inform policymakers and other stakeholders on a range of questions in relation to environmental protection. These reports are intended as contributions to the necessary debate on the protection of the environment.

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Executive Summary

In Ireland, approximately 38% of the population live in rural regions. It is recognised that rural populations contribute significantly more to carbon dioxide equivalent (CO_2e) emissions in the transport and residential energy sectors than their urban counterparts. These higher emissions result from the higher dependence on private transport and the higher energy demand of single-dwelling structures. Community energy transition projects not only address greenhouse gas emissions but also are instrumental in bringing ideas and ultimately actions to fruition. Many community groups have come together to improve their immediate environment and, in doing so, they can have a more significant effect on sustainability and the transition towards a low-carbon society than they initially realise. The actions of these community groups can be far-reaching in that they can inspire other groups to follow and mimic their actions. However, community action groups increasingly find themselves out of their depth when embarking on energy transition projects. Barriers identified in this study include a feeling of hopelessness and inadequacy. The overall aim of this study was to develop, test and revise, as necessary, a toolkit of best practice methods, blueprint and guidance manual to provide practical guidance to communities for planning and implementing strategies for low-carbon transitioning.

The objectives were to:

- identify sustainability and resource efficiency opportunities for rural communities and develop appropriate indicator sets;
- compile and develop relevant case studies of best practice interventions and activities of rural community low-carbon initiatives;
- develop plans and recommendations (support and funding opportunities for green initiatives, provision of grant schemes, local policy levers, training and development of community members) to assist community groups and policymakers and support agencies to realise the potential that community groups have in the transition towards a low-carbon society.

An extensive review of community-based environmental and low-carbon projects revealed many feasible opportunities for Irish rural communities to contribute to the low-carbon transition. National and international case studies were examined from peer-reviewed literature, grey literature, site visits and interviews. An indicator set was selected to represent community-initiated actions and projects. These indicators formed the basis for the toolkit of best practice methods, blueprint and guidance manual.

Key findings are as follows:

- Managing a low-carbon transition will involve much, in addition to adoption of renewable energy and energy efficiency.
- Local industry, local food, access to local amenities, and education and outreach activities each aid in driving the low-carbon transition. These need to be included in any community plan and recognised through a measurement metric to allow quantification of their contributions and, where possible, identify achievements justifying rewards.
- At present, there is no standard metric to measure community-level CO_2e emissions.
- There is no universally recognised standard regarding the selection of relevant indicators, the collection of data, the maintenance of accounts, monitoring or evaluation.
- A growing number of community groups are registered with the Sustainable Energy Community Scheme of the Sustainable Energy Authority of Ireland (SEAI), through which Energy Master Plans are completed. However, these apply only to residential energy and do not take account of energy from the generation of waste, wastewater, water and transport.
- Since 2019, after completion of retrofit works, no follow-up has been carried out by SEAI to assess the level of energy saving realised.
- Rural communities face many challenges, including low employment opportunities, which lead to depopulation. Depopulation in turn may lead to the loss of existing local employment.

Low-carbon transition in rural areas depends on local employment opportunities and the utilisation of local, renewable resources, including people.

- Each community case study revealed unique information and attributes. Input from community groups is invaluable and, when contact and consultation were initiated at the earliest time possible, ideas and outputs were likely to be more relevant to local conditions.
- Social employment schemes (Community Employment, Tús) may be used as leverage to create additional local employment opportunities.

In relation to community sustainability, this report evaluates the opportunities for rural communities in low-carbon transition in relation to energy, waste, water, transport and other contributing factors.

1 Project Background and Introduction

1.1 Introduction

The White Paper on energy (DCENR, 2015) places communities at the centre of Ireland's low-carbon transition plans. Key to decarbonising the Irish economy is the transition to renewables and energy efficiency (EE) across all sectors, in particular the transport, agriculture, industry and residential sectors.

Irish environmental policy is influenced by the European Union (EU); however, implementation and enforcement of EU environmental law has been problematic, with the government struggling to meet targets. This has resulted in the government making significant efforts to address issues associated with enforcement of EU environmental legislation (EU, 2012a; DCENR, 2014). However, the assumption that inclusion of policy will result in enhanced performance is both misplaced and misleading. The Sustainable Energy Authority of Ireland (SEAI) estimated that investment of €35 billion is required to retrofit the current housing stock to a "B" Building Energy Rating (BER) (Engineers Ireland, 2016). The government's White Paper on energy (DCENR, 2015) set a very clear direction for energy policy in Ireland; however, it lacks a robust implementation plan to set out clear targets and milestones, enabling policies and an effective framework of governance (Engineers Ireland, 2016). The White Paper stressed the importance of engaging citizens in the energy transition movement. Conversely, community action groups increasingly find themselves out of their depth when embarking on energy transition projects. Barriers identified include a feeling of hopelessness and inadequacy among those attempting to engage in community projects (personal communication with community members, 2017–2019). Research has shown that many individuals view their individual efforts as useless (Jackson, 2004). A review of the Power of One campaign found that, although it was successful in raising awareness, it failed to significantly change long-term behaviours towards reducing carbon dioxide equivalent (CO_2e) emissions and energy consumption. Individuals who form community groups that work towards a common goal, such as increased recycling (Shaw, 2008), EE or becoming a low-carbon community, are more successful than individual efforts (Heiskanen *et al.*, 2010) as they provide mutual support and context for energy and resource end-user behaviour change. A suggested solution to support sustainable low-carbon consumption is community management of resources by all members of a community, for example community energy groups. Furthermore, significant lasting change needs to be supported by infrastructure, new routines, institutions and networks (communities and/or groups with the same or similar goals) (Heiskanen *et al.*, 2015). Community-based projects may have an important role to play in promoting the ideals of sustainability and low-carbon communities (Carragher, 2011; Byrne and O'Regan, 2016).

Transformation of education for low-carbon transition programmes into meaningful action at the community level, and integration within all levels of society, presents considerable challenges, including consistency of methods and ensuring relevance and quality. Rural communities differ greatly from each other in terms of demographics, topography, and the resources and strengths of community actors. Evidence of community engagement in low-carbon transition is growing, with some undertaking public commitments, for example the SEAI Better Energy Communities initiative (SEAI, 2016), and partnerships with local authorities (LAs) and energy service providers, such as Retrofit Energy Ireland. Communities can learn by engaging in complex processes that can have a significant impact on innovation. Within community groups, many actors/ stakeholders come together. The ensuing dynamics create strong complementary expertise by drawing on a diverse range of backgrounds. This provides a learning opportunity for every member of the group. This collective process is recognised as a driver of innovative ideas and processes. Engaging as a collective group is an effective way of developing locally relevant projects or identifying solutions to identified problems or barriers. Complex processes can be broken down and addressed by different members of a diverse group (Laperche *et al.*, 2008). Communities rarely participate in research and development activities, for example learning

by research; however, they can gain significant knowledge through learning by doing, by interacting with other similarly focused community groups or by exploiting new technologies. Through community interactions, individuals begin to engage with a large number of actors and stakeholders, which encourages a common learning curve. These interactions and learning processes can have a strong positive impact within communities. Similar to the concept of third-level campuses serving as "living laboratories", community groups can have a significant influence on stakeholders in terms of their contributions towards reducing their carbon footprint and that of society as a whole (Heiskanen *et al.*, 2015).

1.2 Societal "Buy-in"

Many rural communities, such as Ballynagran, County Wicklow, Ireland (Byrne, 2016) and Jühnde, Germany (Bioenergiedorf Jühnde, 2016), have formulated and implemented their own action plans to build capacity and collaboration within the local community to address CO_2e emissions from food, waste, transport and energy consumption. The common factor identified in these communities is that in order to commence work on low-carbon projects they had to compete for funding and present structured plans and targets. Many other similarly orientated community groups have been identified; however, these groups are working independently with little guidance, support or funding. Byrne (2016) and Carragher (2011) studied the effect that the actions and interventions of community groups are having on transitioning towards a low-carbon society. They found that community groups are still acting independently, without clear targets or a system of benchmarking, and this means that the combined effect of community group actions remains unknown. In addition, the fragmented and disorganised procedures employed do not promote knowledge transfer or the organisation of events across multiple groups that could be leveraged to influence behaviour that actively promotes and supports low-carbon consumption patterns. Unlike commercial organisations, small and medium-sized enterprises (SMEs) and third-level campuses, which can work towards attaining accreditation to certified environmental management systems, such as the EU Eco-Management and Audit Scheme, ISO 14001 and ISO 50001, and LAs, which can become signatories to the Covenant of Mayors (Covenant of Mayors, 2016), community groups do not have an equivalent certification system available to evaluate, report on and benchmark their environmental performance. The SEAI developed the Better Energy Communities initiative to support community EE projects to retrofit private dwellings and community and commercial facilities. In 2016, the Minister for Communications, Climate Action and Environment announced the 38 community energy projects that would receive €20 million in grant funding. These grants were predicted to support several hundred jobs locally (SEAI, 2016). What was lacking in this scheme was any attempt to calculate the level of savings in both monetary terms and CO_2e emissions. This lack of formal measurement, benchmarking and progress tracking represents a significant challenge in successfully driving the development of a low-carbon society.

The Organisation for Economic Co-operation and Development (OECD, 2012) stated that embedding renewable energy (RE) technologies needs to be achieved through regional and local government policy in conjunction with "knowledge and learning institutions" and relevant groups (SMEs, community groups and other stakeholders). The OECD report further stated that, in countries where top-down policies prevail, the necessary conditions are difficult to establish. However, case studies show that the presence of strong higher education institutes and research institutes and local ownership of RE technologies are key factors for innovation and success (Horan *et al*., 2019; Shawe *et al*., 2019).

1.3 Impact of Environmental Policy in Ireland

For more than three decades, a comprehensive package of environmental regulation, legislation and policy instruments has been developed and implemented by the EU. Commitment to the Paris Agreement holds governments to task to reduce CO_2e emissions through implementation of national energy policies. Globally, urban areas are responsible for approximately 66% of primary energy consumption, with the balance consumed in rural regions (Rosales Carreón and Worrell, 2018). Unlike the many European countries that have a system made up of municipalities, which have strong governance abilities to steer planning and policy, Irish society relies on

national government departments and LAs, which are relatively less autonomous. This can lead to a disconnect between national-level governance and the needs of rural communities.

In terms of RE and EE and its integration with CO_2e emissions reduction targets, rural communities may be major drivers of low-carbon transitioning. Implementing energy reduction targets at the local level requires systematic, strategic and continuous actions, which are very often outside the scope of governance. This can be described as being similar to a "wicked" problem, a concept first described by Rittel and Webber (1973).

1.4 The Rebound Effect

Higher energy demand from increasing economic activity will inevitably impact CO_2e emissions unless that energy is supplied from RE sources. Such technological improvements have previously been argued to be a key factor in mitigating the impact of higher energy demand on the environment (Turner and Hanley, 2011), with increased EE forming a major component of EU CO_2e emissions reduction efforts (EC, 2017a). However, the impact of increased EE on total energy use and therefore CO_2e emissions is uncertain because of the rebound effect, as evidenced in previous work (Brookes, 1990, 2000, 2004; Sorrell, 2009). The rebound effect is seen where improved EE does not reduce demand by as much as expected (weak rebound effect), leads to effects that erase most of the expected savings (strong rebound effect) or, in fact, stimulates greater energy use than if no EE improvements were attempted (backfire), which occurs, for example, when lower energy costs stimulate additional energy-intensive economic activity (Brookes, 1990; Saunders, 2000).

1.4.1 Direct and indirect rebound

The direct rebound effect is generally defined as the change in energy use resulting from the combined substitution and income effects on the demand for the energy-efficient product (Sorrell and Dimitropoulos, 2008). This definition is convenient because economists typically estimate elasticities of demand (e.g. the marginal change in demand for air conditioning as the operating cost of the air conditioner changes), which can be easily converted into a direct rebound effect (Gillingham *et al*., 2016).

The effect of an EE increase on the demand for all other goods and the subsequent change in energy use is often called the indirect rebound effect. However, the literature is not consistent in how this term is used. Some studies have calculated changes in energy use resulting from changes in the demand for other goods, including substitution effects, income effects and any embodied energy used to create the EE improvement (Azevedo, 2014). However, the most common approach described in the literature is to refer to the indirect rebound effect as including only the income effects on the consumption of all other goods. For example, buyers of a more fuel-efficient vehicle may decide to spend the savings on a foreign holiday, which is an energy-intensive activity, or on something much less energy intensive and recyclable (Gillingham *et al.*, 2016).

1.4.2 Income and substitution effects

Berkhout *et al*. (2000) described the rebound effect as existing as a result of (1) the substitution effect – as energy becomes cheaper so an individual uses more – and (2) the income effect, where a higher disposable income as a result of lower energy pricing leads to greater spending and energy use. The authors provided an example of increased car use as a result of lower operating costs gained from equipment efficiency improvements. This can lead to a loss in part of the energy gain, as extra demand for more productive services from equipment implies more energy consumption. As increased consumption is a consequence of a cost decrease, the rebound effect is the loss of potential conserved energy.

1.4.3 Extent of the rebound

There is recognition of the potential significance of the rebound effect, yet its magnitude and importance have been disputed (Barrett and Scott, 2012). Schipper and Grubb (2000) rejected the proposition that the rebound effect could be large enough to offset most of the energy savings arising from efficiency improvements. In their analysis of data covering 80–90% of the total energy demand in International Energy Agency (IEA) countries studied, they stated that they found no evidence that households in wealthy countries automatically channel savings back into increased energy use. However, they also acknowledged that some level of rebound may occur, in the region of

5–15%, but declared this to be minimal, especially in mature economies, explaining that EE measures will always lead to lower energy use. However, other authors have refuted the idea that rebound is "minimal"; for example, Aydin *et al*. (2017) estimated a rebound effect of 19–40%, depending on household wealth. However, Walker *et al*. (2016) posited that, where energy cost savings were used to buy food or a warmer home, this may be seen as an acceptable level of rebound in achieving greater social equity.

1.4.4 Implications at the community scale

Information on the rebound effect is contested and not easily found for producers and industry. However, more evidence exists for accounting for the rebound effect in relation to final consumers (Barrett and Scott, 2012). Studies on consumer rebound typically focus on the direct effects that result from increased consumption of cheaper energy services, such as more fuel-efficient cars leading to more frequent car use or travelling further distances (Small and Van Dender, 2007; Sorrell, 2007). Chitnis and Sorrell (2015) put forward the argument that while the income effects of EE measures are often studied and measured, substitution effects are not. As a result, direct and indirect rebound effects are often underestimated. The authors recognised shortcomings in their previous research (Chitnis *et al.*, 2014), which estimated a domestic energy rebound effect in the region of 0–32%. When modelling of substitution effects was included, the authors found that the energy rebound effect was more likely to be >40%. The cost-effective nature of low-carbon or "green" consumption choices make them more attractive to lower income households, but they are more likely to have higher rebound effects and therefore the lowest environmental benefit (Murray, 2013; Chitnis *et al*., 2014). For example, a household installing heat-retaining insulation offsets the investment cost through energy bill savings, resulting in a zero income effect. However, the reduced unit cost of heating may result in subsequent higher heating usage, known as the comfort effect (Winther and Wilhite, 2015), or in the consumption of other goods and services not directly related to energy, such as food or drink, which are also CO_2e emissions intensive (Chitnis *et al.*, 2014). Thus, changing consumption patterns of households can lead to an increase in the CO_2e emissions associated with that consumption, counteracting the original emission savings. However, it has been argued that higher income households both possess the greatest scope for undertaking green consumption choices and demonstrate the lowest rebound effects (Murray, 2013), as these households are unlikely to consume more energy but rather invest in less energy-intensive goods and services. However, Girod and de Haan (2009) found that higher household affluence is not necessarily an indicator of rebound effects, as such household consumers tend to choose higher quality goods and services without consideration of their environmental impact. Analysis of direct and indirect rebound effects by Buhl *et al.* (2017) concluded that attitudes and norms, in addition to economically driven effects, require careful consideration when monitoring and mitigating the effects of rebound.

1.4.5 Implications for energy efficiency policy

Analysis conducted by Vivanco *et al.* (2016) found that, although the rebound effect has been acknowledged in approximately 35 EU documents since 1996, recommendations for mitigation action to counteract the phenomenon were considered in only six legal acts. Policy scenarios that ignore the potential significance of the rebound effect are likely to result in flawed and misleading guidance for policymakers (Chitnis *et al*., 2013). As policymakers are primarily concerned with national CO_2e emissions and direct rebounds, they tend to neglect embodied emissions and indirect rebound (Chitnis and Sorrell, 2015). Neglecting the rebound effect may overestimate the contribution that resource efficiency can make to reducing CO_2e emissions, resulting in lower than anticipated savings (Barrett and Scott, 2012; Chitnis and Sorrell, 2015). A study by Druckman *et al.* (2011) determined that the rebound effect is significant and needs to be taken into account when estimating CO_2e emissions reductions achievable through behavioural change. Therefore, policy appraisals should allow for rebound effects (Chitnis *et al.*, 2014), as a potentially large rebound effect will have severe repercussions on the effectiveness of policy aimed at reducing energy use and associated emissions (Berkhout *et al*., 2000; Brockway *et al*., 2017).

Past international policies to encourage EE and lifestyle changes have been described as small-scale, poorly designed, underfunded and ineffectual in nature (Druckman *et al.*, 2011). To combat this, the authors

recommended the reinforcement of such policies by introducing more regulations, standards, financial support and information programmes alongside increased pricing of carbon emissions. The authors further stressed that policymakers need to be aware of the best- and worst-case scenarios for rebound effects but that this is not enough – they also need to provide guidance on how to mitigate these effects. This might be achieved through, for example, publicity campaigns or economy-wide carbon pricing. Another key strategy would be to encourage households to invest savings in low-carbon projects. Murray (2013) stated that policymakers need to be aware of the importance of income with regard to the net environmental impact of policies promoting changes in consumption patterns. According to Murray (2013), this means that policy campaigns targeted at low-income households need to reach more households to have the same net benefit as campaigns targeted at high-income households. This view is at variance with that of Girod and de Haan (2009), who found that, regardless of household income, a shift to average emissions by even a relatively low percentage of worst-practice consumption households, known as the "taming the few" approach, could have a profound impact in terms of lowering national CO_2e emissions.

As a result of differences in definitions, as well as in the quality of the data and the empirical methodologies used in measurement, estimates of the magnitude of the rebound effect vary greatly. This ambiguity has clear policy implications as researchers and policymakers need reliable information about the scale of the rebound effect to evaluate the impact of energy savings and the implications of EE policies (Gillingham *et al.*, 2016). The complexity of the modelling systems used, and the uncertainty surrounding measurement, may be part of the reason why the rebound effect is not included in many EE policies (Vivanco *et al.*, 2016). That is not to say that the rebound effect is ignored in national EE plans, as the Irish 2014 National Energy Efficiency Action Plan assumes a high level of comfort uptake associated with low-income households in estimating a precautionary 70% rebound in projected CO_2e emission savings (DCENR, 2014). The differences in accounting for the rebound effect are evidenced in the contrast between this conservative approach by Irish policymakers and estimates from the UK, in which anticipated energy savings from insulation measures were reduced by 15% as a result of the rebound effect (Maxwell *et al.*, 2011).

1.4.6 Energy sufficiency and reducing energy consumption

Counteracting the rebound effect requires an absolute reduction in consumption. A review by Gillingham *et al*. (2016) concluded that, unless the rebound effect has severe external costs, it will be a benefit of, rather than a cost to, EE policy. The authors argued that the focus on minimising energy use, rather than the broader objective of maximising economic efficiency, has caused some policymakers to focus on counterproductive measures to mitigate the rebound effect rather than including social gains as part of the analysis of the benefits of EE policy. Similarly, Sorrell *et al.* (2018) argued that energy sufficiency, that is, a reduction in energy consumption that reduces the energy and environmental impact of that consumption, may mitigate the rebound effect through measures that reflect the level of consumption as being "enough". The authors provided an example in which EE home improvements are accompanied by temperature-limiting thermostatic controls to prevent overheating of homes, thereby limiting possible rebound effects while providing an adequate level of comfort. The authors further recommended carbon pricing as an effective method of mitigating rebound effects and as a means of incentivising EE improvements while protecting low-income groups. However, the authors warned that carbon taxes are most effective when accompanied by other policy instruments, such as EE regulations and information programmes. In a recent paper, the Economic & Social Research Institute (ESRI) demonstrated how a redistribution of carbon tax revenue in a targeted way based on the taxation and social welfare system can avoid many of the regressive impacts of the tax (Tovar Reaños and Lynch, 2019).

1.5 Project Objectives and Methodology

Implementing the Paris Agreement (UNFCCC, 2015) includes understanding the social values of citizens alongside consumption and behaviours. It gives each participating country the flexibility to develop its climate action plan in a manner that reflects its own unique environmental and economic

conditions. It is not limited to technology and scientific advancements. The White Paper on energy (DCENR, 2015) puts citizens and communities at the centre of the low-carbon transition; however, it fails to clearly state how communities will be supported through incentives, infrastructure or policy frameworks. In this project a standardised accounting framework for the assessment of energy consumption, generation and efficiency measures addresses the issues surrounding Ireland's transition to a low-carbon society. This research provides such a framework through a guidance manual, a toolkit of best practice methods and a detailed blueprint based on the experiences of other successful communities.

In previous research successful communities have been studied across the EU; however, many of these studies were carried out at the municipal scale and measurements were conducted using municipal-level data, which do not provide a suitable metric for small rural communities. There is a growing awareness that communities can benefit from knowledge and resource sharing as a means of extending the network of community energy groups across Ireland. At the community level difficulties arise in the areas of data collection, emission factors, calculations and analysis of results. For these reasons case studies encompassing Irish and EU communities were compiled. In addition, case studies were also conducted to investigate the numerous organisations that currently support sustainable communities. There is substantial value in learning from the experiences of other communities and the different metrics available to them. Within this context, the objectives of this project were to:

- develop, test and revise as necessary a toolkit of best practice methods, a blueprint and a guidance manual to provide practical help to communities in planning and implementing strategies for low-carbon transitioning;
- identify sustainability and resource efficiency opportunities for rural communities and develop appropriate indicator sets;
- compile and develop relevant case studies of best practice interventions and activities of rural community low-carbon initiatives;
- develop plans and recommendations (support and funding opportunities for green initiatives, provision of grant schemes, local policy levers, training and development of community members) to assist community groups, policymakers and support agencies to realise the role that community groups can play in the transition towards a low-carbon society;
- promote key communities as exemplars of low-carbon living through an interactive website and a public forum.

2 Design for Community Low-carbon Transition

2.1 Review of Local Economic and Community Plans

The needs of community groups are wide-ranging and complicated. LAs have been tasked with developing local economic and community plans (LECPs) that reflect the immediate needs of communities throughout Ireland.

A review was undertaken to determine the extent to which the LECP of each LA supports communities to become more sustainable and adapt to a low-carbon society. The economic and community aspects are intended to be mutually supportive. It is anticipated that robust economic development can support community-led actions through LA investment in local improvement initiatives, for example Tidy Towns.

The Local Government Reform Act 2014 (Government of Ireland, 2014) set the way for the expansion and strengthening of LA functions and is a significant piece of legislation designed to advance the central purpose of local government. The *Putting People First – Action Programme for Effective Local Government* (DRCD, 2012) highlights the importance of promoting quality of life and wellbeing for people and communities.

Each LA is required to set out the objectives and actions required to promote and support economic development and local and community development within the administrative boundaries, by itself and in conjunction with other community and economic development stakeholders.

The LECP is not intended to be a high-level strategy but rather describes actions that can be delivered by stakeholders, for example community groups, and the LA. In accordance with the principles of sustainable development, LECPs must include specific economic and community elements. Examples are outlined in Table 2.1.

2.1.1 Consultation-led plan

The LECP differs greatly from the White Paper on energy (DCENR, 2015) and the 2017 National Mitigation Plan (DCCAE, 2017) in that both of these government documents call for climate change mitigation at the individual and community levels without consultation and present a "you should do this" approach. The LECPs, on the other hand, are consultation-led documents that demonstrate

Table 2.1. Economic and community elements of LECPs

Economic elements	Community elements
The sustainable economic development objectives may include, for example: 1. Attracting substantial investment and new enterprise, with significant employment, income and growth potential 2. Sustaining/expanding existing enterprise, particularly in sectors having significant growth potential in international markets 3. Improving the quality and diversity of employment in the area 4. Economic transformation/regeneration of urban centres affected by economic decline 5. Strengthening the economic fabric of smaller towns/villages and their capacity to advance rural economic regeneration 6. Economic development objectives in the local/community development programmes and the micro-enterprise support function, and 7. Economic objectives in relevant national, regional, sub-regional and city/county-level plans and strategies	The sustainable community objectives may include, for example: 1. Improved quality and increased frequency of community-based services available to promote social inclusion and tackle poverty and disadvantage 2. Physical, social, economic and environmental regeneration of deprived urban and rural communities 3. Enhanced education and training infrastructure 4. The creation of new jobs, especially in the low-carbon and green economy, and 5. Increased access to and use of high-quality information and communication technology

Source: Minister for the Environment, Community and Local Government (2015).

the vast differences in needs, values and outlooks across the island of Ireland. The elements of LECPs that relate to the economy and community have been developed through public consultation in a collaborative and participative way. The approach has provided key stakeholders, such as community groups, organisations and the general public, with the opportunity to have a meaningful input to the formulation of each LECP to reflect their interests and needs. Table 2.2 provides a summary of the role of LECPs in formulating relevant objectives and actions.

2.1.2 Effect of demographics on the formulation and development of LECPs for low-carbon transitions

There is a clear divide between the concerns and priorities of Dublin and the surrounding counties and those of LA areas that have a more rural aspect, such as Galway, Limerick and Offaly. The LAs located in the eastern part of the country are more focused on economic opportunities and social problems, for example drugs and social exclusion, whereas the predominately rural counties place their focus on rural isolation, transport, community engagement and increasing volunteering and localising consumption and services to maintain lifestyles in rural Ireland.

The LECPs are consultation based and it is clear that the issues, objectives and actions presented (see Table 2.2) are reflective of the areas they represent; for example, Dublin's LECP focuses on drugs, homelessness and other social issues, whereas Galway's LECP is focused on connectivity in terms of transport, broadband and making rural towns and villages more sustainable. In addition, RE is discussed and seen as a pathway to sustainability in more rural LAs.

Where the local economy is weak, a clean, green image is promoted by the LA to make the area an attractive place to visit, invest in, work or live. These LAs represent predominately rural areas.

Many LAs place a strong focus on the economic aspects of the LECP and, as a result, EE and the promotion of RE feature in almost all of the high-level goals and the resultant actions. However, in a number of LECPs the promotion of renewables and efficiency is formulated wholly as an economic consideration. In contrast, the LECPs that inclusively embrace the environmental, social and economic aspects of sustainable development address sustainable or rural transport solutions, community participation, resource efficiency and social enterprise as a means to build thriving, resilient, sustainable and inclusive communities.

An important aspect of the LECP is the mutually supportive characteristic of the economic and community elements. Each element has specific functions and challenges that underpin the end goal of building sustainable communities supported by strong local economies. This joined-up approach between economy and community results in a crossover of common action areas, such as the economic benefits of supporting energy from renewables and EE and the community benefits of tackling fuel poverty and community groups having the opportunity to become involved in RE projects to provide funding for local initiatives.

2.1.3 Support for community groups

How communities are supported by LAs can influence the level of success in low-carbon transitions (Berka and Creamer, 2017; Campos *et al.*, 2017). The high-level goals, objectives and actions developed by each of the LAs are in response to the concerns of individuals, stakeholders and the local community contributing to the consultation process, as discussed previously. Community groups have voiced their concerns that both local and national policymakers neglect to consult with them and instead there is a tendency to tell communities what they need to do (Byrne *et al.*, 2017). A more effective approach is to conduct scoping exercises to enable decisions to be made based on actual needs that have been identified through bottom-up methods.

Proposed actions identified in the LECPs are also reflected in the actions planned or underway in communities across Ireland (Table 2.3). However, LAs have failed to bring to fruition all of the high-level goals that have been proposed. In contrast, many community groups are succeeding in their endeavours. This success is as a result of grass-roots movements and an identified need to address issues locally.

Table 2.2. LECP actions from each LA

LECP	Develop an effective mechanism to encourage engagement	Promote the value of volunteering	Facilitate communities and groups to strengthen skills to build leadership	Develop community facilities (where need has been identified)	Support community based co-operatives and social enterprises	Promote the adoption of EE	Promote the development of innovative RE	Support increased use of RE	Develop local action programmes for recycling and reuse at county and local levels	Support national climate change strategy	Improve efficiency of residential housing stock
	1	2	3	4	5	6	7	8	9	10	11
Carlow	✓	✓	✓	✓	✓	✓	✓		✓		
Cavan	✓	✓	✓	✓		✓	✓	✓			
Clare						✓	✓	✓			
Cork		✓									
Donegal	✓	✓	✓	✓	✓	✓	✓	✓			
Galway	✓					✓	✓	✓			
Kerry	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Kildare	✓		✓		✓	✓	✓	✓	✓		✓
Kilkenny	✓	✓		✓	✓						
Laois	✓		✓	✓	✓	✓	✓	✓			✓
Leitrim	✓	✓	✓	✓	✓	✓	✓	✓			✓
Limerick	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Longford		✓	✓	✓	✓	✓	✓		✓		✓
Louth	✓	✓				✓	✓	✓			
Mayo	No actions in plan										
Meath	✓		✓	✓		✓	✓	✓			
Monaghan	✓	✓	✓				✓	✓			
Offaly						✓	✓	✓	✓		
Roscommon	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Sligo	✓		✓	✓	✓	✓	✓	✓			
Tipperary	✓	✓	✓			✓	✓	✓			
Waterford	✓						✓	✓			
Westmeath	✓		✓			✓	✓	✓	✓		
Wexford	✓					✓				✓	
Wicklow	✓	✓	✓	✓	✓	✓	✓	✓		✓	

Table 2.2. Continued

LECP	Develop/ promote local enterprise to provide advice and support	Investment programme to support rural enterprises and job creation	Research to develop sustainable transport/ energy systems	Support engagement and active leadership	Support public sector bodies to adopt energy management systems (ISO 50001) or Energy Master Plans	Strive for a circular economy with zero waste objective	Support opportunities to connect community groups with other groups/ organisations	Support smart, sustainable transport/ community transport	Support electric transport programme	Investigate possibility of establishing energy agency/hub	Support the resourcing of an energy officer
	12	13	14	15	16	17	18	19	20	21	22
Carlow	✓	✓	✓	✓		✓					
Cavan				✓	✓			✓			
Clare					✓						
Cork							✓	✓			
Donegal	✓	✓	✓	✓			✓	✓			
Galway							✓	✓	✓		
Kerry	✓	✓					✓				
Kildare	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Kilkenny	✓	✓				✓		✓			
Laois			✓		✓		✓	✓		✓	
Leitrim	✓	✓	✓	✓			✓	✓		✓	
Limerick	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Longford	✓	✓	✓	✓			✓	✓		✓	
Louth		✓	✓		✓						
Mayo	No actions in plan										
Meath	✓	✓						✓	✓	✓	
Monaghan	✓		✓	✓			✓	✓			
Offaly	✓	✓	✓		✓			✓	✓	✓	
Roscommon	✓	✓	✓	✓	✓	✓	✓	✓		✓	
Sligo	✓	✓	✓		✓		✓	✓			
Tipperary	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Waterford	✓			✓				✓			
Westmeath							✓	✓		✓	
Wexford							✓				
Wicklow	✓	✓	✓	✓	✓		✓	✓			

Table 2.3. Actions identified in the LECPs and community case studies

Indicator	Actions proposed in the LECPs	Actions from case studies
Residential energy	• Support national climate change strategy • Support public sector bodies to adopt energy management systems (ISO 50001) or Energy Master Plans EE and generation: • Investigate the possibility of establishing an energy agency/hub • Support the resourcing of an energy officer EE: • Promote the adoption of energy-efficient practices • Improve efficiency of residential housing stock Energy generation: • Promote the development of innovative RE technologies and resources • Support increased use of RE	EE retrofits including: • upgrades to windows and doors • draughtproofing • installation of insulation • replacement of open fires with more efficient alternatives • candescent bulbs replaced with light-emitting diode (LED) bulbs Energy generation retrofits including: • installation of solar panels • installation of heat pumps
Transport energy	• Develop a sustainable transport system • Support smart sustainable transport/community transport • Support an electric-powered transport programme	• Community transport service • Community transport service powered by electricity • Demand-responsive community taxi • Voluntary car scheme
Water	Review of the LECPs did not identify community/ individual-motivated actions for conservation of water	• Installation of water harvesting system • Identify and repair leaks • Audit of water appliances and water flow rate
Wastewater	Review of the LECPs did not identify community/ individual-motivated actions for conservation of water	
Solid waste management	• Develop local action programmes for recycling and reuse at county and local levels • Strive towards a circular economy with a zero waste objective	• Campaigns to reduce and eventually remove single-use coffee cups in cafes and restaurants • Zero waste groups that support individuals and businesses to reduce and eliminate waste

2.2 Indicator Case Studies

Table 2.4 provides details of communities that have undertaken stand-alone projects that address issues identified locally requiring bespoke solutions.

2.3 Sustainable Development Goals

The Sustainable Development Goals (SDGs) (UN, 2015) are the blueprint to achieve a more sustainable future for all global citizens. The goals relate to climate, environmental degradation, poverty, inequality, prosperity, and peace and justice. Incorporating the SDGs into community plans (CPs) is important because local actions can have global consequences. Table 2.5 outlines some of the ways in which communities can develop actions that contribute to achieving these goals.

Actions that contribute to resource efficiency, reduce unnecessary consumption and raise awareness of the effects that local actions can have globally benefit not only a single community. The "nearest neighbour effect" (Shaw, 2008), as experienced in communities near Gimbweiler (see Chapter 3), can also act as a catalyst for positive change.

Table 2.4. Case studies that address carbon reduction strategies for specific indicators

Indicator	Case study	Brief description
Transport CO_2e emissions	Fetlar Electric Minibus, Shetland Islands and Aberdeen, Scotland	Access to energy was the driving force behind this project – with no fuel station on the islands there are higher costs and increased CO_2e emissions to provide transport on the island. The result has been: • affordable and convenient transport • a step towards energy sovereignty • decreased dependence on fossil fuels
Transport CO_2e emissions	Heart of Eden Transport Study, Cumbria, UK	A key finding of the study was that potential users of public transport services lacked information relating to the array of transport options available to them. Actions include: • a list of the alternative transport options available has been compiled • Rural Wheels – demand-responsive shared taxi • voluntary car scheme – a service run by volunteers
Waste CO_2e emissions	Zero Waste Cashel, Co. Tipperary – Towards Zero Waste	Residents are working towards zero waste and sustainable resource use. A number of actions have been completed, including: • a Zero Waste Map of Cashel was produced • waste characterisation study completed • workshops organised for Reuse Month • resident participation in the Sick of Plastic Day of Action
Waste CO_2e emissions	Make Kilkee Plastic Free – Plastic Free Me	Local businesses are leading the initiative to eliminate the sale and use of single-use plastics. Targeted measures include: • incentives that encourage the use of reusable water bottles and cups • providing information on alternatives to single-use plastics • logo and project branding to increase visibility • working closely with the LA to provide on-street waste segregation • a survey of businesses on quantities of single-use plastics displaced
Locally produced food	Building a sustainable community food hub, Lea Valley, Walthamstow, UK	Partnership with OrganicLea, a not-for-profit community-based co-operative. Outcomes include: • guidance on processes to deliver surplus food to customers in optimum condition • provision of information to growers on the legal requirements for selling surplus food • provision of information to customers on crops and their use (crops not common to other food outlets)
Residential energy CO_2e emissions	EE improvements to 1890s house, Aberdeen, Scotland	Energy saving of 40% annually achieved by: • upgrading windows and doors • carrying out extensive sealing works to reduce draughts • insulation of the attic, eaves and underfloor areas • using a multifuel stove in place of an open fire • replacing lath and plaster with insulating board
Local industry	Community Expo, Murroe, Co. Limerick	A Community Expo was organised to highlight locally available amenities and, by extension, to promote local industry and community groups: • businesses, clubs and groups were invited to display promotional material and contact details • this resulted in an increase in awareness of locally available businesses, services and amenities

Table 2.4. Continued

Indicator	Case study	Brief description
Water	Midleton Christian Brothers School water conservation, Co. Cork	Midleton Christian Brothers School was awarded the Water School of the Year award for its work on water conservation. It achieved this by reducing water consumption by 26%, even though the number of pupils increased by 10% and the floor area increased by 225%. Actions included: • setting a reduction target of 10% • administering a water usage survey to transition year students • conducting a campaign called Stop the Flow, Save H_2O • installing a water butt for rainwater harvesting
Residential energy CO_2e emissions	Energy Neutral Village, Hooghalen, the Netherlands	The aim of the Local Energy Initiative (LEI) is for Hooghalen to become an energy-neutral village by 2020. The current focus is on EE and reduction of energy consumption. Organised as a foundation, several projects have been initiated, including insulation of houses, energy savings, photovoltaic panels, collective purchasing of energy and collective production of green energy. The LEI is preparing a communication plan to inform the village inhabitants and to secure their future support. People perceive the initiative as an opportunity to increase the quality of life in the village, and it gives a boost to local employment and social cohesion
Local food	Post-carbon resilience, Luxembourg	The aim of the Centre for Ecological Learning is for members to learn and pass on the skills needed for post-carbon communities, with the desired result of creating resilient, thriving and localised communities. Three allotment management concepts were employed: • a transition city garden • a community (common) garden • private allotments Each member has an equal say on all aspects of the management and running of the transition city garden
Residential energy CO_2e emissions, waste CO_2e emissions	Morbach, Germany	The community aim is to create a mutually beneficial concept for energy-producing and energy-consuming companies in order to create a win–win situation through intelligent synergy effects and to minimise costs and pollutants
Residential energy, local food, transport	Transition Oststeiermark, Austria	As a positive grass-roots initiative, Transition Oststeiermark wants to show that an environmentally friendly lifestyle is not primarily characterised by renunciation, but by profit/gain in terms of quality of life, social contacts and meaningfulness Through awareness raising and networking it is endeavouring to take steps that meet future expectations while having fun together, with concrete actions in the following fields: • increasing its EE • protecting food sovereignty • addressing mobility and transport, especially in a sparsely populated area where private transport is considered essential

Table 2.5. Linking SDGs to community actions at a local level

SDG		Community group actions for meeting targets
2	Zero hunger	Locally produced food achieves a number of objectives, including lower food miles, sustainable management of local resources and lower embodied carbon. In terms of addressing food security, where nations can rely more on locally grown and seasonal crops, the need to import food at a high cost is addressed. To address food hunger globally is difficult for small communities; however, reducing demands on food systems, especially crops that have high demands on natural resources, for example soya, helps to alleviate pressure on poorer nations. Land clearing to produce monocultures affects biodiversity and the ability of those food producers to provide for themselves
3	Good health and wellbeing	Rural communities, in particular, rely heavily on private transport. A modal shift to alternative transport options, including walking and cycling for journeys of less than 5 km and public transport for longer commutes, could have significant health benefits. Locally grown food can also contribute to improve health and wellbeing
4	Quality education	Participation in community-led low-carbon transitions can lead to additional learning outcomes and lifelong learning opportunities that are supported by higher education institutions
7	Affordable and clean energy	Through incorporating EE measures and RE technologies, communities can generate environmental and economic benefits. The integration of EE and RE locally increases these benefits and may become an enabler of the development of off-grid energy infrastructure or feed-in energy infrastructure
8	Decent work and economic growth	Rural Ireland has increasingly suffered a decline in population, employment opportunities and economic growth. Community projects that focus on local economies, local food production and RE projects may become important conduits to enable regional and local added value, and balanced regional growth
9	Industry, innovation and infrastructure	Rural regions and their communities can play an important role in identifying and unlocking local energy potentials
11	Sustainable cities and communities	Bottom-up regional and local actions are supported by the EU-led Covenant of Mayors for Climate and Energy, which strives to support integrated climate change mitigation and adaptation strategies. Included in the strategy are pledges to provide access to secure, affordable and sustainable energy. Support and infrastructure for community groups address this goal. Irish communities would benefit significantly by being signatories to the Covenant of Mayors
13	Climate action	Community actions and strategies aim to reduce reliance on fossil fuels and to enable communities to become more energy efficient. Standardised measurements are needed to evaluate the level of success achieved and to highlight actions or strategies that need to be adapted to the specific circumstances of a community. RE generation at the local level provides clean energy, local employment, social benefits, and local and regional added value
17	Partnership for the goals	Communities are developing partnerships with academia, municipalities, LAs and industry. This can act as a catalyst for greater levels of partnership at local, national and international levels. The transformative impact of partnerships across all levels improves outcomes and further strengthens the effect that stakeholders and community groups have on sustainable development. This has been demonstrated within the case studies described in this report

3 Case Studies

3.1 Introduction

For small rural communities, the low-carbon transition will be challenging and may constrain sustainable economic development; however, if done well and properly supported the transition could achieve the opposite. Rural communities are already vulnerable to the perceived costs of climate change mitigation, including because of their high dependence on imported fossil fuels and associated increases in carbon taxes. However, RE technologies, combined with measures to improve EE and access to local resources and an increased level of knowledge and awareness of more sustainable practices, can achieve transformational socio-economic impacts for rural communities. RE sources such as wind, solar energy, biomass, hydropower, geothermal energy and energy from the ocean can create local employment opportunities, by building on existing resources within communities. Existing resources importantly include people who work with great determination to safeguard a sustainable future. However, the absence of a feed-in tariff and the enablement of community ownership of RE and EE will restrict the low-carbon transition.

Renewable energy and EE are key to building climate resilience in rural communities. Mitigation actions and measures form a dynamic component of the transition, and therefore it is vital to develop methods to track, measure and evaluate the success of actions implemented.

3.2 Energy Efficiency in Rural Areas: The Policy Response as of 2019

The first EU body to acknowledge the challenges faced by rural areas was the Committee of the Regions. As a result of the publication of the 2005 *Green Paper on Energy Efficiency* (EC, 2005) and the ensuing *Action Plan for Energy Efficiency (2007–2012)* (EC, 2007), EE emerged as a key policy priority in the EU. Buildings, both public and residential, account for 40% of energy requirements in Europe and are responsible for emitting about one-third of its CO_2e emissions. Improving the energy rating of buildings was seen as a way of reducing emissions and the demand for energy, which subsequently led to the adoption of two directives: (1) the Directive on the Energy Performance of Buildings (2010/31/EU; EU, 2010) and (2) the more recent Energy Efficiency Directive (2012/27/EU; EU, 2012a). The Energy Efficiency Directive provides for the establishment of national EE targets for 2020. However, the development of policies for rural areas receives limited attention as EU policymakers continue to consider that higher priority should be given to urban areas and cities.

Typically, rural areas have significantly lower EE levels than urban areas because of the nature of many of the buildings in rural areas. Unlike much of the UK and Europe, where planning regulations for one-off housing are much stricter, Ireland has a large proportion of newer buildings stemming from the “Bungalow Blitz” of the 1970s and 1980s and the property boom of the 1990s and 2000s. Buildings constructed in the 1970s were not subject to any EE regulations.

The Revision of the Energy Efficiency Action Plan (EU, 2012b) recognised the potential in rural areas for energy savings and the impact that this could have on creating employment and improving the economic outlook in general. However, the soft measures and recommendations have not been confirmed in legislation (FREE, 2014). As a result of the Energy Efficiency Plan 2010, the Smart Cities and Communities Initiative was introduced in June 2012 to support cities and regions to reach a 40% reduction in CO_2e emissions by 2020 through the implementation of ambitious measures such as sustainable use and the production of energy. The Energy Efficiency Plan 2010 states that it is essential that EE be integrated into all relevant policy areas, including, but not limited to, regional and urban development, transport, finance, agriculture, education and industry. The term “rural” is used on three occasions within the text of the plan. The first instance refers to the potential creation of jobs: “whereas the payback period for investments in EE is relatively short compared to other investments and investments have the potential to create a significant number of new local jobs in rural

as well as in urban areas which can to a large extent not be outsourced, in particular in the construction sector and within SMEs, while public awareness and skilled workers are needed to make it happen" (section G). The second use of the term deals with urban development and buildings. Section G focuses on the effects that EE can have on decisions taken with regard to urban and rural development and in particular contributions to smart and sustainable growth. The extension to the Smart Cities programme for the inclusion of rural communities is a welcome acknowledgement that EE is of concern to rural communities and that the programme is not simply about strategies and policies designed for urban areas. However, since activities commenced in 2003, there has been a failure to fully demonstrate the inclusion of rural energy concerns within the priorities of the programme (FREE, 2012). The final use of the term "rural" acknowledges the scope to achieve energy savings in buildings in both urban and rural areas; however, it is stressed that the focus should be on buildings with an energy-saving potential only.

Additionally, the EU Regional Policy (EC, 2015) has adopted a new regulation (Regulation 397/2009/EC; EU, 2009b) to make investment from the European Regional Development Fund (ERDF) available for RE and EE in the context of the European Economic Recovery Plan (EC, 2008). In 2009 a provision to the regulation stipulated that 4% of the ERDF allocation be spent on EE improvements and RE in existing housing units. A further proposal by the Commission stated that a minimum of 80% of the ERDF resources at national level should be earmarked for innovation, SME support, renewables and EE, of which 20% should be set aside for investment in renewables and EE. This equates to €55.5 billion of the €347 billion ERDF budget. Regulation 1301/2013 Article 3 (c) on the ERDF states that the ERDF shall support "investment in infrastructure providing basic services to citizens in the areas of energy, environment, transport and ICT [information and communications technology]" (EU, 2013). The Joint European Support for Sustainable Investment in City Areas (JESSICA) initiative is a support instrument developed with the co-operation of the European Investment Bank and the Council of Europe Development Bank. JESSICA supports sustainable urban development and regeneration in a number of areas, including EE improvements (EC, 2014). However, there is no rural equivalent to the JESSICA initiative to allocate funds from the ERDF towards rural settlements.

3.3 Clean Energy in Rural Areas: The Policy Response as of 2019

When reported on a per-capita basis, cities in developed economies typically generate lower CO_2e emissions and are, in general, more energy efficient than their rural counterparts. Other per-capita emissions, such as nitrogen oxides (NO_x), sulfur oxides (SO_x) and particulate matter (PM), are also higher in rural areas. A number of factors contribute to the higher per-capita emissions in rural areas/regions (FREE, 2014):

- higher reliance on oil, wood and/or coal in commercial and residential buildings because of a lack of connectivity to natural gas pipelines;
- higher consumption of these fuels because of a lower level of EE of buildings;
- the level of emissions generated by agricultural activities;
- lack of reliable public transport networks and connectivity because of low population densities leading to a greater reliance on private transport and longer distances travelled by rural residents to attend work, schools and recreational activities.

The 2020 Climate and Energy Package, adopted in 2008/2009, was instrumental in driving the EU towards developing measures and incentives to decarbonise the European economy and to reach the very ambitious and binding target of a 20% reduction in CO_2 emissions by 2020 (da Graça Carvalho, 2012). A further commitment to reduce CO_2e emissions to 80–95% below those of 1990 levels by 2050 has also been undertaken. Four main policy tools have been developed to achieve reductions in CO_2e emissions:

1. the EU Emissions Trading Scheme (ETS);
2. the Effort Sharing Decision;
3. the Renewable Energy Directive (2009/28/EC; EU, 2009a);
4. the Energy Efficiency Directive (see section 3.2).

The EU ETS, as a horizontal measure, is not designed to have either a rural or an urban focus; rather, it is an EU-wide trading scheme that assists major CO_2e emitters, such as the power sector, to cut emissions.

The Effort Sharing Decision addresses emissions from most sectors that the EU ETS excludes, such as waste, transport, agriculture and buildings. Legalisation forms the basis for a set of policies and measures aimed at moving Europe towards a low-carbon economy with increased levels of energy security. In contrast to the mechanisms that regulate the EU ETS at EU level, national policies and measures to limit emissions for the sectors covered by the effort-sharing legislation are the responsibility of each Member State. Potential policies and measures will:

- address a reduction in transport needs;
- promote public transport;
- move away from transport based on fossil fuels;
- support schemes for retrofitting buildings;
- support more efficient heating and cooling systems;
- promote RE for heating and cooling.

The Renewable Energy Directive, however, is particularly well suited to, and has a potentially beneficial impact on, rural communities. The Committee of the Regions (EU, 2012c) noted that "there is considerable potential in rural areas for both energy generation and to reduce consumption – sizeable tracts of land for wind farms or solar power plants are only available in the countryside".

The rapporteur of the Opinion of the Committee of Regions, Brian Meaney, Clare County Council and Mid-West Regional Authority, Ireland, highlighted the importance of including the needs of rural regions in any policymaking decision by acknowledging the need to address "in a more comprehensive and coordinated way the challenges and opportunities that rural areas face when it comes to energy use and production" (EU, 2012c).

An important question to examine is to what degree investment can benefit rural areas. RE policy may benefit rural areas in three ways: (1) by providing energy security, (2) by boosting economic development and (3) by mitigating climate change (OECD, 2012). With regard to mitigating climate change, the production of heat and energy from biomass, although having the benefit of generating employment locally, can result in significant trade-offs. These trade-offs normally occur in the form of a negative CO_2e balance when land use change and transport requirements are accounted for. Therefore, ideally feedstock for biomass heat and energy plants should be sourced locally. Further to this, careful planning should ensure that RE technologies are not imposed on areas that are not suitable to accommodate them. This principle also applies to the production of biofuel for the transport sector and needs to be considered in the context of the European Commission's proposed 10% share of biofuels in the transport sector through the implementation of targets laid out in the Renewable Energy Directive.

Rural areas, which are instrumental in the provision and generation of energy, are capable of providing energy security at the community level. Significant emissions reductions can be achieved through careful consideration of the specific needs and characteristics of an area. Arbitrary implementation of RE projects must be avoided, with a preference for identifying suitable projects for specific areas: "More care is needed to identify those [appropriate] places rather than adopting policies that somewhat arbitrarily spread RE projects across national landscapes" (OECD, 2012, p. 20).

An integrated approach to energy supply by increasing the RE share of the energy mix can contribute to improving energy security. By providing a less centralised but more integrated supply, the energy supply will be less susceptible to disruption, including price fluctuations, which are the result of unstable markets. RE sources are not without associated security issues, including disruption to supply as a result of daily and seasonal variations in the number of sunshine hours and in wind velocity. Hydro generation may also be affected in times of low rainfall levels. Community energy security appraisals/feasibility studies need to consider such factors, particularly where renewables will be responsible for providing a significant proportion of energy generation (van der Schoor and Scholtens, 2015). Essentially, RE technologies can be a valuable addition to an established energy system and any assessment of their feasibility in the context of energy security should take account of the entire range of RE technologies and the EE strategies employed in an area (van der Schoor and Scholtens, 2015).

With regard to economic development, in rural areas, where few employment opportunities exist, RE can be a development opportunity, creating valuable jobs.

Many governments support RE projects as part of their job creation policies; the United Nations Environment Programme's (UNEP) Green Jobs report states that, "Compared to fossil-fuel power plants, RE generates more jobs per unit of installed capacity, per unit of power generated and per dollar invested" (UNEP *et al.*, 2008, pp. 6–9). Although such a statement, taken at face value, is appealing to government bodies and policymakers charged with tackling persistent unemployment, it is not the full story. Over the long term, decarbonising the economy should result in both job destruction (in carbon-intensive sectors) and job creation (in low to zero carbon sectors), leading to a zero impact on employment figures (UNEP *et al.*, 2008, p. 6; OECD, 2012, p. 35). However, for rural communities, the localised generation of energy from renewable sources may provide sustainable local employment. In many rural communities the potential to create such employment can make a difference to the immediate community.

Renewable energy projects offer participating rural communities a range of economic, environmental and socio-economic benefits, including investment into the community and locally sourced employment. Community Power in Tipperary, in which there is community ownership of both generation and distribution, is establishing a model for this (Community Power, 2019). The potential to be "prosumers" – able to produce as well as consume energy as citizens and community initiatives – may lead to local businesses and residents benefiting directly through the direct capture of resources and the remuneration of investments into a project. RE projects may also positively affect the amount paid by residents for heat and electricity. However, neither of the benefits suggested is a necessary or preordained consequence of participation in a RE project (OECD, 2012, p. 36).

3.4 Case Study Methodology

This section examines sustainable community development in Ireland and the EU using the case study method. This method applies empirical inquiry to investigate contemporary phenomena to bring us to an understanding of complex issues (Yin, 2003). Case studies strengthen knowledge while providing a platform to extend and share experiences. In this context, case studies are presented in this report to provide qualitative insights and to examine real-life situations and experiences of sustainable rural communities. The case studies in this study were selected according to the following criteria:

- active participation in sustainability-focused actions at the community level;
- a typical rural community that represents a variety of geographic regions; and
- unique community attributes – the actions and approaches undertaken are not necessarily the same in each community.

Multiple sources and techniques were used to collect data:

- a review of the LECPs at LA level;
- a review of the proceedings and outcomes of the Citizens' Assembly discussions on "Making Ireland a Leader in Tackling Climate Change";
- internet searches of community groups, including social media sources, community group web pages and the SEAI's web pages; and
- surveys and interviews with community group members.

Multiple sources of data result in large volumes of data produced for analysis. The case study method provided an opportunity to compare sustainability communities across numerous regions and policy constraints. Irish and EU communities were first examined separately, that is, all Irish case studies were grouped together and examined and then the non-Irish EU case studies were examined. This provided a clear indication of emerging patterns across each group of case studies. The findings from each group of case studies were then examined in the same way to establish where similarities or patterns were evident. Additionally, differences between Irish and EU communities became evident and provided the basis for recommendations for Irish community groups and for policy development.

There is a wide range of literature that addresses sustainable communities and low-carbon transition. In our research, an important theme that emerged was investment in EE and renewables and a lessening of reliance on fossil fuels. A key insight from the literature is that new technologies alone will not achieve the targets set out by the Paris Agreement (UNFCCC, 2015), the EU or the Irish government (DCCAE, 2019). Behaviour change at all levels will be

instrumental in achieving the levels of CO_2e emissions reduction required. A second insight is that, to reach the targets, emissions from all residential activities must be investigated, including consumerism, waste generation, water usage, transport usage and use of residential energy for heat and electricity. This provides a more holistic overview to the project.

Many barriers to low-carbon transition at the community level remain. The White Paper on energy (DCENR, 2015) specifically states that communities and individuals are vital for successful transition. However, the White Paper fails to provide guidance or support. Within this context there are openings for new stakeholders and innovative solutions. In this chapter we look at the relationships between community groups with a wide range of actions and targets and how these can influence others to replicate suitable and achievable low-carbon transition projects.

The following section provides the justification for our selection of case studies. We then present the findings of each case study, covering organisation type, sustainability focus, current priorities, the aim of the community in relation to climate change and low-carbon transition, and, finally, relevant additional information gained from informal interviews and discussion with community group members.

3.5 Case Study Selection: Communities

Here, "community" is taken to be a group of voluntarily active participants who are stakeholders in climate-related action (the stake). However, such groups may also come together in partnership with other stakeholders, such as LAs, businesses, industry and other interested parties, to achieve their goals. Examples of such groups are energy co-operatives, transition towns or Tidy Towns groups. Others living within the environs of the community, while not active in organising the community, are affected by the actions of the community. It is envisaged that plans and actions developed and implemented in communities, where successful, would be disseminated to many other communities, to have an impact at national level.

Communities in Ireland, Germany and Croatia were selected as case studies based on a number of criteria. First, in all cases the activities of the community have been developed and implemented locally, by defined community groups. Second, the activities described are applicable to the indicator set, as defined for the blueprint and guidance manual. Third, the case studies represent a wide range of local-level responses to climate change, sustainability and low-carbon transition. Finally, none of the community groups' primary incentive was personal profit or financial gain; rather, the end goal was to provide community benefits, such as the provision of community facilities at a low cost, lessening the financial burden on local schools or community centres, or the provision of services to the elderly and disadvantaged. The end goal extends to providing local services and amenities that contribute to the transition to a low-carbon society.

The environmental landscape in Ireland continues to develop and mature. This is evident in the recent introduction of LECPs at LA level, with each LECP producing an environmental plan that is relevant to the identified needs of the LA area that it represents. The Irish case studies were chosen to represent the different approaches to community transition found in the review of the 32 LECPs produced by LAs. For this reason, Castleblayney (County Monaghan), Lauragh (County Cork) and the East Clare Community Co-operative, Scariff (County Clare) were selected as case studies in Ireland.

Croatia's late entry into the EU has seen active reformation of its environmental management sector. However, Croatia has many islands (circa 1000), where reforms are difficult and costly to implement. In a survey conducted by Eurobarometer (2019), 41% of Croatians thought it necessary to increase financial support for efforts aimed at transitioning to clean energy, and 50% of Croatians wanted their country to reach carbon neutrality by 2050. The case studies from Croatia highlight how the slow pace of implementing EU environmental legislation has affected low-carbon transition at the community level. Membership of the EU has resulted in many positive outcomes for Croatia, such as strong environmental legislation; however, it has also resulted in outward migration in the region of 280,000 people between the censuses carried out in 2011 and 2017. This has had a negative impact on rural regions and their ability to become more sustainable. In Croatia, three communities – Kokorići, Rogotin, and Hodilje, Ston Municipality – are presented.

Strong performance on implementing environmental legislation has aided the development of a successful environmental platform in Germany, particularly in the fields of clean energy and water technology. Eco-innovation is strongly encouraged by government policy and attracts public research funding. The case studies, Gimbweiler and Birkenfeld, which are located in the Rhineland-Palatinate region in south-western Germany, were selected because of their close collaboration with the university and municipality in the region. These demonstrate the advantages that collaboration with experts, local representatives and community groups can have when initiated in a systematic way. The choice of case studies allowed examination of the role of rural communities within different contexts and comparison of differences between EU Member States.

Across the EU, Member States have implemented policies, procedures and grant systems to address their low-carbon commitments. By taking a case study approach as a research method, an understanding of complex issues was reached. Additionally, knowledge was expanded, which adds depth to what is known from previous research. Case studies demonstrate how circumstances or conditions affect contemporary real-life situations and provide a platform for the dissemination of ideas and the extension of experiences.

Critics of case study methodology argue that the study of a limited number of subjects/communities does not offer either reliability or generality of outcomes/findings. However, the study of real-life situations, issues, problems and proposed solutions, when well planned and executed to eliminate bias, is a useful exploratory research tool (Yin, 2003). With this in mind, we have included additional case studies that have been completed through online research into active community groups in the UK, Austria, Croatia and the Netherlands.

In addition to selecting community groups that satisfied the research criteria, a site visit to Malmö, Sweden, was undertaken. The projects being carried out in Malmö are led and supported by the municipality and have resulted in multi-stakeholder environmental and social initiatives that promote sustainability, health and wellbeing. The broad base of sustainability projects address issues from sustainable transport to waste management. An important aim of the city is to make it easy for residents, industry and the municipality to "do the right thing" and to make sustainable choices around issues from the purchasing of consumer goods to travel, services, waste management and energy use.

3.5.1 Ireland: national policy and guidance

Population and economic growth will contribute to the rise in energy demand in Ireland. Ireland follows the rest of the world in its reliance on fossil fuel-derived energy and it is projected that fossil fuels, which currently supply up to 91% of Ireland's energy requirements, will continue to be the dominant energy source, making Ireland the most energy import-reliant country in the EU (O'Rourke *et al.*, 2009). RE use (in particular solar and wind energy) is increasing rapidly and its share in the energy generation sector is forecast to rise to approximately 14% of the final energy demand by 2030.

The SEAI projections to 2030 anticipate energy demand to be strong, in line with economic growth within the Irish economy (SEAI, 2018). This increase in demand, coupled with continued reliance on imported fossil fuels, leaves Ireland in a precarious position (O'Rourke *et al*., 2009; SEAI, 2018). Ireland's position is made more difficult by conditions and features beyond its control, such as limited indigenous fuel supplies, limited levels of interconnectivity and a small market scale in comparison to its European neighbours (Clancy *et al.*, 2015). The key themes pertinent to energy in Ireland are:

- the impact of increased demand;
- changes to consumption patterns;
- fossil fuel dependency;
- volatile natural gas and oil prices;
- an increase in the growth in share of renewables;
- a decline in the market share of coal and peat;
- new electricity interconnections between the UK and France (Brexit may have unknown effects).

Without policy intervention, and with the absence of additional hydro resources and the statutory prohibition on nuclear energy, Ireland's dependence on natural gas for energy generation would account for approximately 40–50% of electricity generation to 2040 and beyond. Reliance could be significantly greater and is highly dependent on the degree of electrification of transport and heating (McMullin *et*

al., 2018). To avoid this over-reliance on a single fuel and to maintain a balanced fuel mix for electricity, it is necessary to incorporate and maintain a diverse mix of RE sources. Within rural communities, the role of renewable gas as an alternative for transport and heating, in conjunction with battery storage and other energy technologies, could contribute to energy security and grid stability. At community level, access to local energy storage may provide improved resilience and safeguarding against grid connection failure during extreme events.

To date, the energy sector in Ireland has made substantial reductions in CO_2e emissions. This has been achieved through a number of changes implemented in the sector:

- changes to the fuel mix;
- increased use of RE; and
- efficiency improvements (Clancy *et al.*, 2015).

In its White Paper on energy, *Ireland's Transition to a Low Carbon Energy Future* (DCENR, 2015), the Irish government acknowledges that RE plays an important role in the security of supply, environmental sustainability and economic competitiveness. The White Paper sets out a very clear direction for energy policy in Ireland; however, it lacks a robust implementation plan to set out clear targets and milestones, enabling policies and an effective framework of governance (Engineers Ireland, 2016). The White Paper stresses the importance of citizens engaging in the energy transition movement. Conversely, community action groups increasingly find themselves out of their depth when embarking on energy transition projects (Boxes 3.1–3.3).

Electric Ireland, the largest provider of electricity in Ireland, is currently running a micro-generation pilot scheme. However, this scheme is available only until 31 December 2019 and has been closed to new energy producers since 31 December 2014. Currently, householders outside the Electric Ireland pilot scheme must "spill" excess electricity back into the national grid for free. The Climate Action Plan (DCCAE, 2019) has established a micro-generation scheme that will allow all householders to generate electricity and sell their excess back to the national grid. Lobby groups, including the Irish Farmers' Association, have called for the initiative to be guaranteed for at least 20 years. In Ireland the SEAI has been tasked with developing programmes to improve the EE of residential and community buildings. SEAI programmes provide grants that are processed from an economic perspective, on the basis of savings to energy costs, retrofit investment costs and payback time. The introduction of a feed-in tariff is seen as a positive approach to encourage individual and community-based energy generation.

Box 3.1. Case study: Lauragh, Co. Cork	
Organisation type	Charity
Contact	lauraghcomco@gmail.com
Community size	250
Sustainability focus: ● RE generation; ● financial and energy savings; ● EE; ● sustainable employment; ● sustainable economy; ● behavioural change; ● energy education.	
Funding and financing sources: ● Clann Credo, SEAI.	

Current priorities:

- climate change;
- energy generation;
- EE;
- transport;
- waste;
- water;
- local food;
- lighting;
- social enterprise;
- building retrofit.

Stated aim of the community:

The objective is to regenerate the community by increasing the potential to make a living here. The way this will be achieved is by creating a community energy scheme. The revenue from this will be used to fund services that the community sees as important. There is interest in improving the EE of homes and researching local energy resources. The aim of this work is to help make Lauragh an economically viable place to live by reducing costs, providing services and creating employment. Lauragh Community Council was formed to give a voice to the community and to plan and seek funding for local projects.

The Council will provide a space where the group can come together and plan projects to improve the area for everyone (under headings like employment, tourism, public amenities and facilities, services, infrastructure and more). The group will work to benefit everyone.

Lauragh is similar to many other communities located on peninsulas and faces similar difficulties, including a low population density exasperated by outward migration, weak employment opportunities and isolation.

Local meetings organised by the Community Council in 2016/2017 to brainstorm ideas for developing the community led to the formation of the Energy Sub-group. Proposed projects include activities for the elderly, safe walking routes to attract tourists to the area and local job creation. In an informal interview with a member of the Energy Sub-group committee, a number of issues were discussed. The project took off in the summer of 2018 after a poster and leaflet campaign informed the community of the SEAI Warmer Homes Scheme (WHS) and a meeting was organised to provide further information and an opportunity to meet experts. The meeting demonstrated different options that could be developed in the community and local businesses gave talks on micro-hydro energy, solar energy and the WHS. The Energy Sub-group has three active members (as of 2019) and, since becoming involved, we have learnt much about the obstacles that can derail community sustainability projects, but also how to overcome these. The issues encountered included difficulties with grant schemes and funding, as detailed below:

- The first impression of the SEAI WHS application process was that it would be overwhelming. However, it turned out be manageable and the forms were not as difficult to complete as first thought. This initial impression created barriers that were unfounded.
- The SEAI keep changing the name of their grant schemes.
- The size of the forms was more daunting than the process of filling them out.
- The financial section was the most difficult, especially setting milestones; however, milestones were goals and could be altered if necessary.
- A grant of €10,000 was available for consultancy work on the Energy Master Plan; however, this grant could not be used to produce posters and leaflets or to pay for the cost of organising meetings.
- The Community Council had secured funding from Clann Credo (Clann Credo is a social investment fund and part of the community and voluntary sector) and this was vital. Payment for consultancy work carried out had to be made upfront and reclaimed afterwards.

- Getting a loan from Clan Credo for the first time was time-consuming and without it the project could have stalled or been abandoned.
- This is a small community and cash flow was challenging. Interest due on the loan was a cause for concern.

The first stage of the SEAI grant application process was the preparation of an Energy Master Plan; however, data collection was slow in some instances. While the need for a baseline was understood, the cost was high for work that potentially could have been completed by the community.

Other difficulties encountered were as follows:

- The same people are involved in many projects and attend meetings and there is a recognised need within the committee to widen the circle to increase engagement outside the core group. The committee members think that this will give more credibility to the project and generate a higher level of acceptance within the community.
- Most of the people who volunteered have full-time jobs and other obligations, which affects their ability to commit to the project. Many depended on seasonal tourism for their income so had to defer their involvement to wintertime.
- There is concern that housing and community buildings are underutilised and that local demographics are not representative of the national population (mainly retired people as a result of younger residents moving away for work).
- Attempts to encourage families to move to the area have not been successful. There are many holiday homes that are unoccupied for much of the year but that are not available for long-term rent or for sale, and local employment opportunities are lacking. This has led to concerns over the future of the local school, which in 2019 employed two teachers. The closure of the school will have further consequences for the population and local employment.
- The availability of locally provided and reliable broadband is seen as an incentive to encourage more people to the area. However, concerns have been raised about the future of this supplier if high-speed broadband is extended to some parts of the area. There are fears that a loss of customers to the National Broadband Scheme will cause the local supplier to close, with a loss of jobs and service for remaining customers who are too isolated to be connected to the National Broadband Scheme.
- Additional difficulties related to the requirement to obtain three tenders and the shortage of suitable consultants. Within the community there is a feeling that members can become more involved in data collection. Cutting out the need for a consultant and the associated fees would keep potential savings within the community to fund further projects and create local employment opportunities.
- Advertising the project in the community was an out-of-pocket expense borne by the committee members and is a barrier to getting more people involved. In addition, it was thought that this money could have been put to better use, for instance it could have been used for minor retrofit works.
- Since 2019 there has been a low uptake of the WHS. This may be because residents do not want committee members to know their financial situation.

Moving forwards:

- Tourism is an important aspect of the local region and the community has expressed an interest in developing walking routes to attract visitors and to provide safe amenities for its residents.
- A number of possibilities to address low employment opportunities have been discussed, including the viability of using local resources that are in abundance. These include gorse, kelp and mountain sheep wool. Incorporating this into a social enterprise could provide local benefits.
- To combat the issue of isolation, a lunch club has been suggested, with the intention of extending the service to everyone in the community. Future plans include outings and excursions as a means to further address isolation.

Box 3.2. Case study: East Clare Community Co-operative	
Organisation type	Not-for-profit co-operative
Web address	http://www.eastclarecommunitycoop.com/
Contact	East Clare Community Co-op Main Street Scariff Co. Clare Tel.: 061 921536 Email: eastclarecoop@gmail.com
Community size	250 shareholders but serves the wider community
Funding and financing sources: ● Clare Local Development Company; ● LEADER (Liaison entre actions de développement de l'économie rurale or Links between Actions for the Development of the Rural Economy); ● National Development Plan 2007–2013; ● Department of the Environment, Community and Local Government (Pobal).	
Current priorities: ● local food; ● sustainability; ● social enterprise; ● facilitating new enterprise creation.	
Stated aim of the community: "East Clare Community Co-operative Society aims to provide an inviting space within the community to generate viable and sustainable activities which support the development of the individual and the community".	
Additional information: The East Clare Community Co-operative is a not-for-profit co-operative that promotes a variety of community-led services and activities. The co-operative evolved naturally and was established initially by newcomers to the community with alternative outlooks and lifestyles. The co-operative was the result of the community coming together and their ideas becoming mainstream. There are 250 shareholders and approximately 20% are active in the co-operative and half of these are very active. A committee was elected to oversee management, which in turn works to secure funding and provide employment locally. In addition to paid employees, a number of people volunteer their time at the co-operative, with some travelling from outside the community to lend a hand. The Co-op's cafe has grown its customer base over the past 3 or 4 years and generates an income from food grown and cooked on site. Other income sources include room rental, which is kept at a low rate so that it is accessible to everyone (€10/hour), and two commercial activities – a cookery school and an enterprise centre. All food grown on site is organic, but has not been certified as such. The cafe uses everything that the Co-op produces so there is no surplus. Additional items are purchased from local producers where possible. The management aims to use local suppliers as much as possible for all purchases, including office stationery and supplies.	

In terms of waste, both the cafe and the cookery school generate compostable waste that is composted on site to be transformed into a resource for the community garden. The compost facility is open to the community and has been welcomed by many whose gardens are too small to accommodate a composter. A three-stage system operates and there are no significant problems with odours or contaminants. The kitchen also generates cooked food that cannot be composted and there are plans to set up a wormery to address this. The position of the co-operative in the centre of the town is essential to its continued success. The co-operative initially secured a long-term lease on the current property to ensure its sustained operation at the heart of the community. In 2019 it was almost 30 years into a 35-year lease.

Funding support from Pobal was essential for maintaining management of the co-operative, which in turn secured external funding (Brothers of Charity, LEADER) and Tús and Community Employment (CE) scheme participation. Currently, the CE scheme employs two people and they in turn generate income to support jobs for six other people.

The main activities of the co-operative are:

- The Garden Cafe – salads and vegetables grown on site are served in the low-cost vegetarian cafe.
- Second-hand clothes shop and bookshop – an outlet for low-cost second-hand items, promoting reuse and repurposing.
- Counselling and support services – in partnership with Ciunas, a range of support measures, counselling and play therapy is provided for the community.
- Scariff community garden – a space to grow organic food to the rear of the Garden Cafe. This space is also used for events such as festivals and theatre productions. Within the garden there is a compost area, a rain water harvesting system and places to take shelter from the elements. The co-operative can also arrange tours for visitors; this was especially welcomed by people attending cookery classes and was an ideal opportunity to show where their ingredients came from.
- Provision of a community market, space rental and a wood-fired pizza oven – what started as a smallholders' market selling locally produced food has grown and expanded to include a large range of home-grown and produced goods and crafts, as well as goods from further afield. Within the building, space is available to rent at a low cost so that a wide range of activities can be provided for the community. In addition, the Men's Shed group built a wood-fired pizza oven that is available to rent for functions and other events. These facilities are seen as important infrastructure on which strong community cohesion has been built.
- Sustenance – Food Training and Enterprise Centre – the centre has provided two fully equipped kitchens for community use. This facility is also used as a pop-up bistro, for food safety training and for accredited food-based courses.
- Cothú Cookery School – formally launched in 2017 with a focus on local, sustainable and healthy food, this school offers a mix of courses to suit all budgets.
- European youth exchanges – the community has been hosting European visitors under the Gruntvig programme. It also offers young people the opportunity to experience youth exchanges to other countries through the Erasmus programme. These exchanges benefit local youth by exposing them to opportunities to improve their leadership and active citizenship skills.

Moving forwards:

The goal is that by 2022/2023 existing loans will be paid off, freeing up resources that can be diverted towards a fund to purchase the property.

Difficulties encountered include:

- Energy costs are high as a result of the activities carried out in the co-operative. This has been addressed in a small way by the installation of a solar photovoltaic system with the financial assistance of a grant from the SEAI. However, there is no battery storage as a grant was not available at the time of application. Excess energy generated is being fed back into the national grid for which the co-operative receives no payment or reduction in its electricity costs.
- There is no incentive to invest further in the building as any benefits will be afforded to the owner of the property and will also increase the value of the property.

This has left management in a catch-22 position – the high energy cost means that there are fewer funds available to put aside to purchase the property, but lowering the energy cost would increase the value of the property. Any other infrastructural work will benefit the landlord but not the tenants.

Box 3.3. Case study: Castleblayney sustainable energy community (SEC)	
Organisation type	SEC
Web address	https://www.facebook.com/castleblayneysec/
Contact	Castleblayneyenergy@gmail.com
Community size	<3000
Sustainability focus: ● EE; ● low carbon/carbon neutral.	
Funding and financing sources:	
Current priorities: ● climate change; ● energy generation; ● EE; ● transport; ● waste; ● water; ● local food; ● lighting; ● social enterprise; ● building retrofit.	
Stated aim of the community: The ambition is to ensure a reduction in energy use in Castleblayney. Our main focus, initially, is in relation to community facilities but we will also target other sectors as we develop. Additional information: The Castleblayney Sustainable Energy Group has received national recognition, in association with Eurotech Renewables, at the SEAI Energy Awards 2018. This award recognises and rewards excellence in all aspects of RE and EE. With a strong community focus on sustainability, Castleblayney SEC has identified a number of issues that require intervention at the local level to drive the community forwards in its low-carbon transition. The Energy Sub-committee has completed an Energy Master Plan for the community. This has highlighted potential energy-saving and retrofit opportunities for householders in the town and surrounding areas. Initial costings for	

basic upgrades to the insulation of walls and roofs, with a provision for low-energy lighting throughout each property, have been calculated. Typical costs amount to €2850 net of SEAI grants, with potential annual savings of €700 and payback periods of 4–5 years. The overall costs to householders can be further reduced if the work is undertaken as a collective through the local energy group.

Moving forwards:

Monaghan County Council has commenced a programme to install external insulation in properties under its remit within the town's housing estates. This has resulted in a chequerboard effect, with many homes in private ownership not qualifying for the energy upgrade. Not only has this resulted in an unsightly front elevation, the overall EE potential of the retrofit cannot be fully realised until all of the properties have completed the energy upgrade. To move forwards on this, the SEC is in the process of applying to the SEAI for funding under the Better Energy Community Scheme to carry out the necessary works. The SEC committee is already in receipt of funding for two other projects: (1) an energy upgrade to the Iontan Centre, the local community enterprise centre, and (2) lighting upgrades for three local businesses.

All aspects of sustainability are important to the community of Castleblayney. There are two community gardens located in the town, with each offering residents the opportunity to grow their own food. In addition, the gardens provide a meeting place, with events held in conjunction with the annual Muckno Mania Festival. The 2019 festival had a special focus on zero waste and volunteers set up crewed recycling stations to educate festival goers on how to separate and properly dispose of waste. There was also an emphasis on reducing waste and the avoidance of single-use plastics. Volunteers also ensured that any residual waste was cleared away after the events. The committee hopes to extend the initiative to all community events in the future.

Difficulties encountered include:

- Barriers have been identified by the committee, with the most limiting being the low level of allocation of funds for administrative duties in relation to the projects. The current rate is 7% of capital funding and this severely impacts on the committee's ability to attract and retain staff to oversee projects to completion.
- The issue of governance is also of concern, with no clear guidance provided by the SEAI on responsibilities and liabilities or mechanisms to protect members of the committee.
- Issues with traffic congestion and transport have been raised and the committee and wider community are looking for ways to make the town more pedestrian friendly. The current streetscape does not allow for pedestrian access between the main commercial areas. Many of the connecting lanes have been blocked and gated, resulting in extended walking distances between the many shopping and recreational areas of the town. The overall result of this disconnect is a high usage of private transport for short commutes. A direct and very obvious effect of this within the commercial area of the town is the poor air quality. A number of suggestions have been put forward, including the opening up of archways and gated laneways to the "backlands". This would open up connectivity between the different areas of the town.

3.5.2 Croatia: national policy and guidance

The South East Europe (SEE) region, which includes Croatia, is witnessing a growing interest in citizen energy and opportunities to invest in RE projects (Boxes 3.4–3.6). Many finance schemes are available that individuals and communities can jointly invest in. Energy co-operatives are not exclusively the remit of citizen energy but rather a conduit for varied stakeholders, such as farmers, local businesses and local enterprises, to become involved in the decision-making of localised energy infrastructure. Croatia, along with the SEE region, is looking at examples in the rest of Europe and the EU to drive government support for community energy and grass-roots movements, such as energy co-operatives. The term "co-operative" remains associated with communist rule and therefore is not a widely accepted model in Croatia. A second issue is that public discussion and, according to stakeholders, knowledge within the scientific community is limited. There is a need to co-ordinate actions, including access to information, training and education, and the design or development of country-specific models to encourage, and give

confidence to, citizens to become involved and to invest in RE projects (Enercoop, 2016). Joining the EU in 2013 has benefited Croatia in many ways, not least in the development of RE. Exposure to the EU energy frameworks and rules relating to the common energy market has enabled talks and actions that have resulted in changes to the structure of energy generation (IRENA, 2017a). Progress has been made possible through the organisation of seminars countrywide and the provision of information via online forums and websites and printed material, resulting in increased support for RE co-operatives. The success of the campaign is evident by the fact that 10 co-operatives were set up in 2013. These co-operatives have various energy focuses, including solar photovoltaic (PV) systems, biogas, biomass, wind electric mobility and EE in buildings. The formation of the energy co-operatives was made possible through dialogue and collaborations between the United Nations Development Programme (UNDP) Croatia and a group of 10 other organisations, including non-governmental organisations (NGOs) and local municipalities. Knowledge and experience transferred to Croatia by Citizenergy, an EU-funded project, was invaluable as it provided a platform to bring together energy co-operatives and crowd-funding opportunities for investors seeking to invest in RE projects (Citizenergy, 2015).

Energy in Croatia is predominately generated from gas/oil (12.4%), coal (20%), wind (7%), biomass (2.3%), solar (0.5%) and large hydropower facilities (57%). Croatia has depleted its own oil and gas reserves and, like other Balkan States, must import much of its energy to meet demand levels (Runko Luttenberger, 2015). In addition to increased imports of natural gas, petroleum products and electrical energy as a result of depleted resources, Croatia is currently facing increased electrical demands nationally, and this trend is expected to continue (Bukarica and Robić, 2013).

Croatia's high dependence on imported fossil fuels extends to its island communities, which experience great difficulties in relation to energy supply and security. Since 2001 the International Renewable Energy Agency (IRENA) has provided support for small island developing states (SIDS). IRENA is also responsible for co-ordinating the SIDS Lighthouses Initiative (IRENA, 2017b). The Lighthouses Initiative supports island communities' transition away from fossil fuels and enables deployment of RE to provide power, heating, cooling and transport (IRENA, 2019). Two EU strategies have been developed to address climate change and sustainable development on the islands: (1) the Smart Island Initiative (Smart Island Initiative, 2019) and (2) Clean Energy for EU Islands (EC, 2017b).

Energy consumption in the Croatian housing stock is higher than the EU national average (Mikulić *et al*., 2016) because of a lack of adequate insulation. As a post-transition country, Croatia is less developed than many other EU states and as such is less energy efficient (Ürge-Vorsatz *et al*., 2010). The economic conditions in Croatia have had enormous consequences for regional and national development. The Croatian mainland has a more developed natural gas infrastructure, whereas southern Croatia and the islands rely on firewood and electricity (the most expensive energy source in Croatia) for energy consumed.

In 2016, the Act on Renewable Energy Sources and High-efficiency Cogeneration effectively removed the feed-in system for facilities with a capacity greater than 30 kW. Support for solar PV systems under the feed-in-tariff ceased at 52 MW, with the result that some planned projects were cancelled with the loss of potentially hundreds of megawatts of electricity. The difficulties faced by community groups and individual householders are many, with existing large-scale RE projects receiving preferential producer status, guaranteed priority access to the national grid and annually adjusted tariffs matched with inflation. Without subsidies, it is not economically viable for individual householders to become energy producers. The current pricing of energy for private households includes non-energy costs at a rate of almost 50%. This covers grid maintenance and other fees that are not netted; this means that, for every kilowatt-hour consumed, the non-energy costs are added on. In addition to the pricing structure, for every kilowatt-hour fed into the grid, the price paid to the householder is reduced by a factor of 90%. A further impediment to householders is the billing cycle. The net metering scheme, under which energy producers or prosumers are billed and credited for energy, works on a monthly billing cycle. This further affects the economic viability of becoming a prosumer of energy because of seasonal variations in energy consumption and generation that are not compensated for in the payment structures (IRENA, 2017a). The commercial and industry sectors are supported by the

Environmental and Energy Efficiency Fund (Fzoeu, 2019). It is expected that the fund will grant subsidies to individual households so that they can invest in energy-generating equipment; however, at its current rate, small-scale energy generation at the household level will not be economically feasible.

Extensive research has been carried out on the technical ability of storage systems to support RE sources (RESs) (Kaldellis *et al*., 2009), solar PV systems, wind energy (Blechinger *et al.*, 2016) and biomass energy (Selosse *et al*., 2018). Kapsali *et al*. (2016) demonstrated the economic feasibility of developing a significant wind energy share in RE generation. Moreover, the study showed that an energy strategy that incorporates a high RES share is cost-effective, with added benefits for desalination and domestic hot water systems that can reduce peak loads and costs as part of a demand–response strategy. Extreme seasonal variations in energy consumption that occur as a direct consequence of the tourism industry require RES systems with considerable capacity for wind and solar energy. In addition, battery storage is a major issue if a 100% share of RESs is to be achieved.

Box 3.4. Case study: Rogotin, Dubrovnik–Neretva County

Community	**Rogotin**
 The centre of the community  Overall look, including the settlement, lagoons and protected areas	 Agricultural land – future threat from rising sea levels
Web address	www.rogotin.hr
Community size	665

Sustainability focus:

- future sustainability of traditional activities: fishery and agriculture;
- how to deal with protection of the Natura 2000 area and development;
- RE generation;
- energy and water use efficiency;
- sustainable employment in tourism as an emerging sector;
- sustainable economy based on traditional resources and the new tourism sector;
- climatic changes: temperature and salinity changes, water level increase;
- migration of younger citizens within Croatia and the EU (including Ireland) and an ageing population.

Environmental status:

- The community is situated in an EU Natura 2000 area – the Neretva Delta – with its specific conservation priorities.

Funding and financing sources:

- EU financial instruments.

Current priorities:

- Climate Change Adaptation Action Plan;
- sustainable energy generation;
- EE and water use improvement;
- waste collection improvements;
- building of the regional sewage system;
- water for agriculture;
- local food production and its branding.

Stated aim of the community:

The major objective is to generate new developments for the community, based on sustainable development principles, in order to secure the traditions of those living in the estuarine area. The community has suffered from several major problems recently, such as an increase in the water temperature of estuarine waters and a reduction in the influx of freshwater, which promotes salinisation. This has impacted agricultural land in the lagoon and estuary areas, decreasing the quality of traditional crops such as tangerines, grapes and several vegetable crops. Warming of the brackish water has attracted several invasive species such as the blue crab, which has had a devastating impact on traditional fishery practices.

Rogotin consists of traditional and new houses; there are no buildings that have been constructed for any business purposes, such as tourist accommodation or food service activities. The houses are supplied with electricity and water from public sources, none of which is generated from renewable resources. The traditional practice of rainwater harvesting has been abandoned. The community is located within the boundary of the town of Ploče. Its town council and mayor are responsible for all communal activities, road infrastructure and development planning. The community is represented by the elected head of the village, but his power is insignificant. The formation of an unofficial board or a local NGO is under consideration to deal with financial opportunities for local projects and developments.

Moving forwards:

The future of the community is not clear. While tourism during the summer season is one of the future development goals, other local activities are clearly endangered.

In order to build a sustainable community, the town needs to declare itself as such.

Difficulties encountered include:

- Different visions for the community as a result of micro- and macro-political interest; further education is needed on the benefits of sustainable development.
- There is no tradition of NGOs or other civil organisations for the promotion of local development and the protection of nature.
- The principles of sustainable development are poorly known and understood. Currently, waste is occasionally dumped in the river reach, even though waste management options are available in the community.
- The community is without legal status and thus is not eligible for direct independent financial aid for project execution.

- There are no incentives for the use of PV solar energy or other RE systems.
- There is no active local action group or no activities are carried out by a formal body.
- Knowledge of ongoing and future climate change is poor and any adaptation ideas are viewed critically because of this lack of information.
- The citizens have narrow short-term views and interests.
- Sustainable development is not imbedded in the core views of the citizens.

Box 3.5. Case study: Hodilje, Ston Municipality, Dubrovnik–Neretva County

Community	**Hodilje, Ston Municipality**
 The centre of the community, with shellfish culture facilities in the foreground	 Local port with small fishing vessels
Web address	http://www.ston.hr
Community size	190

Sustainability focus:

- future sustainability of traditional activities: shellfish culture and fishery;
- how to deal with protection of the bay area as a nature reserve, with specific restrictions on shellfish culture;
- energy and water use efficiency;
- sustainable employment in tourism as an emerging sector in light of the protection status of the bay area;
- a sustainable economy based on traditional resources and new tourism activities;
- climate changes: temperature and salinity changes, water level increase;
- migration of younger citizens from the region and Croatia.

Environmental status:

- The community is situated in a protected nature area, Malostonski Bay, under national legislative systems with their specific conservation priorities. Although the initial reason for protection was preservation of the traditional flat oyster culture, further clarification provided by government agencies does not support this, meaning that the future of the sector is under threat.

Funding and financing sources:

- EU financial instruments.

Current priorities:

- Climate Change Adaptation Action Plan for the shellfish culture sector;
- development of a modern shellfish aquaculture with a hatchery;
- EE and water use improvements;
- waste collection improvements;
- building of the regional sewage system;
- sustainable tourism development;
- local shellfish production enhancement and its branding.

Stated aim of the community:

The community is represented by the elected head of the village, but he has very little power. The formation of an unofficial board or a local NGO is under consideration to deal with financial opportunities for local projects and developments. The main objective of the community is to preserve its protected status through implementation of sustainable development principles in order to secure the local traditional shellfish culture and use of these products in promoting rural tourism. The present tourism model is based on renting accommodation in private houses. A significant number of houses are already used in this way. In addition, one private campsite accommodates tourists in the area. Ongoing tourism is supported by EU financing, which assists in providing tourists with traditional local food and accommodation.

There is no use of PV solar or wind energy for generating RE. Household sanitation is provided by private septic tanks and there is evidence that most wastewater is discharged to the sea without any form of treatment. There is no regional waste centre, so local waste is exported to the neighbouring town of Neum in Bosnia and Herzegovina and consigned to an unmanaged landfill site in close proximity to the coast.

Moving forwards:

The sustainable future of the community is not clear. While tourism during the summer season is one of the future development goals, the traditional shellfish culture and fishery are clearly endangered. The population during wintertime is critically low, putting pressure on local enterprises because of a lack of suitably experienced workers. A significant percentage of business activities are family based. Migration of younger people and the ageing of the remaining population are putting pressure on the remaining traditional employment opportunities. In order to build a sustainable community, the town needs to declare itself as such. A Basic Master Plan for future activities and a Local Action Plan are necessary; these should cover all of the issues identified regarding the sustainability of the community.

Difficulties encountered include:

- The principles of sustainable development are poorly known and understood.
- The community is without legal status and thus is not eligible for direct independent financial aid for project execution.
- There are no incentives for use of PV solar energy or other RE systems.
- Knowledge of ongoing and future climate change is poor and any adaptation ideas are viewed critically because of this lack of information.
- The citizens have narrow short-term views and interests.
- Sustainable development is not imbedded in the core views of the citizens.

Box 3.6. Case study: Kokorići, near the town of Vrgorac, Split–Dalmatia County

Community	**Kokorići, near the town of Vrgorac**
 Overall look, including the settlement, highway and new tourist resort	 Agricultural land – small private land parcels dominated by vineyards, vegetables and strawberries
Web address	www.vrgorac.hr
Community size	161

Sustainability focus:

- preserve traditional ways of living;
- promote traditional food and accommodation facilities;
- energy and water use efficiency;
- sustainable employment in rural tourism;
- a sustainable economy based on traditional agriculture and livestock and the new tourism sector;
- climate changes: air temperature and humidity changes, storms with significant rainfall and floods;
- migration of young people within Croatia and the EU and ageing of the population.

Environmental status:

- The community is situated in a hilly area, only 5 km in a direct line from the sea, but does not have direct road access. The area is not protected by any national legislation.

Funding and financing sources:

- EU financial instruments.

Current priorities:

- sustainable drinking water supply;
- EE and water use improvements;
- household solar energy development;
- water for agriculture;
- local food production and its branding;
- destination management;
- road/tunnel to the coastal area.

Stated aim of the community:

The major objective is to generate new opportunities for the community, based on sustainable development principles, in order to secure the traditional lifestyles. Because of the limitation of resources such as land, water and human resources, the potential for development in this karst area is questionable.

Future development goals of the community include the modernisation of traditional agriculture and its use in rural tourist facilities to target quality and profits. This goal will also depend on better connectivity with coastal

areas through a new tunnel from the community area to the coast. The higher volume of tourists visiting the area will attract the building of new accommodation facilities and private houses, and this should trigger other activities such as local food production, including locally produced ham, fruit and wine.

Moving forwards:

The future of the community (with regard to ongoing migration and ageing) is doubtful.

The population has decreased by 50% in the past 100 years, with the area suffering from migration to other parts of Croatia and the EU. The population in the surrounding areas is already at critical levels.

While boosting agriculture and tourism during the summer season is one of the future development goals, there is little prospect of developing industry. However, a local entrepreneur is building the largest Croatian factory for the production of dried and smoked ham (already EU branded as "Dalmatinski pršut") within 5 km of the community and this will enhance job opportunities locally. Additional income is generated from artisanal agriculture during the summer, as well as from small-scale wine production and tourist accommodation in private homes.

Difficulties encountered include:

- The principles of sustainable development are poorly known and understood.
- Basic training should be provided in order to raise interest and increase knowledge.
- The changes in weather patterns have affected rainfall and recently caused flooding during winter and spring.
- Flooding is a threat for local sustainable and organic agriculture.
- Knowledge of ongoing and future climate changes is poor and any adaptation ideas are viewed critically.
- The citizens have narrow short-term views and interests.
- There are no incentives for household RE systems.
- Sustainable development is not among the core views of citizens.

Many younger and educated people (aged 20–35 years) have left the community and live in the larger cities of Croatia. Others have immigrated to Germany, Ireland or other EU states. This trend is increasing because of the poor development of industry in the area and lack of employment opportunities.

3.5.3 Germany: national policy and guidance

In 2000, the energy transition took off in Germany. Since then millions of ordinary German citizens have become energy producers. "Bürgerenergie", or citizen energy, is the word used in Germany to describe citizen involvement in RE generation (Yildiz, 2014). Investment in solar PV systems, shares in wind farms and, to a lesser extent, bioenergy accounts for 42% of Germany's installed RE capacity of 100.3 GW (Wettengel, 2018). Feed-in tariffs for RE were guaranteed for 20 years by the Renewable Energy Sources Act (EEG) (Federal Ministry for the Environment, 2000). This provided an incentive that encouraged households to install PV systems. The feed-in tariff of €0.51/kWh means that payback times are relatively short. For example, installation of 44 m^2 of PV panels will generate 5000 kWh of electricity and will have a payback time of 10 years, after which the homeowner is in profit.

With the assistance of specialised project developers, energy co-operatives, limited liability companies and limited partnerships have been formed by individuals and groups to facilitate investment in larger and more ambitious RE projects (Boxes 3.7 and 3.8). This approach allows for the part-ownership of solar parks and wind turbines. The co-operatives are not limited to defined communities or localities and many are regional and even inter-regional operations. While the energy projects are owned and operated by individuals and groups, companies and municipalities can also invest. The projects remain separate from municipal utilities.

There are two defined types of citizen involvement in the RE sector. The first is "citizen energy in

the narrower sense" (Trend Research, 2013; Sridhar, 2016):

- private individuals or farmers, either jointly or individually, invest in energy facilities;
- investment is from personal capital; this provides security of control over the project;
- a minimum of 50% of the voting shares are controlled by individuals;
- individuals have a connection to the area where the project is operated.

The second type of citizen involvement is ownership through inter-regional investments. This involves collaboration with municipalities, public energy providers or public credit institutions. In these arrangements, citizens own a minority of the shares; this is referred to as "citizen energy in the broader sense" (Trend Research, 2013; Sridhar, 2016).

The 2016 reform of the EEG introduced a definition of citizen energy companies. This included a proviso for special privileges in energy auctions, thus aiding citizen energy co-operatives in the first auctions. This was in spite of critics claiming that reforms would favour corporate projects and potentially damage the future of citizen energy. As a result of this decision, prices for the feed-in tariff for larger than average installations are determined by daily market prices. This adds a layer of complexity for these energy producers that must either market the energy generated themselves or go through a third party. This removes any guarantee of minimum pricing. The revised regulations affect small energy producers differently. The price of solar panels continues to fall with increased sales, and the guaranteed feed-in tariff has been cut to €0.13/kWh. Uncertainty in the market has affected the take-up of investment in small-scale renewable projects.

The reforms have had a much more pronounced effect on investment in energy co-operatives. A lack of certainty regarding feed-in tariffs has introduced a level of uncertainty that was not previously present, resulting in a "wait and see" scenario as members are left unsure of investment returns. This uncertainty was evident prior to the reforms being approved by parliament: in 2013, just 8% of energy co-operatives did not have an investment plan whereas in the following year almost 33% refrained from investing because of unpredictable returns. In addition, the reforms have affected the number of new co-operatives forming, with numbers falling to 2009 levels. This provides evidence of the need for co-operatives to be confident in the feasibility of implementing the new legal requirements before committing to an investment plan.

Box 3.7. Case study: Birkenfeld Municipality, Germany	
Organisation type	Municipality
Web address	https://www.vg-birkenfeld.de/rathaus/buergermeister.html
Contact	Dr Viktor Klein: v.klein@gvg-birkenfeld.de
Community size	6923 (2017)
Funding and financing sources: ● Municipal funds and research grants.	
Current priorities: ● climate change; ● energy generation; ● EE; ● transport; ● waste; ● water; ● local food; ● lighting;	

- social enterprise;
- building retrofit.

Stated aim of the community:

Birkenfeld 2030: All administrative buildings will be energy efficient. The district heating system is currently connected to public buildings and 12 private homes. The next issue to address is transport as CO_2 emissions in this sector have not fallen.

The current Mayor, Dr Bernhard Alscher, with support from Trier University of Applied Sciences, was motivated to save money by employing RE technologies. This strategy also meant that the municipality was eligible to receive funding from the federal government for efforts to reduce CO_2e emissions.

Additional information:

Collaboration with the Trier University of Applied Sciences Birkenfeld Campus was instrumental in fostering ideas and increasing interest locally in RE technologies. RE has been beneficial to the municipality as the motive of saving money was brought to the attention of the community, which encouraged people to get involved financially.

Unlike the SEAI grant schemes in Ireland, there are no federal government grants for RE technologies in Germany. Payback from investments is realised through the sale of excess energy and reduced energy costs.

Initial reactions to the project were of disbelief, with people unconvinced and questioning its practicality. To address this, council members were invited by Trier University to attend meetings that were designed to demonstrate the potential benefits to the municipality. Examples were shown of projects implemented in other towns and villages. Collaboration and support between stakeholders and local actors was found to be important for advancing ideas and successfully completing projects.

Regional added value (RAV) is an important factor in promoting energy projects. The local mayor admits that, for many, financial benefits to the local economy were the primary motivator rather than CO_2e emissions reductions. Where RAV is strong there is the potential to carry out additional projects that do not add value but are socially beneficial. In addition, short election times can be a hindrance as communities need to think in the longer term. With a majority vote at municipal level needed to pass motions it was important to educate members; this was achieved by demonstrating social, economic and environmental gains.

Moving forwards:

The Mayor of Birkenfeld, supported by the Institute for Applied Material Flow Management (IfaS) at the Trier University Birkenfeld Campus, planned to use the local media to further highlight the community's agenda. The mayor felt that climate change and sustainability must be kept in people's minds and that competition should be encouraged between towns and villages. Healthy competition was a way of ensuring continuous improvements and holding interest.

The savings realised through EE measures and RE generation provided the municipality with funds to purchase an electric car for use by community members. This has resulted in other nearby villages becoming interested in the project and looking for guidance on how to replicate the actions in their own locality.

There are a number of positive outcomes related to the project, including a new energy-saving project for the municipality's schools and kindergartens; a side budget being set aside for reducing CO_2e emissions from public buildings; and a limited company formed with mayors from small villages to install and operate solar systems to benefit people locally (however, the PV systems belong to a separate company).

The developments gave rise to the need to employ a full-time climate protection manager (CPM). This position entailed networking with other municipalities and conveying progress made in Birkenfeld to a wide range of stakeholders. Dr Viktor Klein took up the role as CPM and was a member of the Association of Climate Protection

Managers. The association gave a stronger voice to the CPMs and provided a platform from which its members promoted the work that they do within their municipalities. A point made by Dr Klein was the importance of an approachable mayor who was willing to listen and try new things. He also stated that being able to make decisions quickly was key to implementing actions as quickly as possible. In addition, he reiterated the point made previously that it is very important to show people rather than tell people what the energy projects would achieve.

Birkenfeld was one of hundreds of municipalities and communities that participated in Earth Hour (227 German cities participated in 2018). This event was used as an opportunity to keep climate change and RE in the minds of its citizens.

Box 3.8. Case study: Gimbweiler Municipality, Germany	
Organisation type	Municipality
Web address	http://www.gimbweiler.de/
Contact	Dr Viktor Klein: v.klein@gvg-birkenfeld.de
Community size	420

Sustainability focus:

- solar energy (thermal and PV systems);
- wind energy;
- district heating;
- biomass energy;
- community electric vehicle;
- broadband to facilitate working from home.

Funding and financing sources:

- land leasing fees from solar and wind energy installations;
- government subsidies and loans (paid back over 30 years from profits from district heating and broadband subscriptions).

Current priorities:

- climate change;
- energy generation;
- EE;
- transport;
- social enterprise;
- building retrofit.

Stated aim of the community:

The community aims to become a bioenergy village.

Additional information

The village of Gimbweiler is located in the western Rhineland-Palatinate region of Germany. It is not a wealthy region and it has seen many of the younger population migrate to larger towns and cities. The mayor of Gimbweiler, Martin Samson, realised that in order to safeguard a vibrant community the village would have to be attractive to families and professionals. The migration to larger towns and cities has resulted in many villages being left with very few young families. The demographics in Gimbweiler, however, are becoming much more favourable and the community is not facing the same problems as other villages in the surrounding areas, such as empty homes.

The residents have been open and welcoming to the ideas and actions proposed by the mayor and his working group, which was formed in September 2016. This is because of the open and well-prepared way that information was conveyed to the residents. As a result, for instance, there has been no opposition to energy generation from wind or solar installations. Projects planned for the village include a district heating (DH) system powered by 25% solar thermal energy and 75% biomass from locally sourced woodchip. The cost of the DH system and broadband network is €6 million. Government subsidies amount to €4.2 million, with private investors making up the remainder. Of the total funds raised, €1 million was raised locally through a low-cost loan; the profits from the DH system and the broadband network are being used to service this loan, with a payback time of 30 years. The immediate benefit to the community is that members will have lower energy and broadband expenses and the money saved will stay in the community, no longer going on imported fossil fuels. Another advantage to connecting to the DH system is that there is no longer a need to have individual boilers and associated maintenance costs.

The DH system has encountered organisational, financial and structural problems, which are being addressed. The more people who sign up for DH, the more financially viable the project will be. To encourage take-up of DH, free broadband (basic subscription) is being offered. The broadband fibre-optic cables are being installed with the DH network, which lowers costs and speeds up installation. The energy to run the water pumps is supplied by a PV system, which generates 70kW peak power. Having a high-speed broadband connection will facilitate people who want to work from home and will encourage people to stay in the community. Two energy projects, wind turbines and a solar installation, are funded by an external company. The community lease land to the company (€5,000/year for the solar installation and €50,000/year for the wind turbines) and this income is diverted back to the local budget for community projects. The newly developed town hall, a low-energy building that employs a heat pump, is one such project that has benefited. However, government subsidies and local labour were also needed to complete the project.

As a rural community, transport is a big issue, especially with an ageing population. In response to this, an electric car has been purchased, which is run on locally generated solar energy for the benefit of the entire community, with a group of eight or nine volunteers providing transport services for residents at no cost.

The proactive outlook of the mayor and his ambition to make Gimbweiler an attractive place to live has resulted in extensive talks with companies to provide services to the village.

Moving forwards:

- upgrading street lights to light-emitting diode (LED) – this will result in additional energy savings for the village; in addition, all residents will have LED lighting installed in their homes;
- assisted living for elderly residents in a new building connected to the DH system so that they can continue living in the village and contributing to the local economy;
- installation of solar thermal panels in the sports club, which will provide additional energy cost savings by providing hot water for the shower facilities; lighting in the sports club is also LED;
- purchase of sports equipment from savings made through consumption of locally generated energy to encourage families to remain in the area.

The community budget is currently €380,000, with an additional €44,000 provided through profits from RE projects currently operating. In terms of energy provision, the mayor said that the community has identified everything that can be addressed at this time; however, it is always looking to the future.

The success of energy projects in Gimbweiler has not gone unnoticed and neighbouring villages and towns have indicated a desire to emulate its success.

3.6 Summary of Case Study Outcomes

The focus of this section is to bring together the findings from the Irish and EU case studies of community groups and networks. Findings from these case studies were used to develop the guidance manual, toolkit of best practice methods and blueprint for rural communities in the transition to a low-carbon future.

In this context, emerging and persistent challenges faced by rural communities were disclosed, as follows:

- *Decreasing population*. This was especially notable in the Gimbweiler and Lauragh case studies. Both of these communities are located outside a reasonable commuter distance to areas of employment opportunities.
- *Heavy dependence on fossil fuels*. Although in Ireland and the EU grant schemes and feed-in tariffs have been progressive towards RE and EE, there remain many households that are unable to use the supports available in their respective regions for financial reasons. These households continue to suffer from fuel poverty and remain reliant on fossil fuels for their energy requirements. This is particularly applicable to transport needs, mainly because of the absence of reliable public transport services and infrastructure to support the uptake of electric vehicles.
- *Limited access to finance for energy upgrades*. In Ireland the SEAI provides basic energy upgrades at no cost to qualifying households (includes cavity wall and roof insulation and installation of low-energy bulbs). For non-qualifying households the upfront cost of energy upgrades can be prohibitive. For example, external insulation for an average three-bed semi-detached house costs approximately €11,000–13,000 net of the SEAI grant, which is currently €6000. A deep retrofit, after a deduction of 50% grant aid, costs on average €30,000–50,000. In the case of the German and Croatian case studies, no grants are available. Householders are reliant on selling energy to the grid to pay for the cost of purchasing and installing energy-generating equipment.

Other barriers include:

- community group burnout because of a lack of funding to employ a designated person to take on the responsibility of administrative duties;
- limited access to information and resources;
- lack of financial mechanisms in Ireland and Croatia to allow investment in larger projects that would potentially provide an income to communities from operational profits.

Significantly fewer barriers were identified in the two case studies from Birkenfeld and Gimbweiler than in the other case studies. In each of the German examples of community actions, the importance of informing and involving residents in the community at the earliest stages of project planning is evident in the level of acceptance established. This point was emphasised by both mayors when interviewed for this study. In addition, the legal position on the provision and payment of feed-in tariffs, which ensures the generation of future financial supports and potential profits for the benefit of the community and its residents, was cited as being instrumental to the acceptance and success of the projects.

Community benefit has been demonstrated as a way of increasing acceptance and reducing the level of opposition to proposed community projects. Ongoing economic and social benefits and reinvestment of profits into the community further secure local acceptance. The model in Ireland favours large, established operators taking control of projects, with very little ongoing financial or social benefits for the communities that host them.

4 Assessment of the Future Direction of Low-carbon Initiatives

Globally, the trend towards low-carbon energy, transport, production, manufacturing, procurement and investment has gained credibility and acceptance. A variety of initiatives and technologies have been developed and introduced to mobilise communities and individuals to act in a positive way towards the low-carbon transition. In this chapter we present an assessment of low-carbon initiatives that have been developed, with the aim of providing an assessment of the future direction of low-carbon initiatives.

4.1 Residential Energy and Options for Communities

The SEAI is working with homeowners, communities, businesses and government agencies to achieve sustainable, secure, clean and affordable energy. The SEAI's 2017–2021 strategy (SEAI, 2017) has identified four key challenges:

1. Rapid market and technological changes will place citizens at the centre of the energy transition. This will require informed and engaged citizens to ensure that the benefits of this transition are realised.
2. Large-scale deep retrofits within the existing housing stock and built environment will be key to achieving the necessary level of energy efficiencies. In addition, behavioural changes and adoption of appropriate technical solutions will be vital in reaching the required targets. Suitable finance models will be necessary to fund these actions.
3. To drive the transition there is an urgent need to advance innovation through policy and technological interventions.
4. There is a need to involve all sectors of society in the energy transition. Communities and individuals will be key enablers and partners in small, low-carbon technologies involving behavioural changes and practices in the home, as well as stakeholders in large-scale infrastructure.

The aim of the strategy is to make energy transition a commitment of the majority of individuals and commercial and public bodies in which they participate to achieve a more sustainable energy future. Significant change is required to meet the targets set out by the Paris Agreement (UNFCCC, 2015) and the White Paper on energy (DCENR, 2015). The SEAI has been at the forefront of community energy and sustainability through the development and provision of citizen- and community-focused supports. A brief description of SEAI-funded programmes is provided in Table 4.1.

Energy-efficiency and energy-saving measures are defined as either technical or behavioural. Table 4.2 provides data on energy savings that can be achieved through technical and behavioural measures in residential buildings throughout Ireland (SEAI, 2015, p. 14). The total energy saving (TWh) for each measure has been divided by the number of occupied households and converted to kWh. This provides an average potential energy saving per household. Approximately 35% of homes retrofitted to date have taken advantage of the free energy upgrades. These householders are on low incomes and are among the socio-economic group most likely to suffer fuel poverty. However, as established by Vilches *et al.* (2017), retrofitting of buildings occupied by householders in fuel poverty does not always have the desired outcome of reducing the consumption of energy but instead results in increased levels of comfort. In these instances, CO_2e emissions reductions and monetary savings are not significant.

Retrofit packages, as outlined in Table 4.3, demonstrate the number and type of energy improvements that can be carried out to reduce energy costs. Shallow measures are generally the first actions to be undertaken. The SEAI provides grants to eligible households so that these actions can be completed free of charge. For those not deemed to be eligible, partial grants are also available. Medium measures include all shallow measures with the addition of energy-efficient appliances, heating controls and a

Table 4.1. Description of SEAI-funded programmes

SEAI programme	Description
Sustainable Energy Communities Programme	Funding and support to help communities with EE projects (technical support, capital funding and partnerships)
Better Energy Communities	A national retrofit initiative with an annual budget of €28 million. All projects should be community orientated and demonstrate community benefits. Funding is available to homeowners, communities and private sector organisations. Projects that are undertaking energy-saving upgrades are eligible
Better Energy Programme	This is an umbrella for a number of government schemes that provide full or partial grants for household energy upgrades. The scheme is open to owners of homes built before 2006
Better Energy Warmer Homes Scheme	The SEAI provides free EE upgrades for eligible homes. The upgrades are carried out at no cost to the eligible homeowner. Upgraded homes are warmer and healthier and cost less to run
Deep Retrofit Pilot Programme	Launched in 2017, this pilot scheme provides grants of up to 50% for homeowners that retrofit their home to a BER of A and replace fossil fuel heating systems with a renewable system

Source: SEAI (2019a).

Table 4.2. EE opportunities in residential buildings

Measures	Potential energy saving (TWh)	Potential energy saving per household (kWh)
Technical measures		
Energy-efficient appliances: "cold" and "electrical cooking"	0.67	394.66
Draughtproofing	0.38	223.84
Roof insulation	1.21	712.74
Energy-efficient lighting	0.26	153.15
Cavity wall insulation	0.84	494.80
More efficient boiler with heating controls	3.81	2244.26
Energy-efficient appliances: "wet" and "consumer electronics"	0.48	282.74
Floor insulation	1.05	618.50
Solid wall insulation	1.47	865.90
Heat pump	0.3	17.67
Energy-efficient glazing	0.57	335.76
Total savings from technical measures	11.05	6344.01
Behavioural measures		
Air dry instead of tumble dry	0.32	188.49
Turn off lights when not in use	0.29	170.82
Reduce room temperature by 1°C	1.14	671.51
Turn off heating in unused rooms	0.25	147.26
Use efficient shower head	0.42	247.40
Total savings from behavioural measures	2.42	1425.48
Total potential savings	13.47	7769.49

Note: 1 TWh equals 10^8 kWh.

Source: SEAI (2015, p. 14). The information presented is an extract of the original table and is reproduced with the permission of SEAI.

Table 4.3. EE opportunities in residential buildings applying SEAI retrofit packages

Retrofit packages	Energy saving (kWh)
Shallow	
Cavity wall insulation	494.80
Ceiling insulation	712.74
Draughtproofing	223.84
Energy-efficient lighting	153.15
Total	1584.53
Medium	
All shallow measures	1584.53
Energy-efficient appliances: “wet” and “consumer electronics”	282.74
Heating controls and more efficient boiler	1873.16
Total	3740.43
Deep	
All medium measures	3740.43
Solid wall insulation	865.90
Energy-efficient glazing	335.76
Energy-efficient appliances (cold and electrical cooking)	394.66
Floor insulation	618.50
Heat pump	17.67
Total	5972.91

Source: SEAI (2015). The information presented is an extract of the original table and is reproduced with the permission of SEAI.

more efficient boiler. A deep retrofit extends to energy-efficient glazing, additional energy-efficient appliances, a heat pump and floor insulation. This work can be invasive and costly.

4.1.1 Retrofit scenarios

Four home types have been selected as representative of current Irish housing stock. Electricity and heat demands have been determined based on an assessment of BER and Central Statistics Office (CSO) data (CSO, 2016). The costs of heat and electricity quoted were calculated prior to any retrofit being commenced and are based on average prices in 2019 (Tables 4.4 and 4.5).

It was first determined whether a retrofit measure reduced the energy demand from electricity or heat. By applying the cost per kilowatt-hour to the total kilowatt-hours avoided through application of each retrofit measure, a monetary saving was calculated. Emission factors (2.32 $kgCO_2e$) for residential heat and electricity consumption were calculated from CSO input–output tables at 2015 purchaser prices (CSO, 2018) and used below to calculate the potential CO_2e emissions reductions that result from a shallow retrofit of a three/four-bed semi-detached home.

Total kWh saving = 1584.53 (from Table 4.3), of which 153.15 kWh is assigned to electricity energy, with the remaining 1431.38 kWh assigned to heat energy. Therefore:

$$1431.38\,\text{kWh} \times €0.064 = €91.60 \quad (4.1)$$

$$153.15\,\text{kWh} \times €0.25 = €38.29 \quad (4.2)$$

The total saving amounts to €129.89, with a reduction of 301.34 $kgCO_2e$.

The potential savings in euros and $kgCO_2e$ for four house types typical in Ireland are shown in Table 4.6.

Payback periods can vary from 0 to 10 years for shallow and medium retrofits and can be significantly longer for deep retrofits. Initial findings by the SEAI on the deep retrofit scheme have shown that the average cost to upgrade a home from an average BER of F to an average A3 rating is €48,417 (SEAI, 2019a).

The Better Energy Programme provides a range of EE grants dependent on the type of work to be carried out and eligibility criteria. The remedial measures

Table 4.4. Heat requirements from oil, natural gas, solid fuel, coal, peat, wood and wood products (average cost per kWh)

Home type	Size (m^2)	kWh/m^2	kWh/year	Cost/kWh (€)	Total cost/year (€)
Three-bed semi	102	169.85	17,324.70	0.064	1108.78
Three/four-bed semi	120	169.85	20,382.00	0.064	1304.45
Four/five-bed detached	160	169.85	27,176.00	0.064	1739.26
Large detached	200	169.85	33,970.00	0.064	2174.08

Table 4.5. Electricity requirements (inclusive of taxes, PSO levy and standing charges)

Home type	Size (m^2)	kWh/year	Cost/kWh (€)[a]	Cost/kWh (€)	Total cost/ year (€)[a]	Total cost/ year (€)
Three-bed semi	102	3000	0.194	0.250	582.00	750.00
Three/four-bed semi	120	4000	0.194	0.250	776.00	1000.00
Four/five-bed detached	160	6000	0.194	0.250	1164.00	1500.00
Large detached	200	8000	0.194	0.250	1552.00	2000.00

[a]**Costs include taxes, PSO levy and standing charges.**

PSO, Public Service Obligation.

Table 4.6. Shallow, medium and deep retrofit potential monetary and CO_2e savings for selected household types

Retrofit	Home type	Heat (kWh)	Electricity (kWh)	Saving (€)	kgCO_2e reduction
Shallow	Three-bed semi	1216.67	130.18	110.41	256.15
	Three/four-bed semi	1431.38	153.15	129.89	301.34
	Four/five-bed detached	1903.74	203.69	172.76	400.81
	Large detached	2376.09	254.23	215.63	500.25
Medium	Three-bed semi	2808.86	370.51	272.39	631.95
	Three/four-bed semi	3304.54	435.89	320.46	743.47
	Four/five-bed detached	4395.04	579.73	426.22	988.82
	Large detached	5485.54	723.58	531.97	1234.17
Deep	Three-bed semi	3950.43	705.50	429.20	995.75
	Three/four-bed semi	4647.57	830.00	504.94	1171.47
	Four/five-bed detached	6181.27	1103.90	671.58	1558.06
	Large detached	10,260.91	1832.47	1114.82	2586.37

and grants available are presented in Table 4.7. The final cost to the grantee and the payback time are determined by the level of retrofit completed and the associated energy savings. Behavioural changes have a significant bearing on the final energy-saving potential (see Table 4.1) and are an important aspect of low-carbon transition.

Changes in the spending habits of householders post energy retrofit will have significant repercussions for residential emissions. The kgCO_2e emitted for every euro spent on heat and electricity is high at 2.32 kgCO_2e/€, but is lower than that emitted for every euro spent on air transport, at 2.47 kgCO_2e/€, and significantly higher than that for food from agriculture, forestry and fishing, at 1.32 kgCO_2e/€, or food products, beverages and tobacco, at 0.86 kgCO_2e/€ (CSO, 2018). Therefore, depending on individual choices, especially in higher income households, there is a possibility that higher CO_2e emissions could result.

4.2 Challenges and Policy Implications

It is anticipated by many that the transition to greater sustainability will be through disruptive

Table 4.7. Better Energy Programme grants

Remedial measure	Cost per m² (€)	Typical installation cost (€)	SEAI grant (€)	Typical cost with grant (€)
Ceiling insulation 300 mm	10.00	600.00	400.00	200.00
Ceiling insulation 200 mm	7.50	450.00	400.00	50.00
Ceiling insulation 100 mm	7.00	420.00	400.00	20.00
External wall insulation				
Apartment or mid-terrace house	120.00	9600.00	2750.00	6850.00
Semi-detached or end-of-terrace house	120.00	13,200.00	4500.00	8700.00
Detached house	120.00	19,200.00	6000.00	13,200.00
Cavity wall insulation				
Apartment or mid-terrace house	8.50	680.00	400.00	280.00
Semi-detached or end-of-terrace house	8.50	935.00	400.00	535.00
Detached house	8.50	1360.00	400.00	960.00
Internal dry lining				
Apartment or mid-terrace house	87.75	7020.00	1600.00	5420.00
Semi-detached or end-of-terrace house	87.75	9652.50	2200.00	7452.50
Detached house	87.75	14,040.00	2400.00	11,640.00
High-efficiency gas boiler and controls		2955.00	700.00	2255.00
High-efficiency oil boiler and controls		3277.00	700.00	2577.00
High-efficiency LPG boiler and controls		2955.00	700.00	2255.00
Heating controls		1633.00	700.00	933.00
Draughtproofing		200.00		200.00
Energy-efficient lighting (CFLs/LEDs)		6.95		
Lagging jacket		20.00		

External and internal wall areas are derived from the average size of each category of house type – 160, 110 and 80 m² respectively. Cavity wall insulation, ceiling insulation, draughtproofing, energy-efficient lighting and a lagging jacket are provided free to eligible households.

CFL, compact fluorescent lamp; LED, light-emitting diode; LPG, liquid petroleum gas.

Sources: Slevin and Grady (2015) and SEAI (2019b).

and transformative change. Thus, supporters of transformative change stress the importance of the early involvement of stakeholders so that resilient solutions are developed to address sustainability challenges.

Transition efforts face many challenges, with an unwillingness to engage being one example. Failure to engage with and inform stakeholders at the early stages of the local transition process, and throughout, can lead to non-participation and to a situation in which there is a lack of understanding surrounding energy supply and demand issues. These can include (1) an oversupply of energy, which leads to wastage, overuse and pollution (can be led by the more affluent in society) and (2) insufficient energy services, leaving some individuals without access to services because of their location or because of underconsumption as a result of low income and poverty. This can, as a secondary challenge, lead to adverse health outcomes and higher mortality rates (Sovacool *et al.*, 2016). Another challenge is an inability to conform. This occurs as a result of conditions beyond the control of the individual or household, when they are locked into unsustainable infrastructure. This includes sub-standard housing, a low income or a combination of both, making significant change difficult and very often outside their control. Where appropriate interventions are employed, for example grant-aided retrofits, these result in minimal energy savings as these households typically benefit from warmer, less damp homes. In addition, these households are not in a financial position to carry out deep retrofits, which would include greater energy consumption reductions and technologies to micro-generate energy, reducing CO_2 emissions and household energy costs further.

A failure by policymakers to recognise the difficulties that many householders face when addressing access to energy reduction and energy-generating technologies is evident in the SEAI grant schemes (SEAI, 2019b). Funding of 50% of a deep retrofit is available to qualifying properties; however, the average cost of upgrading a house to the required standard is in the region of €48,000. Low-income households and sub-standard housing are effectively excluded. The UK Low Carbon Transition Plan (DECC, 2009) published by the Department of Energy and Climate Change pays little attention to accessibility and fairness in the decision-making process. In addition, the social element of sustainability is very often recognised as being omitted in the literature and transition plans. This failure to include social aspects damages future demand reduction efforts.

As demonstrated by Chatterton *et al.* (2016), energy consumption differs greatly between socio-economic groups and a relatively low number of high-income groups place the greatest burden on the energy supply through choice. These groups can be considered to be "energy decadent" because of their individual circumstances and lifestyle choices. The argument put forward by Chatterton *et al.* (2016) is to target these groups so that greater progress can be made. Therefore, rather than seeking an 80% reduction across all of society, it may be worthwhile to examine ways to reduce consumption in those sectors that are consuming on average 30% more energy. Such households are in a better position to invest in deep retrofit projects, with the potential for higher gains in terms of energy reduction and uptake of RE generation technologies. There are, however, other issues that emerge as a result of lowering the energy demand and consumption costs. Rebound, which is widely discussed in the literature, occurs as a consequence of monetary savings being diverted to alternative consumption patterns. The greatest effect occurs after the payback period is complete and there is an increase in household spending on travel, electronics and fast fashion.

4.2.1 Policy implications

The results presented here demonstrate the importance of re-spending and its effect on the magnitude of rebound. The current policy is to provide funding in the form of grants for communities and householders to implement energy retrofits. It is important to recognise the characteristics of communities and individuals. The "nearest neighbour effect", whereby behaviour change is brought about through exposure to positive actions, can act as a catalyst for positive change. This effect is most successful when stakeholders work together.

In terms of appropriate policy implementation, communities must be supported in a manner that allows members to implement actions. In order to carry out such actions, a community requires a governance framework that facilitates a decision-making process that takes responsibility for safeguarding the ongoing advancement of defined targets. Policy mechanisms that make provisions for communities to come together in partnership with stakeholders, such as LAs, businesses, local actors and other interested parties, are needed.

A greater understanding of the energy demand is required, however, and this will require behaviour change at the individual level, driven by actions at the community level, with low-carbon lifestyles becoming the norm.

No mechanisms are available to measure or appraise the extent of actual energy or monetary savings beyond theoretical evaluations. In addition, carbon reduction policies are aimed at CO_2e emissions from energy, to the neglect of waste, water, transport and consumer goods and services. The absence of a holistic approach to CO_2e emissions reduction tactics, and an overzealous focus on the energy sector in isolation, acts as an enabler for the rebound effect. The existing carbon tax incentivises EE measures and energy upgrades; however, savings that are re-spent may not be subject to a carbon tax despite the possibility of higher embodied emissions of the goods or services involved. The carbon tax, in its current form, applies only to direct energy consumption, that is, carbon emissions from transport and residential energy. The result of this approach widens the gap between the cost of energy and the cost of goods and services. As the cost of energy rises through the addition of the carbon tax, the potential savings from EE measures also increase.

A carbon tax that is calculated on the carbon intensity of all goods and services, including energy, would raise the cost of consumption in proportion to carbon intensity and incentivise the purchase of goods

with a lower carbon intensity. Typically, low-income households rely on emission-intensive energy sources as a result of barriers to efficient alternatives; conversely, high-income households are in a better financial position to invest in EE retrofits and therefore their overall savings are greater. In addition, high-income households consume more goods and services, resulting in higher overall emissions.

The SEAI provides grant payments and technical assistance to increase the number of houses able to undergo energy retrofits. Close monitoring of the outcome of energy retrofits is necessary to manage CO_2e emissions reductions effectively. Environmental awareness alone is inadequate and policy interventions are needed to increase environmental efficiencies across all consumption sectors to motivate shifts towards greener consumption patterns. This includes consuming products that are more environmentally sustainable and consuming less.

Individuals, householders and communities can be drivers of the low-carbon transition; however, the embodied energy intensity is not always obvious and this makes responsible consumption difficult. Policy that forces producers of consumer goods and services to reduce the CO_2e footprint of the transport and manufacturing sectors would lower the embodied energy intensity of all other sectors. Policy that targets embodied energy intensity from an economy-wide position removes the responsibility from householders and shifts it higher up the production hierarchy.

Carbon pricing is a policy intervention that is largely rejected by the public as a tax collection exercise. An interdisciplinary approach is needed to ensure that information programmes are effective in informing a wide range of stakeholders, communities and householders of its importance in limiting rebound and driving the low-carbon transition.

5 Guidance Manual, Blueprint and Toolkit

5.1 Blueprint and Logic Model for Community Low-carbon Transition

Blueprints present representations of how actions or initiatives are expected to work (Table 5.1). They outline the strategies adopted and why these are good solutions to the challenges ahead. In this context, an effective blueprint provides an explicit statement of the actions identified to achieve change and the results proposed by the community. The blueprint is flexible and does not have to be linear. The use of flow charts or tables is common, as well as the use of functional formats. Concept maps and mind maps are also a useful way to identify and describe relationships between complicated elements of a CP. This blueprint was developed to present the requirements of a community by providing clarity and direction without losing sight of important details. It is intended to be a dynamic guidance document and thus one that keeps participants moving in the desired direction. By being dynamic, it accepts that actions and desired outcomes are liable to change over time and therefore encourages positive changes. However, the blueprint acts as a model to keep communities and participants active and moving in the same direction by providing clear guidance and reference points, forming the basis for standard evaluation, assessment and comparison.

Each of the case studies presented addresses at least one environmental problem. Local-level responses are being implemented with various levels of success. Indeed, the solutions are reproducible and have the potential to be unscaled. For many community groups and individuals, there is a knowledge gap between project actions and the actual environmental outcomes. With the exception of Energy Master Plans, which are conducted by consultants, there are no guidance documents or metrics to evaluate the success or failure of a project or individual actions within a larger project.

The CP developed as part of this project aims to fill that gap. The CP defines the nature of communities' low-carbon transition. It provides the evidence that proposals meet the expectations of a community. It:

- sets out the objectives and defines the strategy for a community;
- identifies available resources within the community;
- identifies activities and actions to be undertaken by the community;
- provides the basis for ongoing review and monitoring of the actions implemented;
- ensures the continuation of actions to meet all necessary criteria and enable completion of the original objectives.

Analysis of the LECPs and case studies provided guidance for the selection of relevant indicators. The selected indicators were divided into two categories: primary indicators (PIs) and contributory indicators (CIs) (Table 5.2). In order to measure and monitor

Table 5.1. Elements of the blueprint and logic model

Inputs	Actions and activities	Outputs	Outcomes and impacts
Resources provided for the community	Activities and actions undertaken by the community	Measurable changes in sustainability and emissions of the community	Changes or benefits that result
↓	↓	↓	↓
Grants and other funding, volunteers, staff, equipment	Training, sustainability education, implementation of low-carbon initiatives	Lower carbon emissions, increased awareness of environmental and sustainability issues Local employment and increase in the number of people trained Behavioural change	Regional/local added value Long-term increased sustainability and monetary savings associated with lower carbon emissions

Table 5.2. Primary, contributory and reporting indicators

Indicators	Reporting indicators
PIs	
Residential energy	• Electricity CO_2 emissions
	• Natural gas CO_2 emissions
	• Solid fuel CO_2 emissions
Transport energy	• Diesel CO_2 emissions
	• Petrol CO_2 emissions
	• Hybrid CO_2 emissions
	• Electric vehicle CO_2 emissions (from electricity at charging stations outside the household)
	• Public transport CO_2 emissions
	• International travel CO_2 emissions
Water	• Number of occupants in the household multiplied by the emission factor[a]
	• Litres consumed per annum by commercial interests (if included in the CP)
Wastewater	• Number of occupants in the household multiplied by the emission factor[a]
	• Proxy value can be reduced where water-saving devices and rainwater-harvesting systems are installed, e.g. water-saving appliances, taps
	• Level of wastewater treatment (primary, secondary or tertiary)
Solid waste management	• Volume of waste generated (L or kg)
	• Volume of waste recycled (L or kg)
	• Volume of waste composted (L or kg)
CIs	
Locally grown food	• Area (ha) of identified areas within the community that are being used to grow food crops on a private basis
	• Type and quantity of crops
Local industry	• Count of local industry in the community
Availability of community recycling facilities	• Count of material types collected
	• Size of collection container and frequency of collection of full container
Availability of community composting facilities	• Volume of green waste delivered to facility annually
	• Volume of compost produced annually
Education and outreach activities	• Evaluation and count of local activities

[a]**Emission factors derived from published sources.**

emissions, each PI and CI requires reporting indicators that capture quantitative data. Screenshots of Excel spreadsheets demonstrate the method applied for calculating emissions (Figures 5.1 and 5.2), with Tables 5.3 and 5.4 describing the calculation process.

5.2 Importance of the Guidance Manual, Blueprint and Toolkit to Communities: Key Issues for Community Sustainability

The blueprint describes a straightforward planning and data collection methodology, which is reliant on expenditure and consumption to satisfy the data needs of the PIs. Data collection requirements for the model have been kept to a minimum; for example, calculation of petrol CO_2 emissions, a reporting indicator for transport, requires one data point, "weekly spend", to be collected. Similarly, calculation of electricity CO_2 emissions requires only the bi-monthly electricity bill. CO_2 for the reporting indicators is calculated in the model using emission factors and mathematical equations. This approach is useful in that there is no requirement for technical knowledge. In the case of transport CO_2 emissions, for which there has been controversy surrounding "cycle beating" to make certain vehicles seem more economical, this approach measures emissions purely on a consumption basis. When weekly expenditure is €30 and the cost of a litre of diesel is €1.59, then 18.87 L

HOUSEHOLDFUEL Type		Monthly value	Units	Time	Annual Use	Kg CO_2/kWh	VAT	Standing charges	Cost per kWh	Kg CO_2/yr
Electricity		€240.00	Euro	Bi-monthly	€1,440.00	0.52	1.14	€175.00	0.17	3373.22
Gas (piped)		€175.00	Euro	Bi-monthly	€1,050.00	0.20	1.14	€79.23	0.06	3013.43

Figure 5.1. Calculation of electricity and gas emissions. VAT, value-added tax.

TRANSPORT	Weekly spend	Weekly Value	Units	Time	Annual Journeys	Kg/unit	Tonnes CO_2/Yr
Car Diesel	30	18.87	Litres	Weekly	52	**2.64**	2.5902
Car Petrol	40	23.77	Litres	Weekly	52	2.39	2.9550
Bus	15	500	Pass Km	Weekly	52	0.019	0.4940
Train	20	400	Pass Km	Weekly	52	0.092	1.9136
Plane SH		500	Pass KM	Annual	1	0.15	0.1832
Plane LH		5400	Pass KM	Annual	1	0.12	1.5785

Figure 5.2. Calculation of transport emissions.

Table 5.3. Adjustment to an electricity bill to calculate kWh consumed and CO_2 emitted

Adjustment to bill	Results
Total electricity bill	Amount X
Minus VAT at 13.5%	X divided by 1.135 = X1
Minus standing charge of €24.625 (bi-monthly)	X1 minus 24.625 = X2
Minus PSO levy of €4.64 (bi-monthly)	X2 minus 4.64 = X3
Cents per kWh at €0.1699	X3 divided by 0.1699 = kWh
Conversion to kgCO_2 emitted per kWh	kWh multiplied by 0.52 kgCO_2/kWh

PSO, Public Service Obligation; VAT, value-added tax.

Table 5.4. Adjustments to a natural gas bill to calculate kWh consumed and CO_2 emitted

Adjustments to bill	Results
Total gas bill	Amount X
Minus VAT at 13.5%	X divided by 1.135 = X1
Minus standing charge of €6.60 (monthly)	X1 minus 6.60 = X2
Cents per kWh including carbon tax at €0.05746	X2 divided by 0.05746 = kWh
Conversion to kgCO_2 emitted per kWh	kWh multiplied by 0.2047 kgCO_2/kWh

VAT, value-added tax.

of diesel have been combusted. The emission factor for diesel is 2.64 kg/L, resulting in weekly emissions of 49.82 kgCO_2 and annual emissions of 2590 kgCO_2. This approach removes the need to consider vehicle make and model, driving conditions and habits. To allow for fluctuations in fuel prices for transport and residential energy, the model is linked to online price trackers provided by AA Ireland (2019) and Money Guide Ireland (2019), respectively. These both track energy prices and update prices on a monthly basis and work in a similar manner to online currency converters. A similar approach is taken for the data collection processes and calculation of the remaining reporting indicators. This will ensure a simple and time-efficient process. By systematically monitoring expenditure and consumption for each PI, variations because of technical or behavioural changes can be shown. Additionally, an increase in consumption for any reporting indicator can be identified. The ability to monitor CO_2 emissions at this level could have the effect of strengthening behaviour change, which could in turn lead to significantly greater CO_2 emissions reductions across other indicators, not just transport and residential energy.

5.3 Development of an Online Application to Map Progress

In its current form the toolkit includes measurement tools that have been built in Excel using emission factors, conversion factors and equations to calculate community-level emissions using data collected for each indicator.

Mobile applications (apps) have, in recent times, become more popular than computer-based software and programmes. The use of mobile apps means that data and other information can be inputted and accessed quickly and easily. An example of an app to measure emissions from consumption of petrol and diesel is presented in Figure 5.3. Figure 5.4 details the data required for the background calculations. The user inputs only their weekly expenditure.

At the community level, participants register for an account and can input the data for each indicator. These data are collated with the data inputted by other registered users to provide a data-rich representation of the community. The data and change patterns can be monitored and used to determine where actions are successful. In addition, the app can be used to show how savings or increased expenditure on one or more indicator affect other indicators.

Because of the General Data Protection Regulation (GDPR), a secure app would be necessary, which is not within the remit of this project. However, organisations such as the SEAI or energy agencies may deem it useful to develop such an app for measuring and monitoring community energy projects.

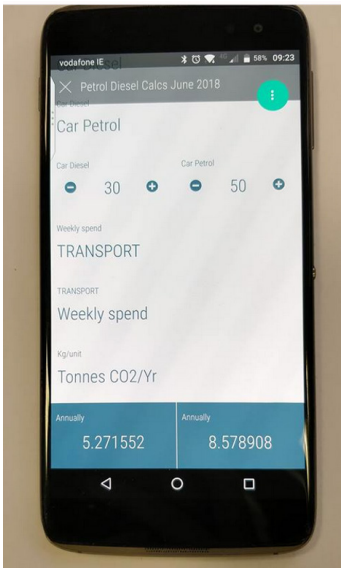

Figure 5.3. App on a mobile phone showing the volume of CO_2 (tCO_2/year) emitted for a sample weekly expenditure of €30 on petrol and €50 on diesel.

Petrol and Diesel | Online Prices AA Ireland

	A	B	C	D	E	F	G	H	I	J	K
1	TRANSPORT	Weekly spend	Weekly Value	Units	Time	Annual Journies	Kg/unit	Tonnes CO2/Yr	Tonnes C	Irish Forest ha	Global forestry ha
2	Car Diesel	30	38.4	Litres	Weekly	52	2.64	5.271552	1.437698614	0.183705934	0.958944976
3	Car Petrol	50	69	Litres	Weekly	52	2.391	8.578908	2.339706436	0.298962489	1.560584193
4	Bus		50	Pass Km	Weekly	52	0.019	0.0494	0.013472752	0.001721518	0.008986325
5	Train		200	Pass Km	Weekly	52	0.092	0.9568	0.260945929	0.033343091	0.174050935
6	Plane SH		N/A	Pass KM	Annual	28420	0.15	10.384668	2.832187331		
7	Plane LH		336	Pass KM	Annual	55340	0.12	16.1769888	4.411914058		
8											
9											
10											
11											
12											
13											

Figure 5.4. Excel database containing usage data, emission factors and conversion factors.

6 Key Findings and Recommendations from the Project

6.1 Low-carbon Best Practice Review

In order to inform on potential initiatives and policies on low-carbon transition, an extensive review of existing low-carbon transition projects was conducted. This review focused on actions implemented within Ireland and selected EU states.

Several barriers are encountered in RE and EE projects. The high costs of energy retrofits and RE technologies are most significant at the community level. Those most adversely affected by high energy costs are least likely to be in a financial position to benefit from any grant-aided upgrades, with the exception of free energy upgrades delivered by the SEAI. The average cost of installing a PV system with battery storage is in the region of €11,000, after SEAI grant aid. For a significant number of households in fuel poverty this is beyond their budget. To address this issue, focused projects and solutions are necessary and can be effective, as demonstrated in the case studies presented in this report. However, the collective outcomes of community actions need to be recognised, with provisions put in place to support and encourage pathways towards more widespread collaborations at local and national levels. Individual actions are necessary to drive the transition, but in the absence of national policy and support structures actions will remain individual and disconnected, leading to a failure to achieve the level of change/ disruption required for a successful and just transition.

The SDGs provide a global focus on the need to transition from fossil fuels and a carbon-based economy. Through high-level policy agreements – the White Paper on energy (DCENR, 2015) at the national level and the Paris Agreement (UNFCCC, 2015) at the international level – targets have been set that, in the next decade up to 2030, aim to achieve significant change in energy systems and a move towards more sustainable and renewable sources. A greater understanding of energy demand is needed, however, and this will require behaviour change at the individual level, driven by actions at the community level, so that low-carbon lifestyles are seen as the norm.

Effective measurement tools are necessary to monitor and track the effects that community group projects have on delivering low-carbon transition. The capacity to effectively illustrate changing patterns in energy consumption, and how those changes affect CO_2e emissions, is an important driver of successful technical and behavioural change. The purpose of the guidance manual, blueprint and toolkit is to highlight CO_2e emissions, where these emissions come from, how community energy projects affect these emissions and whether there are unintended consequences in terms of higher CO_2e emissions from other household or community activities.

- The decarbonisation potential of carbon reduction measures associated with technical change are significant, ranging from reductions of 256 $kgCO_2e$ to 2586 $kgCO_2e$, depending on the level of retrofit completed and the house type (see Table 4.6).
- Lower income households are less likely to save money after an energy retrofit – warmer, more comfortable homes normally result.
- Higher income households can benefit from more technical solutions, including RE technologies. This has a greater potential to free up income for other activities.
- At the community level there is a conscious movement towards low-carbon transition and an awareness of the potential local benefits, including employment opportunities, health benefits, utilisation of local renewable resources and regional added value.
- Current grant schemes are conditional on criteria that are set by national governments and reliant on annual budget allocations; this uncertainty can be a barrier to engagement.

6.2 Summary and Evaluation of Findings

This research evaluated the role of community groups in low-carbon transition. The research resulted in the development of a toolkit of best practice methods, a blueprint and a guidance manual to guide and

inform communities in Ireland. Relevant case studies have been compiled and evaluated to provide guidance to assist other communities to map out and systematically address strategies, targets, policies and measures that will guide them in their transition to a low-carbon future.

Key findings:

- Managing a low-carbon transition will involve more than the adoption of RE and EE.
- Local industry, local food, access to local amenities, education and outreach activities each aid in driving the low-carbon transition. These need to be included in any CP and recognised through a measurement metric to allow quantification of their contributions, and where possible identify achievements justifying rewards.
- At present there is no standard metric to measure community-level CO_2e emissions.
- There is no universally recognised standard regarding the selection of relevant indicators, the collection of data, the maintenance of accounts, monitoring and evaluation.
- A growing number of community groups are registered with the Sustainable Energy Community Scheme of the SEAI, through which Energy Master Plans are completed. However, these apply only to residential energy and do not take account of energy from the generation of waste, wastewater, water and transport.
- Since 2019, after completion of retrofit works, no follow-up has been carried out by the SEAI to assess the level of energy savings realised.
- Rural communities face many challenges, including low employment opportunities, which lead to depopulation. Depopulation in turn may lead to the loss of existing local employment opportunities.
- Each community case study revealed unique information and attributes. Input from community groups was invaluable and, where contact and consultation were initiated at the earliest time possible, ideas and outputs were likely to be more relevant to local conditions.
- Social employment schemes (Community Employment – CE; Tús) may be used as leverage to create additional local employment opportunities.

6.3 Recommendations

Recommendation 1: All community groups in receipt of public funding for RE, EE and low-carbon projects should be required to measure and monitor progress in reducing greenhouse gas emissions.

Since 2019 there has been no requirement to map community progress in RE, EE and other low-carbon projects. Evidence from the literature suggests that cities, universities and businesses that implement actions perform better when there is a system in place to measure progress. One model that Irish communities could adopt is the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC). This model includes transport, waste management (including biological treatment, incineration and wastewater treatment), residential buildings, energy generation, rail transport, aviation, industrial processes and product use. Use of such a standardised methodology would enable reductions in community-scale greenhouse gas emissions to be publicly reported in a consistent and reliable way.

Recommendation 2: Data should be collected in a standardised way.

Baseline data should be gathered for a standardised set of indicators. Community groups are mainly co-ordinated and run by volunteers. For the most part, these volunteers have other responsibilities and their time is valuable. Data collection should not be time-consuming or involve lengthy calculations or data that are not readily accessible. Therefore, it is recommended that:

- a standardised indicator set is provided to all active communities;
- data collection is uncomplicated, straightforward and not overly time-consuming;
- in calculations, the need for complicated data sets is avoided;
- a simple model for data input is developed, which avoids the need for emission factors and mathematical equations.

Recommendation 3: Increased consultation with community groups should be undertaken.

The LECPs develop high-level goals and action plans as a result of an extensive scoping exercise

with community groups, stakeholders and other interested parties. These plans reflect the needs and expectations of a wide spectrum of citizens. In generating Ireland's White Paper on energy, an opportunity to consult with communities was missed and instead an approach of exhorting people to act was taken, without providing guidance or support. Equally, the National Development Plan (DPER, 2018) does not explicitly describe how its budget of €1 billion for the Rural Regeneration and Development Fund and €500 million for the Climate Action Fund under Project Ireland 2014 will be used to implement national targets and how these may be achieved through action at the local level. From international case studies it is clear that communities have been identified as ideal partners for municipalities. It has been shown that significant outcomes from community projects are achievable through these partnerships. Positive outcomes are not limited to energy and emissions reductions but include more inclusive socio-economic and environmental benefits for the community.

Recommendation 4: Investment support is required for RE and EE projects that divert surplus income to local environmental and socio-economic initiatives.

The pathway towards a low-carbon transition to 2050 requires an 80–95% reduction in CO_2e emissions. The National Mitigation Plan (DCCAE, 2017) represents a change in policy direction for the Irish government with regard to Ireland's performance on climate action. Included in this plan are investment actions for cross-sectoral climate action. To achieve these targets private and public sector investment is vital. As part of the decision-making process in relation to public capital investment projects, community decarbonisation projects need to be considered as targets for investment. Of special value are those that divert resources and surplus funds to local environmental and socio-economic initiatives. International case studies have demonstrated the benefits to local communities and their economies when surplus funds remain in the local economy, thus increasing regional added value, sustaining local populations and addressing climate change actions.

Recommendation 5: LAs should extend energy retrofits to privately owned properties in LA-managed housing schemes.

Local authorities are tasked with the maintenance of properties in their ownership. LAs provide social housing to eligible persons through various housing schemes. In LA housing schemes the number of properties in LA ownership has fallen in recent times as occupants have been allowed to purchase the property in which they are residing. This has led to mixed ownership modes in most LA housing schemes. National case studies have shown a missed opportunity by LAs with regard to retrofitting properties in their ownership. By failing to offer external insulation to all those residing in LA housing, including those who have taken ownership of their property, community groups now have to apply to the SEAI to fund individual properties in LA housing schemes, resulting in higher costs being incurred. This means that some residents may not be in a financial position to complete a retrofit without external support. Under the Department of Housing, Planning and Local Government's Social Housing Investment Programme (DHPLG, 2019), LAs are allocated capital funding to complete work on their social housing to maintain or improve the standard of their housing stock. A shallow retrofit is estimated to cost between €765 and €1100, depending on the house type. This results in a potential annual energy saving of between 1347 kWh and 1582 kWh for a typical three- or four-bedroom LA house (see Tables 4.6 and 4.7); annual savings in monetary terms could potentially be €110–130, with an annual reduction in emissions of between 256 kgCO_2e and 301 kgCO_2e. External insulation is estimated to cost between €6850 and €8700 for the same house type, with a potential energy saving of 866 kWh per annum. Further reductions in cost can be achieved when such work is carried out on a number of properties in the same area at the same time. There needs to be in place a mechanism whereby non-LA households can avail of retrofit works as part of the retrofit programme to benefit from these potential savings. This could be achieved through closer collaboration between homeowners, the LAs and the SEAI.

Recommendation 6: Use social employment schemes (Further Education and Skills Service, CE or Tús) as leverage to create additional employment opportunities for community-based low-carbon projects.

The case study from the East Clare Co-op demonstrated how additional staff can be employed and supported by social employment schemes such as CE or the Tús initiative. The Lauragh and

Castleblayney communities cited difficulties in securing people to engage with the public and funding bodies. Both communities rely heavily on volunteers and stated that this is not sustainable. Volunteers have many other commitments and many can give their time only in the evenings, which restricts their ability to contribute optimally. Additional financial mechanisms are needed to facilitate the recruitment of part-time and full-time workers to enable community groups to carry out the necessary administrative duties. In addition to social employment schemes, financial levers are needed to provide good-quality administration of community projects. Since 2019, the cost to employers has been a barrier to community groups employing staff to manage community projects. Tax exemptions and the retention of social welfare benefits in line with return-to-work supports (Careers Portal, 2019) are necessary so that the cost to the community is lowered.

Recommendation 7: Provide financial and technical support to communities so that they can identify and address local issues.

Parallels between the communities in Gimbweiler and Lauragh were identified through analysis of the case studies. These communities have both identified a declining population and a lack of employment opportunities as barriers to success. In the case of Gimbweiler, the solution was to lease municipal lands to an energy company to generate RE. The income from this was then used to secure funding and loans to develop a district heating system and high-speed broadband. Surplus funds have been ring-fenced for local projects. The use of municipal lands has been instrumental in the success of the Gimbweiler community since 2019. Lauragh community has identified local resources that could address its energy needs; however, funding for such a project is not within reach for this community. Access by community groups to LA-owned property in rural areas could be used as a mechanism to engage with prospective investors in energy generation and other technologies. Safeguards, such as surplus funds being ring-fenced for environmental and socially beneficial projects, would make such proposals more acceptable to the general public. Ireland's National Assets Management Agency (NAMA) owns an extensive catalogue of property throughout Ireland, including lands that are undeveloped and located in rural areas. Included in NAMA's remit are social initiatives, including providing homes for social housing and making properties available to schools and for other public benefits. In addition, NAMA collaborates with IDA Ireland to identify properties that are suitable for companies interested in investing in Ireland. Mechanisms to extend the remit of NAMA to provide community groups with suitable properties, where available and feasible, would enable communities to follow the Gimbweiler example. Further collaboration with IDA Ireland would build linkages between community groups and potential investors.

Recommendation 8: Enable decision-making at the community level to address locally important energy issues.

As evident in the case studies, the willingness to engage the public, and in particular communities that are active in low-carbon transition projects, has a significant role in driving decarbonisation. The Luxembourg case study provides an example of how, by giving participants the opportunity to take an active role in the decision-making process, not only participation but also sustained engagement were encouraged.

External support structures were shown to be an important factor in creating community cohesion and acceptance in both Birkenfeld and Gimbweiler, where the university and the municipality provided the necessary mechanisms to secure funding for projects, alongside sharing of essential knowledge, experience and technical expertise. Instrumental in the success of these projects was informing the wider public about the plan of action at an early stage. In addition, including them not only in the decision-making process but also in the social and financial benefits was found to be essential. As with the approach taken in the development of the LA LECPs, there is a necessity to involve and inform the public about opportunities to engage with community groups, LAs and national government in any developments at the earliest stage possible.

Recommendation 9: Post-completion surveys should be carried out of completed retrofit works to evaluate energy savings.

Since 2019, prior to any retrofit works commencing, the SEAI-approved installer completes a survey of the property and, based on the data gathered, calculates its BER. This is, in theory, the energy that is required

to run the property. After retrofit works are completed a second assessment of the property is completed and an updated BER is calculated and a certificate issued. No verified energy consumption or emissions reduction data are collected at any stage of the process. For reporting purposes it should be a requirement of the SEAI that all properties provide energy use data pre and post completion of any works. These data could be used to determine where rebound occurs and additional support and information could then be provided to limit rebound where this is identified as significant.

Recommendation 10: Develop affordable grid connection pathways for community-led RE projects and feed-in tariffs to increase the affordability of RE generation for communities.

Experience in other EU Member States clearly shows that in many instances the optimal way for communities to gain regular funding over a longer period of time is by selling RE into the national grid at a reasonable tariff rate. With such a regular income, more ambitious decarbonisation actions may be undertaken by communities. In October 2019, the Climate Action Committee determined that there was only one community-owned energy project with a connection to the national grid. It was argued that large energy projects led by major developers took up all of the available capacity for connection. The current rules for accessing the energy market make it extremely difficult for communities to secure a grid offer, because of the significant amount of funding required to make an application. Even where a grid offer becomes available, community groups are at a disadvantage, with grid offers ranging from €1.3 million to €2.9 million. Since 2019 there has been no technical or social obligations to give priority to local projects or to reduce grid connection charges for community connections.

6.4 Strengths and Weaknesses of the Study

At the commencement of this study a scoping exercise was carried out using the SEAI database to identify active community groups in Ireland. The SEAI database consists of more than 150 communities registered for the Sustainable Energy Community Scheme. Screening of the registered sustainable energy communities using the criteria set out in the study found that only six sustainable energy communities were taking a holistic approach to sustainability rather than just focusing on energy grants for efficiency. Of these, three responded to a request to participate in this study. Each of the communities displayed different attributes, barriers and successes. This provided the study with a significant amount of information and relevant data. However, a larger number of participating communities would have provided greater levels of insight into the level of involvement and commitment that exists at the community level. The study would also have benefited from a wider range of experiences and views. In addition, there might have been additional examples of successful actions and outcomes that would be of significant value to other community groups starting out in their low-carbon transition.

The case study method, although limited, was essential for gaining useful insights into the realities faced by community groups. The qualitative approach was responsive to local situations and stakeholder needs, and this served to minimise researcher bias. Site visits and informal interviews revealed unique information, including barriers to progress and enablers of success. This information would not have been captured through the adoption of other methods, such as desk studies, telephone conversations, surveys or rigid interviews. Because of the limited number of communities that participated, the evaluation and findings are preliminary and form the basis for further work.

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Abbreviations

BER	Building Energy Rating
CE	Community Employment
CI	Contributory indicator
CO_2e	Carbon dioxide equivalent
CP	Community plan
CSO	Central Statistics Office
EE	Energy efficiency
EEG	Renewable Energy Sources Act
ERDF	European Regional Development Fund
ETS	Emissions Trading Scheme
EU	European Union
IRENA	International Renewable Energy Agency
JESSICA	Joint European Support for Sustainable Investment in City Areas
LA	Local authority
LECP	Local economic and community plan
NAMA	National Assets Management Agency
NGO	Non-governmental organisation
OECD	Organisation for Economic Co-operation and Development
PI	Primary indicator
PV	Photovoltaic
RE	Renewable energy
RES	Renewable energy source
SDG	Sustainable Development Goal
SEAI	Sustainable Energy Authority of Ireland
SEE	South East Europe
SIDS	Small island developing states
SMEs	Small and medium-sized enterprises

AN GHNÍOMHAIREACHT UM CHAOMHNÚ COMHSHAOIL
Tá an Ghníomhaireacht um Chaomhnú Comhshaoil (GCC) freagrach as an gcomhshaol a chaomhnú agus a fheabhsú mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaol a chosaint ó éifeachtaí díobhálacha na radaíochta agus an truaillithe.

Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

Rialú: *Déanaimid córais éifeachtacha rialaithe agus comhlíonta comhshaoil a chur i bhfeidhm chun torthaí maithe comhshaoil a sholáthar agus chun díriú orthu siúd nach gcloíonn leis na córais sin.*

Eolas: *Soláthraímid sonraí, faisnéis agus measúnú comhshaoil atá ar ardchaighdeán, spriocdhírithe agus tráthúil chun bonn eolais a chur faoin gcinnteoireacht ar gach leibhéal.*

Tacaíocht: *Bímid ag saothrú i gcomhar le grúpaí eile chun tacú le comhshaol atá glan, táirgiúil agus cosanta go maith, agus le hiompar a chuirfidh le comhshaol inbhuanaithe.*

Ár bhFreagrachtaí

Ceadúnú
Déanaimid na gníomhaíochtaí seo a leanas a rialú ionas nach ndéanann siad dochar do shláinte an phobail ná don chomhshaol:
- saoráidí dramhaíola *(m.sh. láithreáin líonta talún, loisceoirí, stáisiúin aistrithe dramhaíola)*;
- gníomhaíochtaí tionsclaíocha ar scála mór *(m.sh. déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta)*;
- an diantalmhaíocht *(m.sh. muca, éanlaith)*;
- úsáid shrianta agus scaoileadh rialaithe Orgánach Géinmhodhnaithe *(OGM)*;
- foinsí radaíochta ianúcháin *(m.sh. trealamh x-gha agus radaiteiripe, foinsí tionsclaíocha)*;
- áiseanna móra stórála peitril;
- scardadh dramhuisce;
- gníomhaíochtaí dumpála ar farraige.

Forfheidhmiú Náisiúnta i leith Cúrsaí Comhshaoil
- Clár náisiúnta iniúchtaí agus cigireachtaí a dhéanamh gach bliain ar shaoráidí a bhfuil ceadúnas ón nGníomhaireacht acu.
- Maoirseacht a dhéanamh ar fhreagrachtaí cosanta comhshaoil na n-údarás áitiúil.
- Caighdeán an uisce óil, arna sholáthar ag soláthraithe uisce phoiblí, a mhaoirsiú.
- Obair le húdaráis áitiúla agus le gníomhaireachtaí eile chun dul i ngleic le coireanna comhshaoil trí chomhordú a dhéanamh ar líonra forfheidhmiúcháin náisiúnta, trí dhíriú ar chiontóirí, agus trí mhaoirsiú a dhéanamh ar leasúchán.
- Cur i bhfeidhm rialachán ar nós na Rialachán um Dhramhthrealamh Leictreach agus Leictreonach (DTLL), um Shrian ar Shubstaintí Guaiseacha agus na Rialachán um rialú ar shubstaintí a ídíonn an ciseal ózóin.
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaol.

Bainistíocht Uisce
- Monatóireacht agus tuairisciú a dhéanamh ar cháilíocht aibhneacha, lochanna, uiscí idirchriosacha agus cósta na hÉireann, agus screamhuiscí; leibhéil uisce agus sruthanna aibhneacha a thomhas.
- Comhordú náisiúnta agus maoirsiú a dhéanamh ar an gCreat-Treoir Uisce.
- Monatóireacht agus tuairisciú a dhéanamh ar Cháilíocht an Uisce Snámha.

Monatóireacht, Anailís agus Tuairisciú ar an gComhshaol
- Monatóireacht a dhéanamh ar cháilíocht an aeir agus Treoir an AE maidir le hAer Glan don Eoraip (CAFÉ) a chur chun feidhme.
- Tuairisciú neamhspleách le cabhrú le cinnteoireacht an rialtais náisiúnta agus na n-údarás áitiúil *(m.sh. tuairisciú tréimhsiúil ar staid Chomhshaol na hÉireann agus Tuarascálacha ar Tháscairí)*.

Rialú Astaíochtaí na nGás Ceaptha Teasa in Éirinn
- Fardail agus réamh-mheastacháin na hÉireann maidir le gáis cheaptha teasa a ullmhú.
- An Treoir maidir le Trádáil Astaíochtaí a chur chun feidhme i gcomhair breis agus 100 de na táirgeoirí dé-ocsaíde carbóin is mó in Éirinn.

Taighde agus Forbairt Comhshaoil
- Taighde comhshaoil a chistiú chun brúnna a shainaithint, bonn eolais a chur faoi bheartais, agus réitigh a sholáthar i réimsí na haeráide, an uisce agus na hinbhuanaitheachta.

Measúnacht Straitéiseach Timpeallachta
- Measúnacht a dhéanamh ar thionchar pleananna agus clár beartaithe ar an gcomhshaol in Éirinn *(m.sh. mórphleananna forbartha)*.

Cosaint Raideolaíoch
- Monatóireacht a dhéanamh ar leibhéil radaíochta, measúnacht a dhéanamh ar nochtadh mhuintir na hÉireann don radaíocht ianúcháin.
- Cabhrú le pleananna náisiúnta a fhorbairt le haghaidh éigeandálaí ag eascairt as taismí núicléacha.
- Monatóireacht a dhéanamh ar fhorbairtí thar lear a bhaineann le saoráidí núicléacha agus leis an tsábháilteacht raideolaíochta.
- Sainseirbhísí cosanta ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

Treoir, Faisnéis Inrochtana agus Oideachas
- Comhairle agus treoir a chur ar fáil d'earnáil na tionsclaíochta agus don phobal maidir le hábhair a bhaineann le caomhnú an chomhshaoil agus leis an gcosaint raideolaíoch.
- Faisnéis thráthúil ar an gcomhshaol ar a bhfuil fáil éasca a chur ar fáil chun rannpháirtíocht an phobail a spreagadh sa chinnteoireacht i ndáil leis an gcomhshaol *(m.sh. Timpeall an Tí, léarscáileanna radóin)*.
- Comhairle a chur ar fáil don Rialtas maidir le hábhair a bhaineann leis an tsábháilteacht raideolaíoch agus le cúrsaí práinnfhreagartha.
- Plean Náisiúnta Bainistíochta Dramhaíola Guaisí a fhorbairt chun dramhaíl ghuaiseach a chosc agus a bhainistiú.

Múscailt Feasachta agus Athrú Iompraíochta
- Feasacht chomhshaoil níos fearr a ghiniúint agus dul i bhfeidhm ar athrú iompraíochta dearfach trí thacú le gnóthais, le pobail agus le teaghlaigh a bheith níos éifeachtúla ar acmhainní.
- Tástáil le haghaidh radóin a chur chun cinn i dtithe agus in ionaid oibre, agus gníomhartha leasúcháin a spreagadh nuair is gá.

Bainistíocht agus struchtúr na Gníomhaireachta um Chaomhnú Comhshaoil
Tá an ghníomhaíocht á bainistiú ag Bord lánaimseartha, ar a bhfuil Ard-Stiúrthóir agus cúigear Stiúrthóirí. Déantar an obair ar fud cúig cinn d'Oifigí:
- An Oifig um Inmharthanacht Comhshaoil
- An Oifig Forfheidhmithe i leith cúrsaí Comhshaoil
- An Oifig um Fianaise is Measúnú
- Oifig um Chosaint Radaíochta agus Monatóireachta Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag comhaltaí air agus tagann siad le chéile go rialta le plé a dhéanamh ar ábhair imní agus le comhairle a chur ar an mBord.

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Developing the Potential of Community Energy Action Groups in the Transition to a Low-carbon Society

Authors: Susan Byrne and Bernadette O'Regan

Identifying Pressures

The transition to a low carbon and sustainable economy and society will require effective public engagement and acceptance. Many Irish community-based groups have been working towards addressing climate change through actions to enhance sustainability at a local scale. There is a perceived lack of agency support including in relation to communication, knowledge sharing and technical guidance for implementation and monitoring. This often results in community groups feeling isolated and having a poor understanding of the real-world impact of their efforts in mitigating environmental challenges. Pressures include the lack of clear guidelines, resources such as indicators and measurement tools, and dedicated support agencies.

Following the criteria adopted in this study, screening of communities identified only six communities that were engaged in implementation of a holistic plan for sustainability, with most focusing on gaining grants for enhancing energy efficiency.

Informing Policy

Managing a community-scale low carbon transition involves more than the adoption of renewable energy and energy efficiency actions. Transition requires changes to local amenities, local industry, local food, and education and outreach activities.

This research identified access to funding as a major barrier to implementation of more ambitious projects at the community scale. Experience in other European Union (EU) states clearly shows that in many instances the optimal way for communities to gain the long-term funding necessary for ambitious actions is by selling renewable energy into the national grid at a tariff greater than that currently available in Ireland.

The benefits to communities and their economies can occur where this income is invested in the local economy to increase regional added value, thus enabling communities to implement further decarbonisation actions. External agencies provide crucial support in creating community cohesion. In the EU, higher education institutes and local authorities are often successful in providing this support. Including the wider public in the community decision-making process, and also ensuring that they share in the social and financial benefits, was found to be essential. Inclusion of the wider public is required if community-scale action is to enhance national-scale decarbonisation action.

Developing Solutions

The research strongly demonstrates that an effective pathway towards a low carbon transition can be achieved at the community scale given supporting policy and funding structures. Examples from two German communities showed the potential of local actors to identify, and to act on, locally relevant sustainability issues. Additional policy and funding structures that enable community groups to develop and advance their low carbon transition projects are required if Irish community groups are to replicate the successes of communities in other EU countries in achieving significant greenhouse gas emissions reductions, and thus work to create models of more sustainable living, and help meet national targets.

With regard to acknowledging the contribution that Irish community groups make to national low carbon transition, it is important that the greenhouse gas emissions reductions achieved through locally initiated projects are measured, recognised and rewarded where appropriate. The impact of decarbonisation actions are not limited to energy and emissions reductions, but also include a wide range of both economic and environmental benefits. In this report, a template toolkit and guidance manual to support action at the community scale are presented.

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