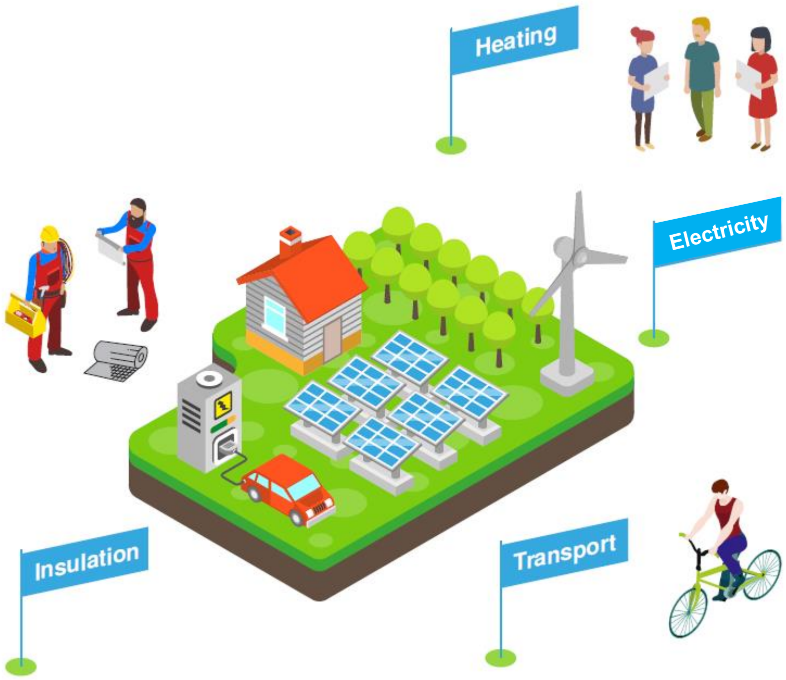
Powerful Community Pathway

BOYLE

REPORT | 2019



POWERFUL COMMUNITY PATHWAY

BOYLE

REPORT | 2019

This report is a product of Good Energies Alliance Ireland under the direction of Aedín McLoughlin and Liam Breslin, with the technical assistance of Paul McNama and Mel Gavin of IT Sligo, and funding support from Erasmus+ Programme and Irish Environmental Network (IEN).

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THE SURVEY

Main goal

The goal of this study is draw a baseline of the energy profile of the typical household in the town of Boyle (Co. Roscommon), in order to modelize an energy transition scenario that unlocks benefits for the community. The Powerful Community Pathways is meant to be inclusive to bottom-up approaches and citizenship participation in order to share the burden of the transition as well as the value.

Calendar

- May 2019 — Survey preparation and design
- May-June 2019 — Household energy survey administration
- June 2019 — Analysis of data, report writing and editing
- June the 17th 2019 — Presentation of results at Energy challenge seminar + community energy workshop

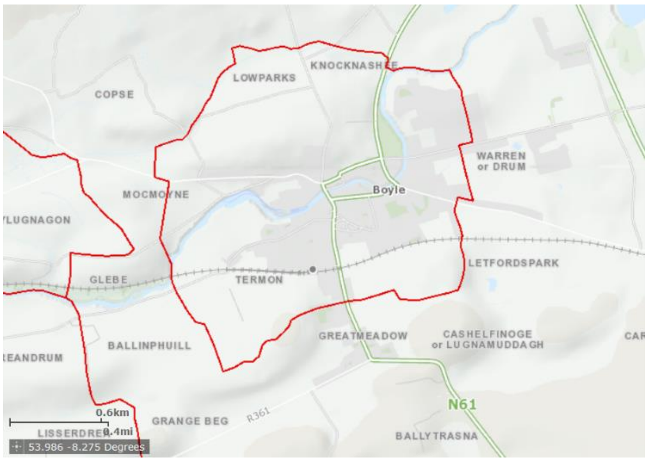
Methodology

In order to collect primary data for energy uses, the doorstep survey technique was adopted. The target population was identified as the residents of Boyle, that, according to the 2016 census had 1123 occupied households in permanent housing. Assuming a 95% confidence level and seeking a 10% margin error, 89 respondents were required. A questionnaire of 55 questions was designed. The survey was first administered in a pilot phase to 10 households to test it and refine the instruments. 103 households were then surveyed, representing roughly the 10% of the occupied housing stock. Data treatment and analysis was carried out to obtain descriptive figures regarding the surveyed population as well as average quantities of requirements, expenditure and emission equivalent for each energy carrier (electricity, thermal and transport fuels). For calculations and comparisons, CSO data (settlement data), SEAI data and energy market price data were employed. Transition scenarios are based on the model designed by IT

BOYLE: OVERVIEW

Boyle area

Figure 1



Source: CSO SMAP, 2016

Boyle is a rural town located in County Roscommon. As of 2016, the population town was 2,568. The housing stock amounts to 1,411 and 1,123 houses are occupied.[1] The occupancy rate is nearly 80%. The number of cars can be estimated at around 1,514.

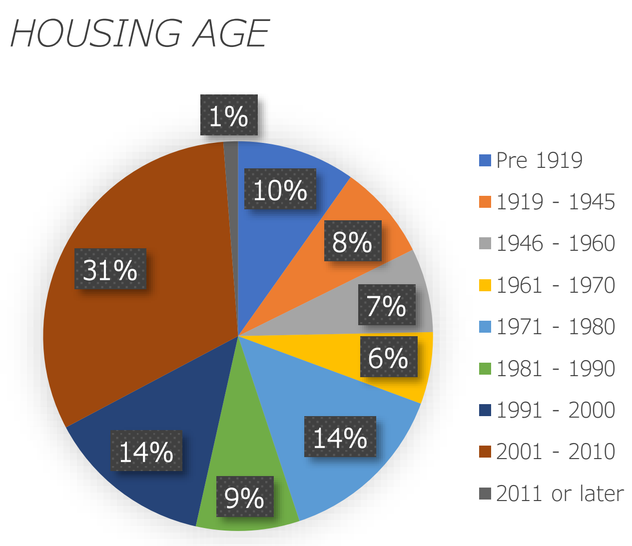
Table 1: Boyle in numbers

Total population	2568
Housing stock	1411
Occupied houses	1123
Cars	1514

Source: CSO Census (Settlement), 2016

The age of houses for the whole settlement of Boyle is quite heterogeneous, but more than a quarter of the housing stock was built between 2001 and 2010.

Figure 2



Source: CSO Census (Settlement), 2016

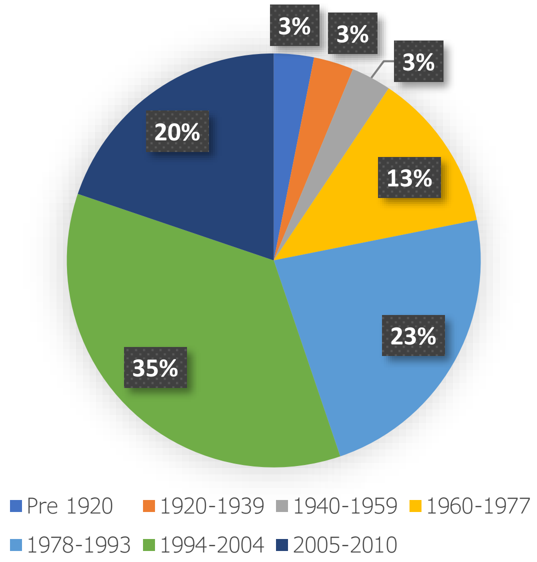
1 Central Statistics Office – Census 2016

Sample characteristics

The two surveyed population clusters lie in the outskirts of Boyle. In those sub-areas, more than one third of the houses were built between 1994 and 2004; a quarter before 1978: less than a quarter between 1978 and 1993 and 20% since 2005.[2]

Figure 3

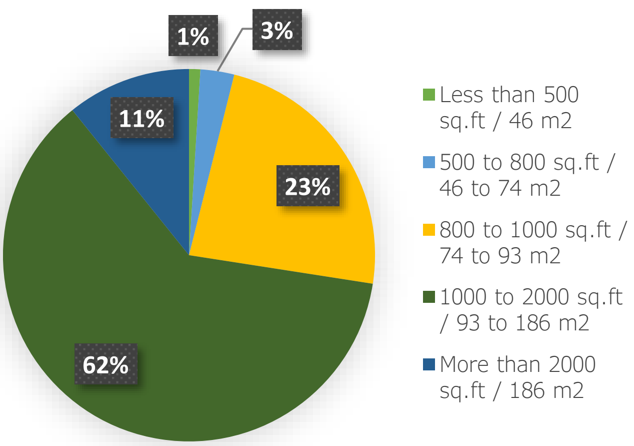
HOUSING AGE



62% of the houses have a floor area between 1,000 and 2,000 sq.ft; 23% between 800 and 1,000 sq.ft and 11% more than 2000 sq.ft. The remaining 4% is less than 800 sq.ft.

Figure 4

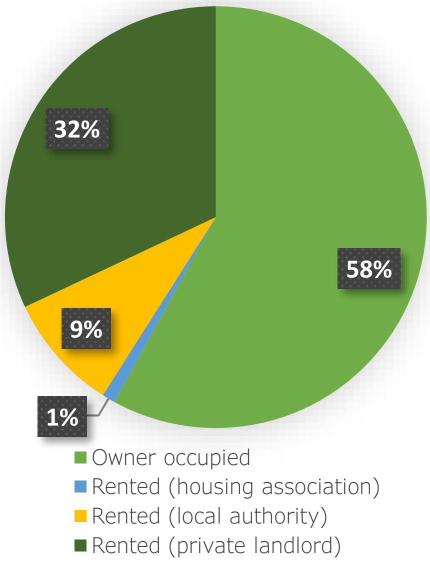
FLOOR AREA



Majority of the houses were "Owner occupied" (c. 58%). Renting from private landlord is the prevalent type of renting, with local authority and housing association being only 9 and 1%, respectively.

Figure 5

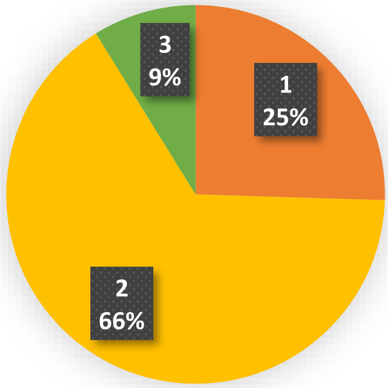
TYPE OF OCCUPANCY



Two-thirds (66%) of all houses surveyed had two permanent adults in. 25% had one adult and 9% had three. Average number of children is 2

Figure 6

NUMBER OF PERMANENT ADULTS

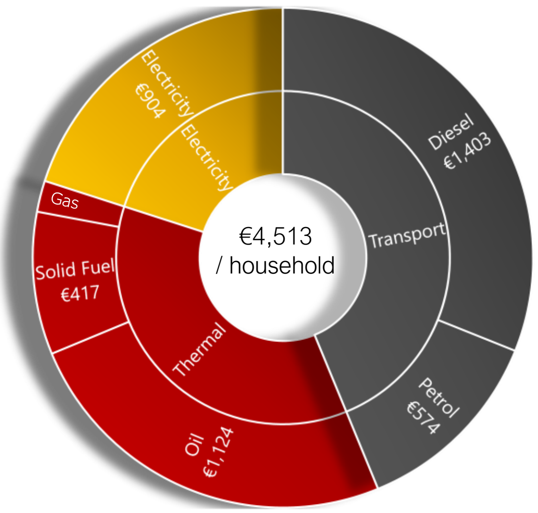


2 Note that 2006 was the year in which stricter building standards were enacted pertaining better heat retention and efficiency.

RESULTS

Average annual energy costs per household

Figure 7



Considering the population surveyed, the typical energy costs per household are:

- €1,977 forn Transport (44%)
- €1,632 for Heating and Cooking (36%)
- €904 for Electricity (20%)

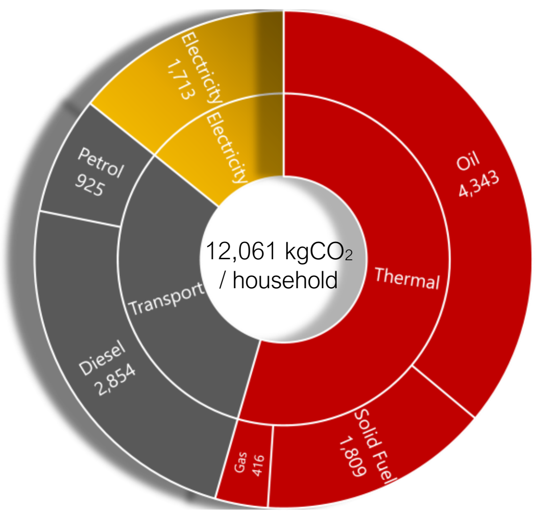
Thermal costs are about 51% higher than the national average per household (€20/week in 2015) [2]

Transport costs are about .8% higher than the national average per household (€35/week in petrol/diesel in 2015) [3]

Average total cost per person is approx. €1,618 (including minors).

Average annual GHG emissions per household[4]

Figure 8



Annual carbon footprint per household consists of:

- 8,281 $kgCO_2$/year, of which:
  - 1,713 $kgCO_2$/year for electricity (15%)
  - 6,568 $kgCO_2$/year for heating (54%)
- 3,779 $kgCO_2$ for transport (31%)

For a total of over 12 thousand $kgCO_2$/year.

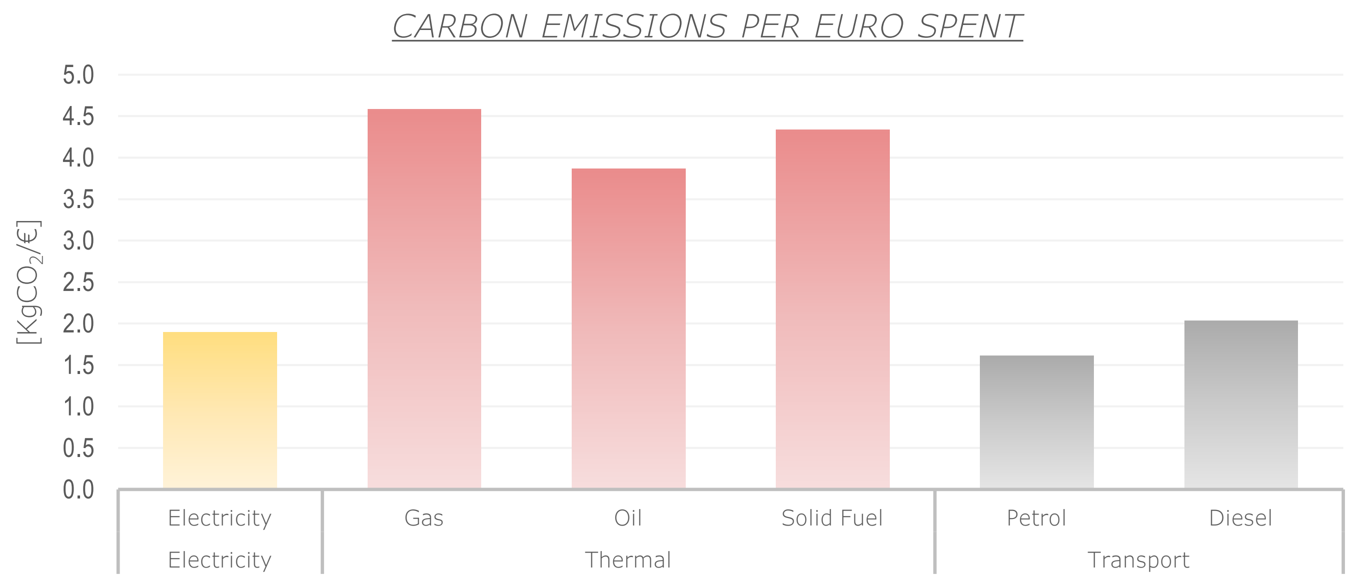
Thermal energy needs have the largest climate impact, due to high reliance on oil and solid fuels for heating purposes.

Transport energy needs have the second largest impact, due to dominance of private diesel cars: 31%.

3 Central Statistics Office – Household Budget Survey 2015-2016 – Data actualised with inflation rate

4 Note on methodology: the climate impact of a typical household, in terms of carbon dioxide emitted, is calculated starting with household energy requirements or spending figures, transformed into the respective kWh via the net calorific values (NCV), then converted into the carbon content, through the fuel-specific carbon emission factor provided by SEAI

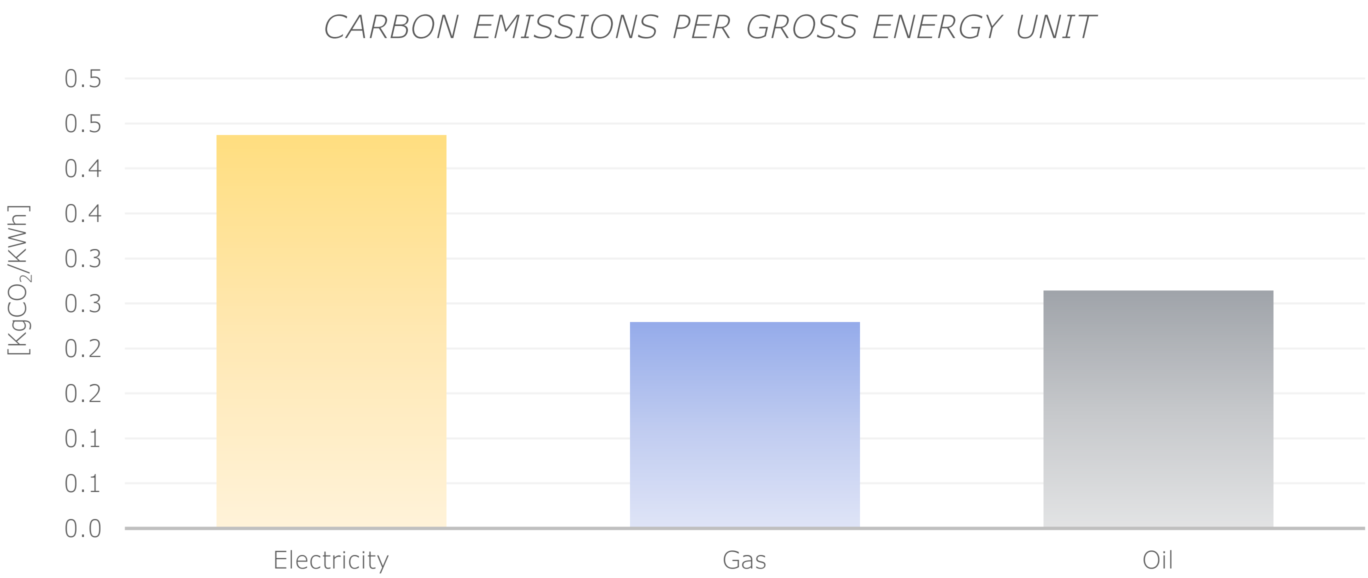
Figure 9



1 euro spent on different energy carriers has a different climate impact: thermal carriers display highest carbon content per euro, approximately double the value of electricity and motor fuels. They are a cheap source of heat-trapping emissions.

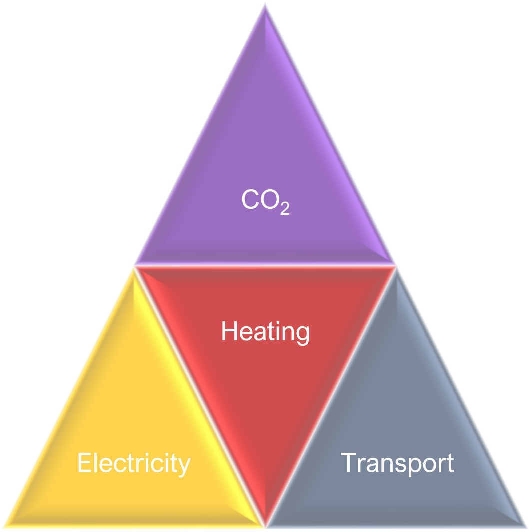
However, in terms of unit of (gross) energy produced, electricity has the highest climate impact, due to a national grid still strongly dependent on fossil fuels (mostly natural gas, plus coal and peat).[5]

Figure 10



5 As per 2017 SEAI data, 51% of national electricity comes from natural gas. Electricity generation from fossil fuels is characterized by high industrial transformation requirements and the national grid suffers from considerable transmission losses. On the contrary, electricity from renewable sources is virtually 100% transformation-efficient

Total energy costs and climate impact



Applying our sample findings to the total population of Boyle, we estimate the annual energy cost and climate impact related to the entire local community:

- €2.334 million for Heating and Electricity
- €1.820 million for Transport

Which equates to

- 11,100 Tonnes CO_2

Over 90% of the energy expenditure flows out of the local economy (and out of the country), due to energy production centres being outside of the county territory (and outside Ireland if we take into account imported fossil fuels).

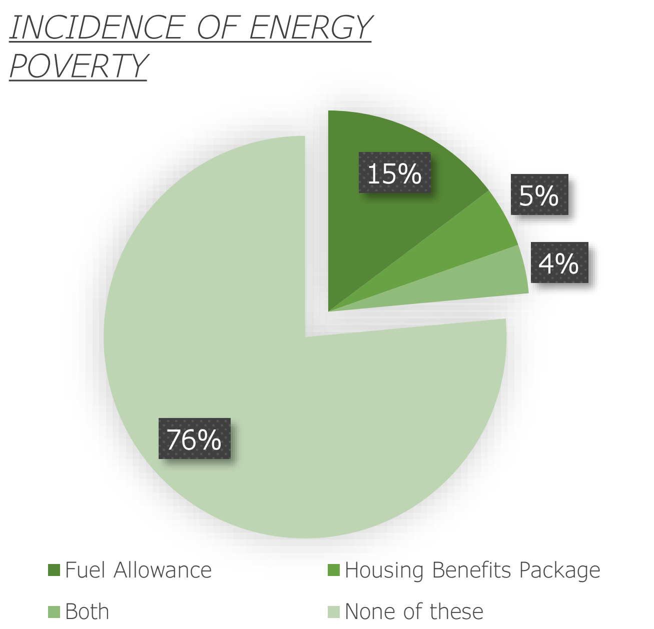
On the contrary, renewable energy, which production can also be a propeller for the domestic economy when sources are locally harvested and distributed, is marginalized. Spending on renewable energy system is estimated at 8.6% in Boyle. [6]

6 This spending figure is computed taking into account a national 25% quota of renewables in the electricity mix, 7% of renewable heating (wood) and 2.7% mandatory biofuel mix at the pump)

Focuses

Energy poverty

Figure 11



Energy poverty has been defined by the EU as "*a situation where individuals or households are not able to adequately heat or provide other required energy services in their homes at affordable cost*"

If we take the group of households that is recipient of fuel allowance and/or housing benefit package as our proxy of fuel poverty, then c.25% of Boyle families are deemed to be energy poor.

However, this figure is likely to be under-representative: as is the case in other parts of Europe, some households that are eligible to welfare measure are not aware of it.

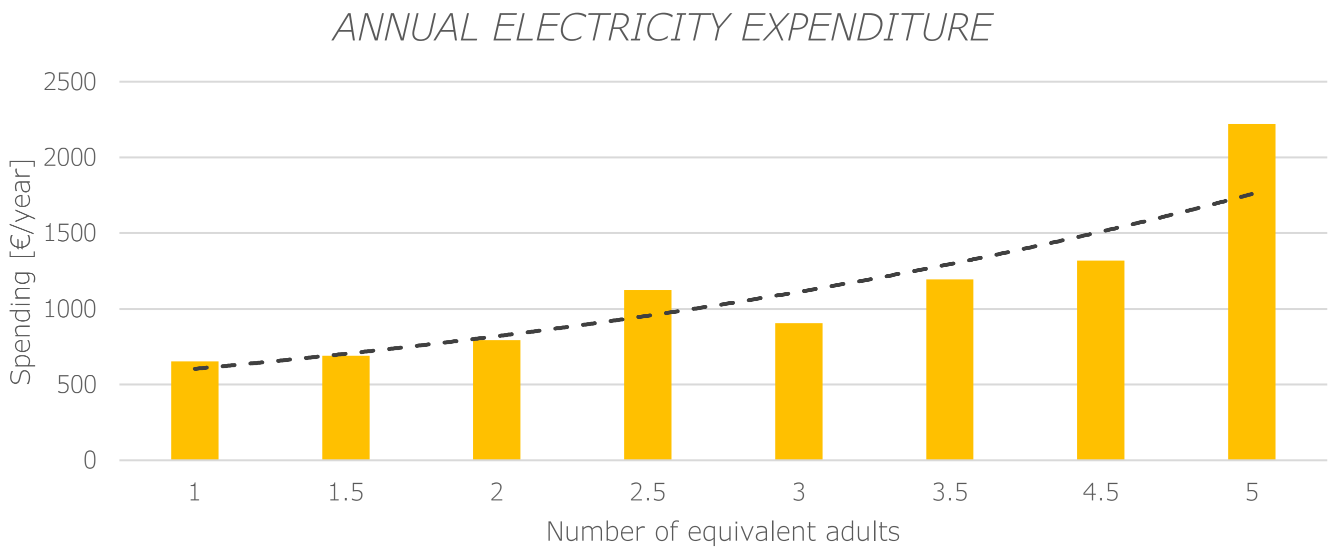
According to the Department of Communication, Energy and Natural Resources (2016), up to 28% of Irish households could be in energy poverty condition.[7]

If we expand the energy poverty definition to include households with poor or none insulation, damp and mould presence, and reliance on indoor burnt solid fuels, the figure tend to increase.

7 A Strategy to Combat Energy Poverty 2016-2019, (Department of Communications, Energy and Natural Resources, 2016). This study uses, as objective measure of prevalence of energy poverty, the number of households for which the theoretical expenditure in energy items and services to keep the home heated according to WHO standards is above a certain threshold of their disposable income.

Electricity

Figure 12



Note: children and part-time adults have been counted as half a permanent adult to obtain an equivalent scale of electricity consumption by household members.

The trend line shows that electricity bill raises with family numerosity.

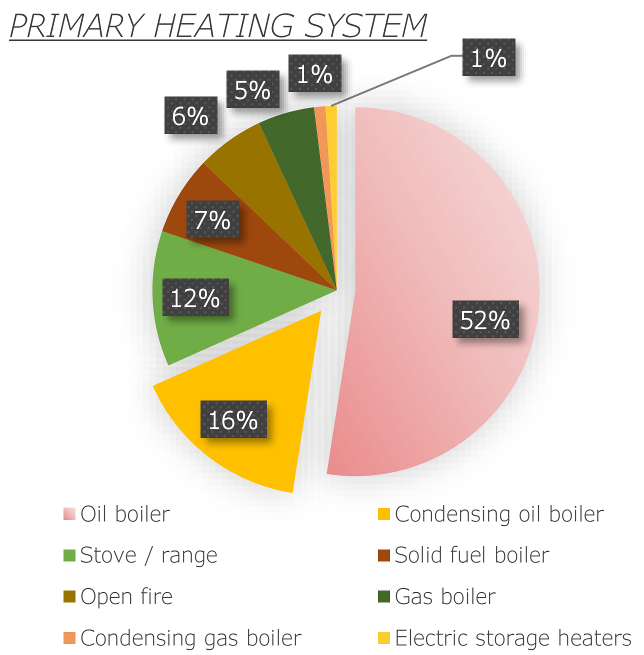
It is important to remark here that, as per now and excluding milled peat, electricity in Ireland has the highest carbon emission factor among energy vectors (38% higher than the average). Again, this is due to the fact that fossil fuels are still a dominant share of the electricity mix in Ireland (c.75%).

Space heating

Primary heating system

Oil boilers are by far the most commonly used heating system in Boyle (68% of households), reflecting the overall situation of rural Ireland settlements[8].

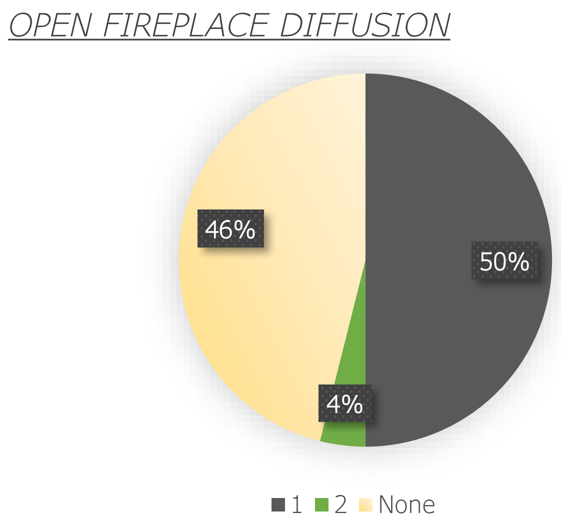
Figure 13



Secondary heating system

81% of households use a secondary heating system, with solid fuels systems being the most common back-up solution (open fire: 29%, stove/range: 23%). Open fireplaces (as well as old stoves with no chimney) are source of indoor air pollution (release of carbon monoxide and particulate) and tend to require more fuel due to low efficiency of combustion.

Figure 14



8 Energy in the residential sector (SEAI, 2018).

Solid fuels

46% of households use coal as primary solid fuel alongside other back-up fuels (wood and/or peat).

Peat is used as primary solid fuel by 30% of households.

Wood receives considerably less attention as primary solid fuel (14%). Wood can be considered a renewable energy vector if its harvesting is sustainably managed,. On the other hand, when burnt it still releases the CO_2 that was trapped during growth as well as other health harmful by-products of imperfect combustion.

Figure 15

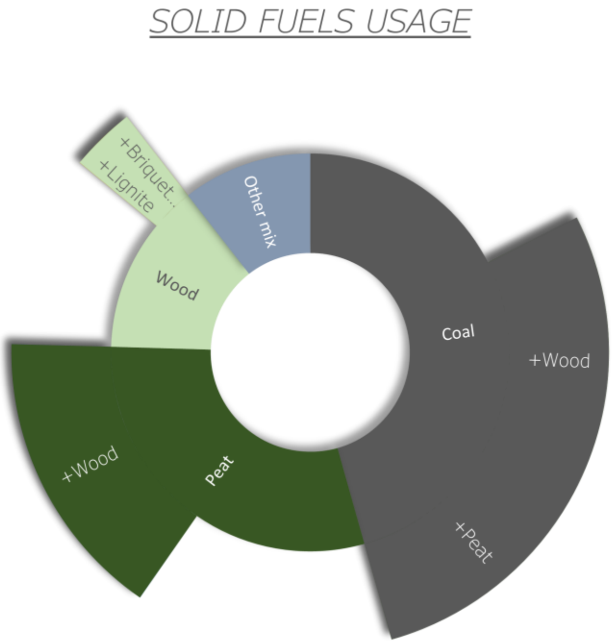
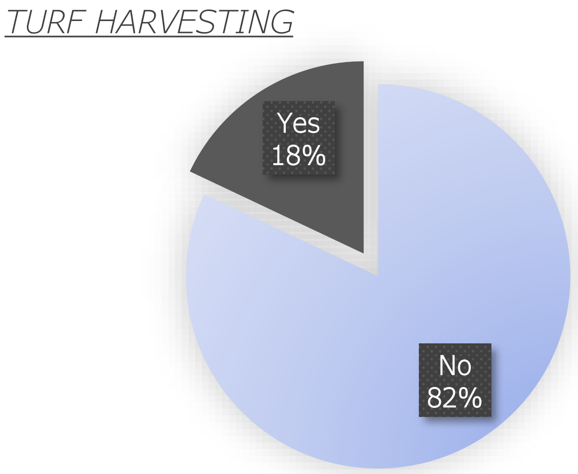


Figure 16

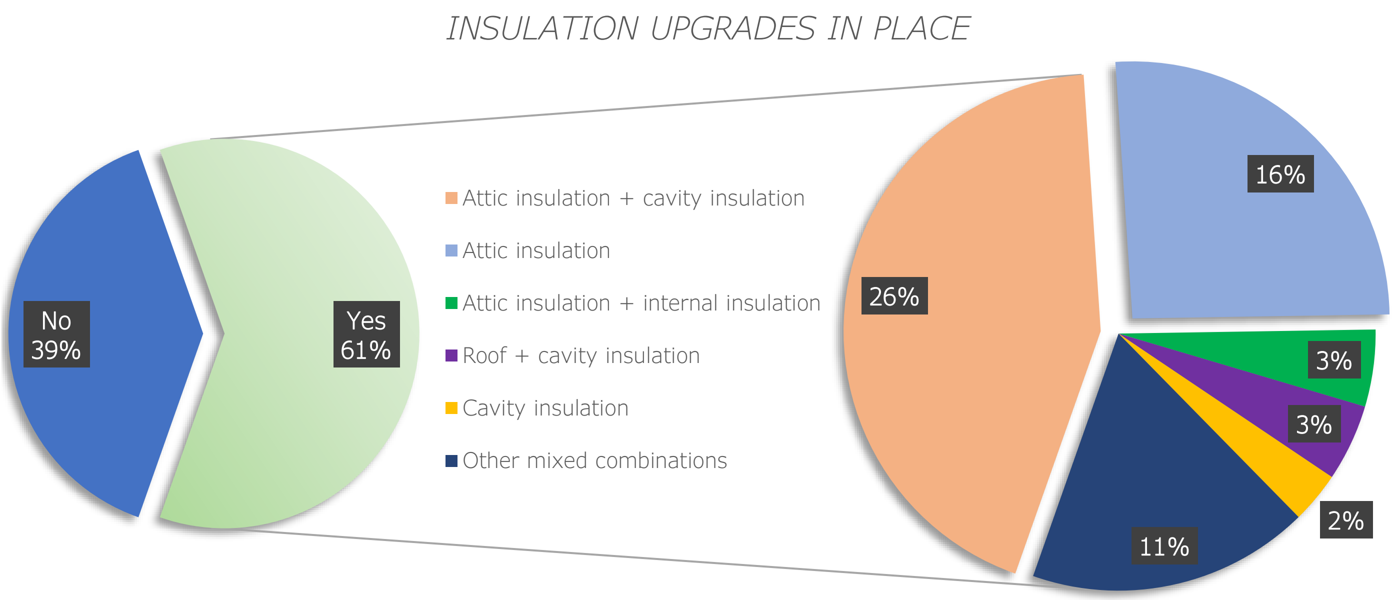


Turf (peat) is harvested locally by 18% of the households. However, a few admitted to being given turf by neighbours, therefore the final consumption of turf is larger. Turf's efficiency as fuel is low because it is less energy-dense with respect to other sources. It also shows the highest carbon emission factor among heating fuels.[9]

9 Sod peat net calorific value is 3640 kWh/tonne (53% less than coal) and its carbon emission factor is 0.374 kgCO2/kWh (32% more than other fuels) (SEAI, 2019)

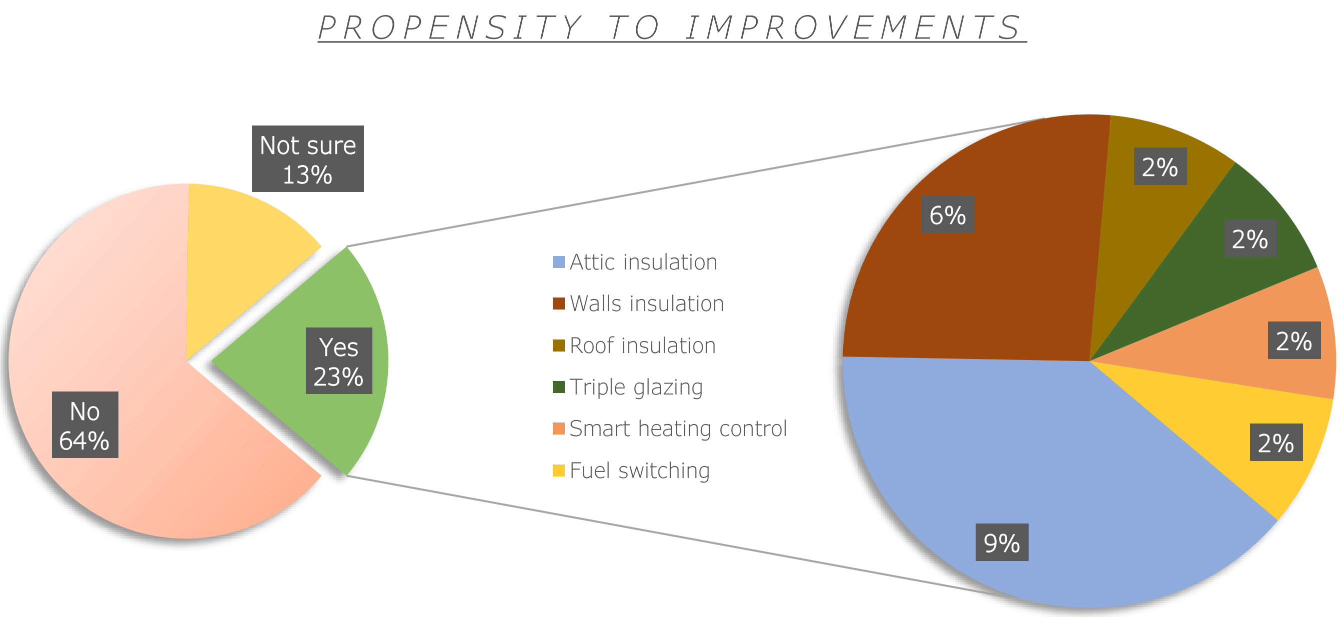
Buildings efficiency

Figure 17



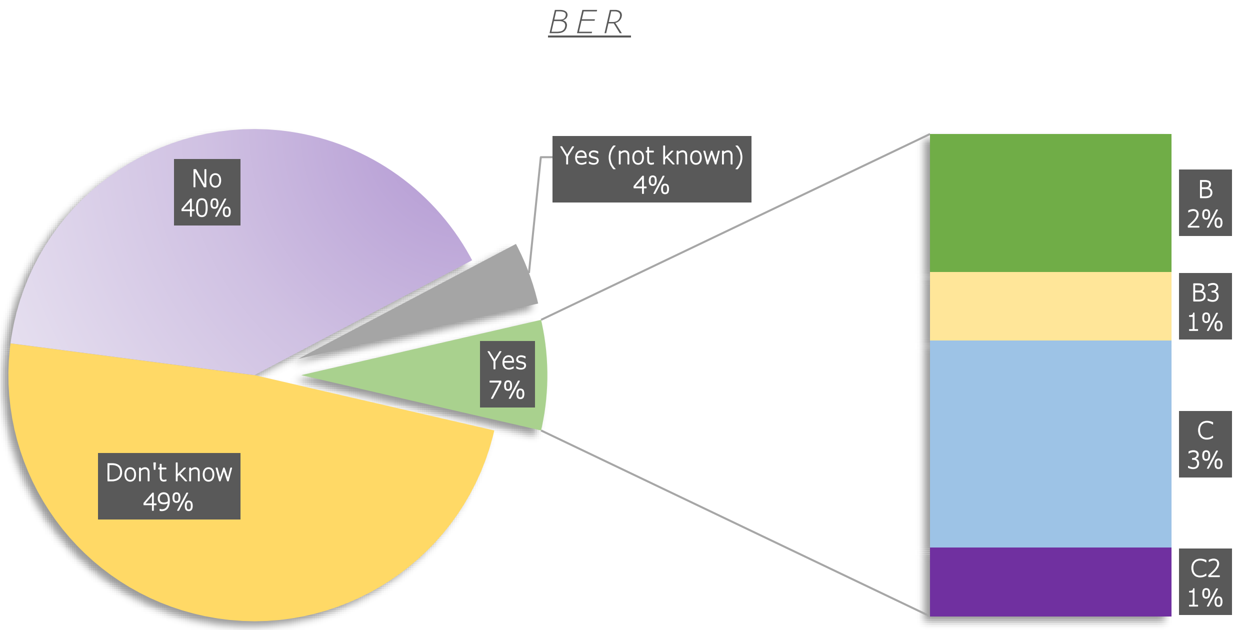
More than half of the households (61%) had some insulation upgrades since construction. Out of the households that intervened with heat retention works, attic insulation resulted the most preferred, done by up to.75% of households. Note that almost half of the insulated households chose to combine attic insulation with cavity insulation.

Figure 18



Almost two thirds of Boyle households (64%) are not considering any improvements to (further) cut down on heating costs in the future. Out of the households who responded positively, attic and walls insulation were the preferred options for retrofit.

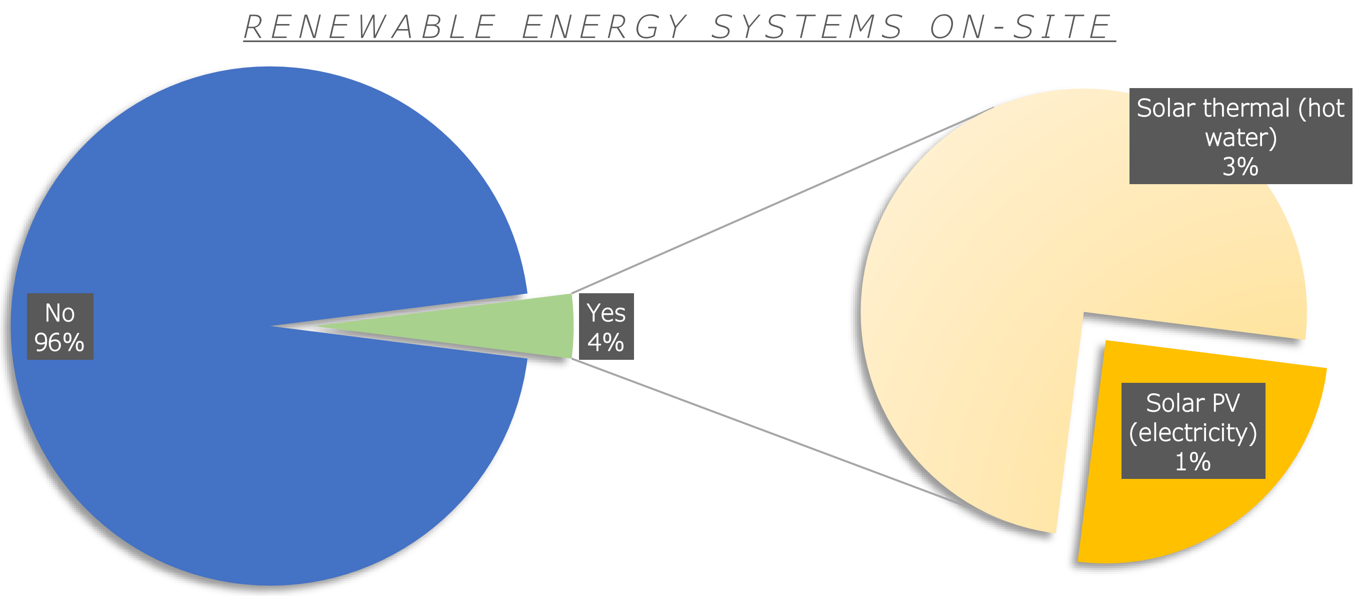
Figure 19



A Building Energy Rating (BER) is a certificate which indicate the energy performance of the building. It ranks buildings from A to G on the basis of their thermal energy requirement per space unit. c.90% of our household sample does not have a BER or is unclear about it. This shows a huge gap in education and awareness about how a BER relates to household energy costs and living conditions.

Renewable energy

Figure 20



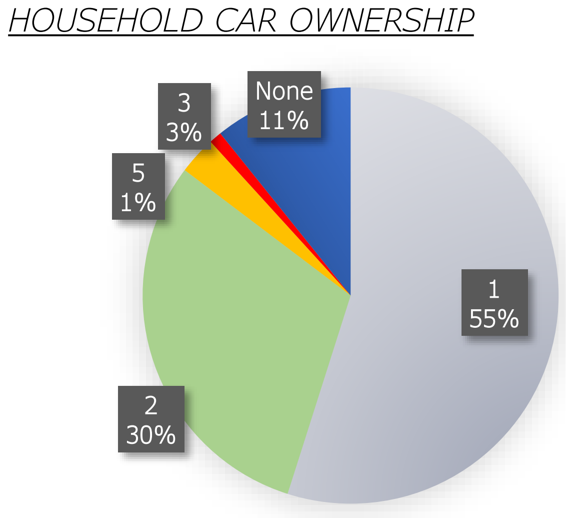
Home renewable energy systems are found on a very scant subsection of the housing stock (4%). This shows untapped potential for Boyle residents to adhere to the incoming micro-generation scheme for renewable electricity and clean heating capacity. Deployment of stand-alone PV home system shall be encouraged with proper remuneration scheme for *prosumers*.[10] In our sample solar thermal for water heating appears to be relatively more diffused than solar photovoltaic.

10 Prosumer is a word originally coined by futurologist Alvin Toffler (1980), crasis of the words producer and consumer, to address the shift from a producer-led market model to a culture where the consumer actively participates to the generation of content. Applied to the energy lexicon, it indicates a situation where households (or other units) are at the same time consumers and producers of energy. For example, the owner of a PV system can self-consume the electricity generated on-site and feed the grid with the surplus, possibly receiving a monetary compensation for that through a feed-in tariff and/or a delayed consumption credit (which is technically called net metering).

Transport

Personal vehicle

Figure 21



With c.1514 circulating cars, the private car is the ruling means of personal transportation in Boyle. 68% are diesel cars, the rest being petrol.

The average household owns 1.45 cars. There are about 6 cars every 10 residents.

Most daily car travel distances are in the 1-10 km range (≤100km per week), with the median distance travelled daily being 24 km (176km per week).

More than half of the interviewed population is considering switching to an EV. Price is the main deterrent for not switching, followed by range anxiety.

Figure 22

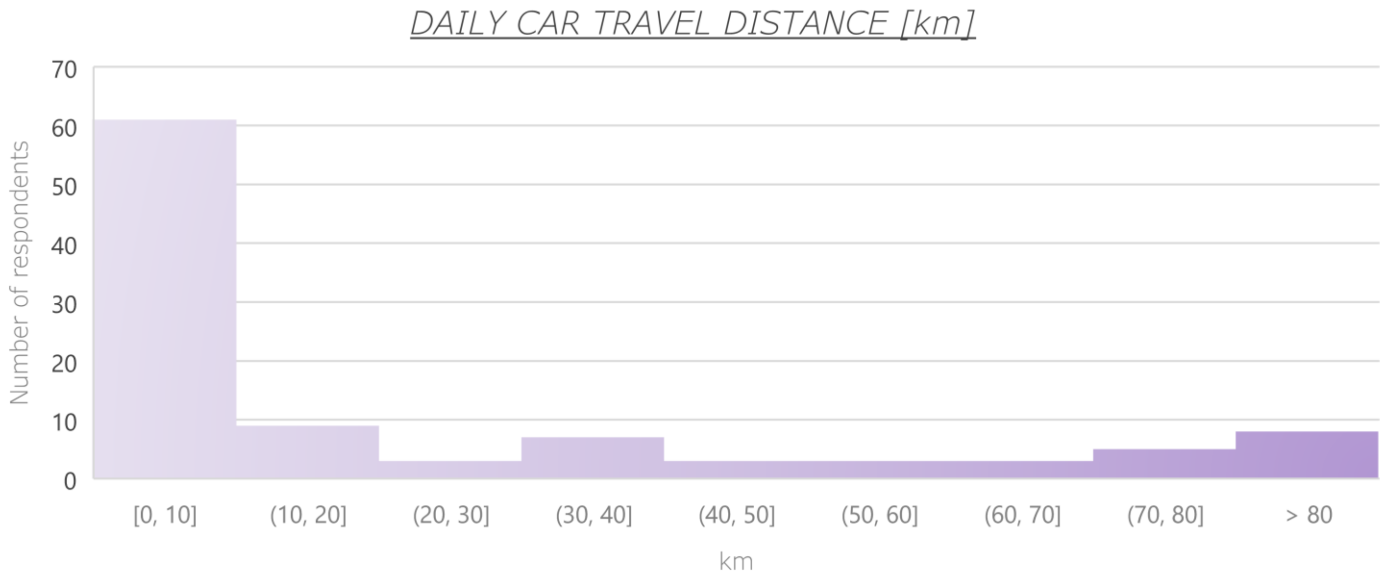
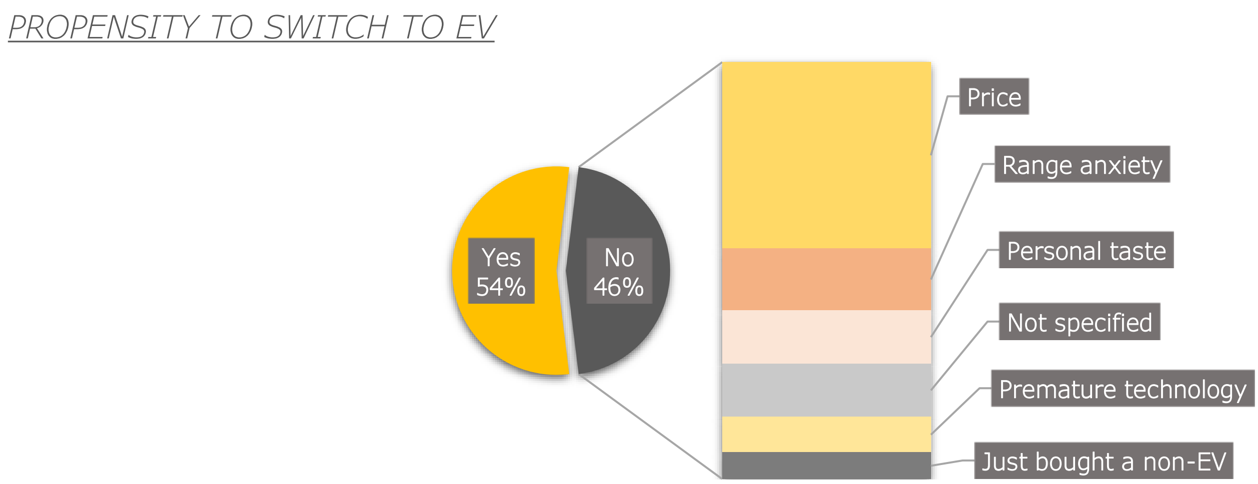


Figure 23



Part 2: Transition

Drivers of energy transition

Behaviour

Individual choices are at the core of the transition and escalate at community level. Start by making an inventory of your energy needs in your daily life and prioritize the essential ones. Keep track of energy expenses. Being aware of your interactions with energy triggers saving-oriented behaviours. Bring this mindset at work and in your community.

Energy Efficiency

Efficiency is the cheapest and cleanest energy source. The most sustainable watt is the one that is not produced at all. Reduce the amount of primary energy requirement of buildings by adopting simple energy hacks and investing in insulation. Heat retention measures quickly pay back with return on investments.

Renewable and clean energy generation

Start producing your own energy from renewable and clean sources on-site. Investments in renewable electricity and heat technologies break-even fast and give you decades of "free" energy.

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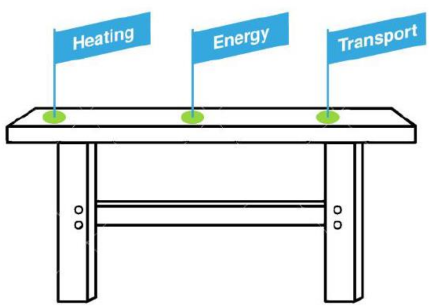


The Powerful Community Pathway identifies four transition dimensions: Knowledge (K), House (H), Transport (T) and Community. The transition dimensions are not discrete, but overlapping and complementary. Knowledge lays the foundation for the transition to evolve. Community engagement adds momentum and shared value to a just and inclusive transition. Transitions that are eligible for grants have a (G) postfix.

Transitions Dimension 1: Knowledge

Knowledge and understanding

One of the key findings of the surveys is that most residents do not have a clear understanding of their energy uses, or energy profile. To kickstart any realistic transition we first need to have a grasp on the energy use. The transitions for knowledge outlined here don't all guarantee savings, but they are essential to decisions-making and bringing about further game-changing solutions.

The starting point is to know how much energy you use in your home and car. What we call a "baseline". You can record energy use in quantities such as litres of oil, litres of petrol, kWh and CO2 emissions. But the easiest way to start is by recording costs.

The measures highlighted here should be thought of as a starting point. Getting to understand your energy use and learning how your home uses energy will help you to make further behavioural changes, many of which can bring real cost savings. Transitions for knowledge are the foundation for all other transitions.

Understanding home and car energy use

(K1) Your Energy File

Put together a file or folder for all your home and car energy bills: electricity, oil, gas, solid fuels, petrol, diesel.

- This can be a paper file, especially if you receive all your bills by post or paper receipt.
- Computer files e.g. in excel, can be very useful to see trends or changes.
- For oil or gas deliveries, put the receipt into the file each time. The receipt should have quantities as well as costs.
- For solid fuels keep a notebook and note each time you buy bags of coal, briquettes or have fuel delivered e.g. timber blocks. Date each entry and try to note quantities as well as the cost.
- For your car, keep a small notebook and note each time you fill or top up with petrol or diesel. Date each entry and try to note the litres as well as the cost.

Sum up your costs for each type of energy at least once a year, maybe even every 3 or 6 months. This will help you to see changes in use and costs. This will also allow you to look for improvements as you make further changes, e.g. insulation, LED light bulbs.

(K2) Submit electricity meter readings

Submit electricity meter readings every month. This will help to avoid sudden changes in bills and make the bills more accurate for your Energy File.

- Learn how to read and submit the reading from your supplier. There are usually a number of options e.g. by phone, text or online.
- Set a reminder on your phone for the last day of each month

(K3) Switch energy suppliers

Switch electricity supplier every 1 or 2 years. Most suppliers offer short term discounts for new customers for the 1st year, but then you are automatically moved onto the standard rate. Cost savings of more than 10% should be expected.

- Use online price comparison websites e.g:
  - www.bonkers.ie
  - www.switcher.ie

Switching oil supplier is not always practical. However you can compare current oil prices online to make sure you are getting a good deal, using www.cheapestoil.ie

(K4) Be your own energy manager

There are a number of useful guides to help with this transition. A very useful source is the SEAI booklet – Householders, be your own energy manager (available from SEAI)

Grants and support schemes

There are numerous grants, incentives and support schemes which can help individuals and communities with energy transitions. The list below is not exhaustive. For an exhaustive and updated list of grants and support schemes refer to the SEAI website.

Free Energy Upgrades for Eligible Homes

This scheme funds energy efficiency improvements to the homes of vulnerable people who are in receipt of certain welfare payments, at no cost to the homeowner. The works available include: Attic insulation, Cavity wall insulation, External and Internal wall insulation, Draught proofing Lagging jackets, Low energy light bulbs, Energy advice

https://www.seai.ie/grants/home-energy-grants/free-upgrades-for-eligible-homes/

Insulation Grants

This scheme provides fixed grant amounts for a wide range of insulation upgrades, from €400 for attic or cavity wall insulation to €6,000 for an external insulation “wrap” for a detached house. All homeowners, including landlords, whose homes were built and occupied before 2006 can apply.

https://www.seai.ie/grants/home-energy-grants/insulation-grants/

Solar Water Heating Grant

All homeowners, including landlords, whose homes were built and occupied **before 2011** can apply for a €1,200 grant for the purchase of a solar water heating system.

https://www.seai.ie/grants/home-energy-grants/solar-water-heating-grant/

Solar Electricity Grant

Rebates are available for home PV capacity installation up to 2kWp (6-7 panels) or up to 4kWp if the PV system comes with batteries. Rebate amount is €700 per kWp while the battery storage system is covered with a lump-sum of €1,000.

https://www.seai.ie/grants/home-energy-grants/solar-electricity-grant/

Heat Pumps Grant

The grant value is variable depending on the end-use of the heat pump installed. Water heating pumps (whether of air, water or ground source) are eligible for a €3,500 grant while space heating pumps (air to air) for €600. Be sure your home is heat pump-ready before purchasing one by engaging a SEAI registered technical advisor that will conduct an assessment of your dwelling fabric heat loss. The assessment is refunded with an extra €200 by the scheme.

https://www.seai.ie/grants/home-energy-grants/heat-pump-systems/

SEAI Electric Vehicle Grant

This grant goes from €2,000 up to €5,000 for the purchase of eligible private Electric Vehicle (EV) or Plugin Hybrid Electric Vehicles (PHEV).

https://www.seai.ie/grants/electric-vehicle-grants/grant-amounts/

Electric Vehicle Home Charger Grant

Electric Vehicles registered new or bought second hand from 01/01/2018 onwards are eligible for a purchase and installation grant for a home charger unit up to €600.

https://www.seai.ie/grants/electric-vehicle-grants/electric-vehicle-home-charger-grant/

Community grants

SEAI Better Energy Communities (BEC) and Sustainable Energy Communities (SEC) are two national retrofit and low-carbon initiatives specifically designed to catalyse community-wise energy transition. Upgrades can take place across various building types and sectors to reduce energy use and costs throughout the community. These schemes are particularly valuable to engage cross community and private business support.

https://www.seai.ie/grants/community-grants/

https://www.seai.ie/sustainable-solutions/community-projects/community-network/

Energy supplier incentives

A number of large energy suppliers offer support incentives to homeowners energy efficiency projects. These incentives can generally be stacked with SEAI grants. One example is the Electric Ireland Energy Efficiency Incentive:

https://www.electricireland.ie/residential/products/heating-services-repair/energy-efficiency-incentive

Transitions dimension 2: House

(H1) Get a Building Energy Rating (G)

A Building Energy Rating (BER) certificate indicates your building's energy performance. The BER should be accompanied by an 'Advisory Report' that will include recommendations for energy improvements. This is a very good way to get professional advice on what kind of improvements you can make to your home. A BER will cost approx. €150-€200. You can get quick quotations at www.bercert.com

Understand your home

Making changes at home can be simple efforts such as learning how to set your heating, or more complex investments such as major insulation upgrades. A number of key opportunities were highlighted in the surveys.

Estimate your own BER

You can estimate your own BER from the year your home was built and the main heating system.

Table 2: BER self-evaluation chart

Oil/gas central heating		Standard electric heating		Solid fuel central heating	
Year of construction	Typical energy rating	Year of construction	Typical energy rating	Year of construction	Typical energy rating
2012+	A3	2012+	A3	2012+	A3
2010-2011	B1	2010-2011	B1	2010-2011	B1
2008-2009	B3	2008-2009	C3	2008-2009	B3
2005-2007	C1	2005-2007	D1	2005-2007	C2
1994-2004	C3	1994-2004	E1	1994-2004	D1
1978-1993	D1	1978-1993	E2	1978-1993	D2
Pre 1978	D2/E1/E2	Pre 1978	G	Pre 1978	F

These tables indicate the typical BER rating for houses by age for various fuel types. The data reflects typical Building Regulations and practices at the time of construction.

Home heating

Find out your comfortable temperature

Use room thermometers in different areas of the home to find out what your comfortable temperature is. Bedrooms and hallways should not need to be kept as warm as main living areas. Use your heating controls to set the room temperature, rather than opening windows or doors.

(H2) Draught proofing (G)

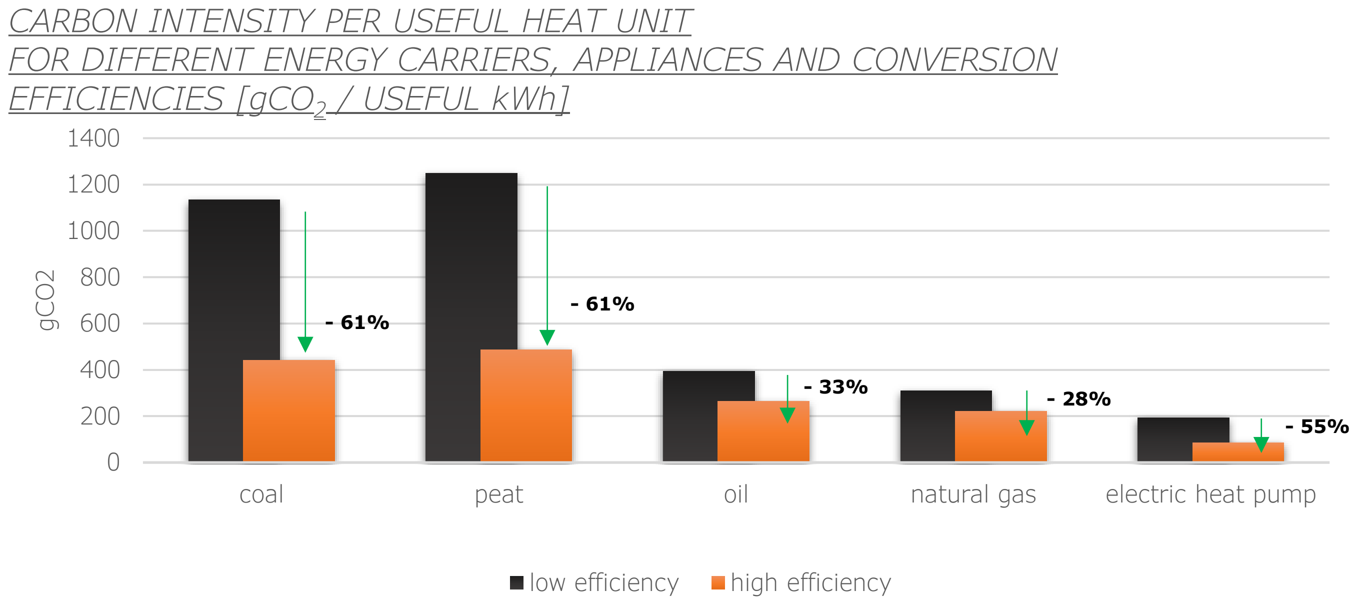
Air leakage and draughts in your home lose heat and can cause discomfort. Draught proofing is a low cost improvement option and a simple DIY solution that you can do in stages. Start with the main entrances and living areas of your home. There are numerous products available for different areas of the home.

- Draught strips for doors and windows
- Sealants for joints

(H3) Open fireplaces – install a chimney blocker

The majority of homes in the community still have open fireplaces, which are inefficient and are an easy escape route for heat from your home. For open fireplaces, which are used for long periods, a simple chimney blocker can be installed. Chimney draught excluders/balloons are available from most DIY stores for approx. €30.

Figure 24



Source: GEAI elaboration on SEAI - Energy in the residential sector, 2018

The figure above shows the drastic drop in carbon emissions (and hence of energy requirement and costs) per delivered heat for a range of primary heating sources and appliances, when considering different degrees of energy conversion efficiency.[11]

(H3) Open fireplaces – install a solid fuel stove (G)

Open fires are approx. 30% efficient, which means that 70% of the heat (and cost) goes up the chimney and is lost from your home. A solid fuel stove achieves typically >60% efficiency, and higher efficiencies are common. Stoves are also safer than open fires and reduce draughts.

(H12, H13) Upgrade to a Condensing Oil Boiler (G)

Start by having an efficiency test carried out on your existing boiler at your next service. Standard boiler efficiency is typically 60%-70%. Condensing oil boiler efficiency will be greater than 90%, offering at least 20% energy savings. This investment should be prioritised for standard boilers that are over 15 years old, but is certainly worth once considering the efficiency drops below 65%.

11 Open fireplaces and non-condensing boilers are considered low efficiency devices, whereas a high efficiency device might be a modern stove with proper smoke exhaustion and a condensing boiler. Refer to the energy label for the efficiency level of electric appliances (e.g. heat pumps)

(H11) Upgrade Heating Controls (G)

Most homes have simple clock timers as their main heating controls. Improved heating controls have the potential to provide up to 20% energy savings. Typical upgrade measures include:

- Separating the space heating and water heating
- 7-day programmable timers
- Creating different heating zones in your home e.g. living areas, bedrooms
- Thermostatic Radiator Valves (TRVs)
- Room or area thermostats
- Mobile remote control and smart home technology

Insulation upgrades

The survey showed that there are significant opportunities to increase insulation in the majority of homes. The simplest options start with attic insulation and cavity wall insulation. If this is already in place in your home, deeper retrofit options can also be considered.

(H5) Attic insulation (G)

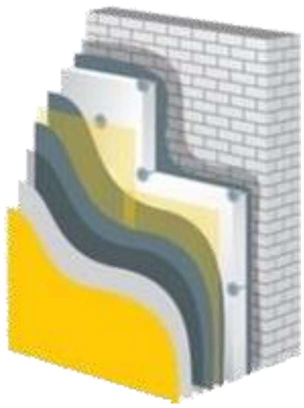
Ceiling level attic insulation is very cost effective and can be completed quickly. The current standard for attic insulation is 300mm (1 foot) of Rockwool or equivalent. Check your attic to see what depth of insulation is in place. If it is less than 150mm, this work should be on your list.

(H6) Cavity wall insulation (G)

If you have cavity walls this should be your first measure. Pumped cavity insulation is cost effective and can be completed quickly without any interruption the inside of your home. Working with neighbours, especially in semi-detached and terrace housing, can often bring group discounts.

(H7, H8, H9, H10) Internal & external wall insulation (G)

For solid walls, internal or external insulation may be an option. You might also consider this as a 2nd measure for cavity walls. These measures are significantly more costly and intrusive than pumped cavity insulation, but you can expect at least 25% heating cost savings when upgrading from a solid wall.



Switch to renewable energy

The most common renewable energy used in your community is wood fuels. The survey showed that there are also a small number of solar thermal (hot water) systems. Both of these measures should be exploited where appropriate.

Switch from coal to locally sourced wood fuel

Coal is cheap, has high heat content and is readily available on the market. But it also pollutes the local environment, has very high CO2 emissions and is imported. This last point means that most of the money you spend on coal leaves the local and national economy.

SEAI price comparisons indicates that switching from coal to wood could incur a cost increase of up to 60% per kWh, but that choosing bulk wood delivery could save you 8% per kWh.

Switching to a local wood fuel supplier will also support a local, sustainable industry and help to support local jobs.

(H16) Install a Solar Thermal (hot water) system (G)

Solar thermal systems can meet 50-60% of your overall hot water requirement, saving you money on your heating bills. This option should be considered for family homes with a daily hot water demand and a south facing roof.

Install a Solar PV Home System with storage (G)[12]

On average, a solar PV system can save between €200-€300 per year on your domestic electricity bill. A well-dimensioned PV system paired with storage can virtually make you run off-grid. By investing in solar PV, your house BER will increase and so will the monetary value of your property. Moreover, giving off the excess electricity to the grid can be object of remuneration once feed-in tariff schemes for microgeneration are reinstated.

Install a Heat Pump (G)[13]

Heat pumps are an electric-powered valid alternative to fossil fuels heating systems that lower household energy costs and emissions while raising indoor comfort. They can extract heat from outside air, from water bodies or from the ground. They are the perfect match of well-insulated homes.

Electricity use

Many of the transition opportunities for electricity use in the home relate to understanding and behavioural changes. Choosing A rated electrical equipment is also widely recognised by consumers as a way to reduce electricity bills.

(H14) LED lighting

Lighting can be approx. 20% of the total electricity cost for the home. This should be a course of action for all homes on an ongoing replacement basis. While LED bulbs are more expensive, they last much longer and have much lower running costs. 80% savings can be expected when upgrading from incandescent and halogen bulbs.

12 This action is not computed in the House (H) saving scenarios because, at the time of writing, feed-in tariff for microgeneration had been discontinued.

13 This action is not computed in the House (H) saving scenario.

Exemplar housing

(H17) Deep retrofit (G)

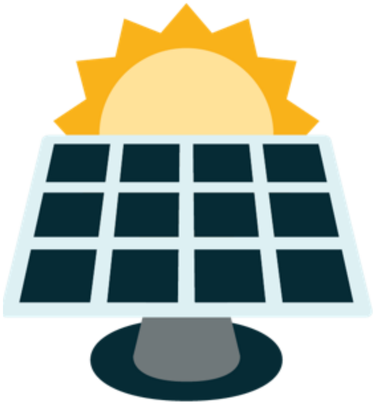
This refers to higher investments for comprehensive home energy improvements. This is worth considering especially for homes which are likely to stay in the family for next generations. Typical measures will include multiple insulation levels, airtightness works, heating and controls upgrades, as well as adoption of renewable technologies such as solar thermal or heat pumps. A number of support programmes offer more information on typical works:

- Deep Retrofit programme

  https://www.seai.ie/grants/home-energy-grants/deep-retrofit-grant/

- Superhomes

  http://superhomes.ie



TRANSITION DIMENSION 3: TRANSPORT

Enhance public transport use

The research and survey feedback has shown a very low use of public transport in daily travel habits. There are a number of clear contributing factors to this:

- Lack of public transport on suitable routes and schedules
- Cost or public transport
- Need for private transport at the destination

Considering these factors and knowing the general need for private transport in rural communities there are still some transition opportunities to increase public transport use and reduce car journeys.

(T1) Keep up to date with the public transport options

Your community is served by public bus routes and nearby rail stations. These services can change from time to time, so it is important to stay informed on what is available. Check your options at https://www.transportforireland.ie and https://www.locallink.ie/

(T1) Consider a hired car

If you need a private vehicle for your journey, check local car hire companies, or use the GoCar service, which is now available in a number of urban centres. Check https://www.gocar.ie/locations

Rationalise car journeys

If car is a necessary, there are a still a few options to reduce transport costs and impacts, by optimizing its usage.

(T2) Car-pooling and lift sharing

In rural communities, this is often simply accomplished by talking with family, neighbours and colleagues. There are a number of websites and apps which can be used to find lift sharing options also:

https://www.carpoolworld.com/dashboard.html

https://www.carpling.com/ie/

This is a good option if you have a car but simply want to share costs and travel with company.

(T3) Work from home

Check with your employer if you can work from home, even on a limited basis, applying smart working shifts. Even 1 day per week will reduce your annual travel costs by 10% to 15%.

Switch to electric vehicle

Because of the need for private transport in rural communities, switching to Electric Vehicle (EV) or Plugin Hybrid Electric Vehicles (PHEV) is a major transition opportunity to tackle the climate impact of private transport. However, due to the significantly lower running costs, this is also a chance to reduce transport costs for the community.

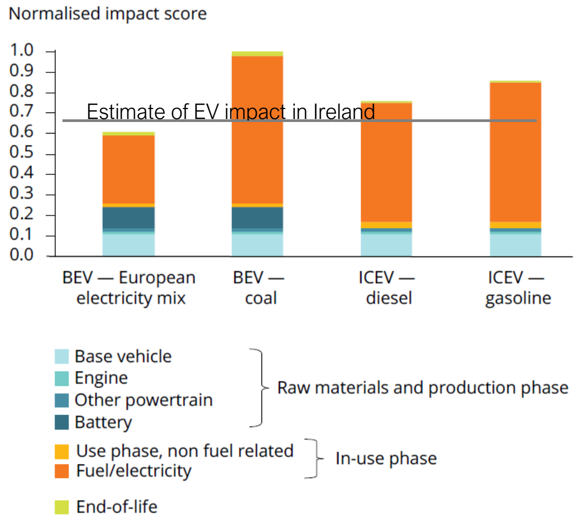
The running cost comparison below is based on a 500km weekly commute and shows the annual fuel cost savings against a petrol and diesel equivalent. EVs will also benefit from the lowest road tax bracket.

Table 3: fuel cost comparison of EV and ICEVs

Car	Weekly Fuel Cost (€)	Annual Fuel Cost (€)
Nissan LEAF	€7	€364
Petrol equivalent	€54	€2,808
Diesel equivalent	€40	€2,080

However, to have a proper estimate of carbon emissions and cost reductions, we have to look at the entire lifecycle of EVs. Since EVs are recharged through the national grid, the national electricity mix, which is by three quarters comprised of fossil fuels, has to be factored in. At current state of things, EVs in Ireland have only slightly less the impact of diesel cars. Moreover, battery value chains and disposal are source of concerns, being far from environmental and social sustainability standards. The figure below compares the impact of EVs and internal combustion engine vehicles (ICEVs) based on their fuel source. We can have a rough estimate of the life-cycle impact of an EV in Ireland given that the national electricity mix is slightly less "clean" than the European average.

Figure 25: Impact comparison of EVs and ICEVs



Source: EEA Report 13/2018

In conclusion, EVs have the advantage of taking the smog associated with combustion engines out of urban centres and their batteries can alleviate grid stress by acting as a scattered back-up reserve, but there are still price and non-price barriers to their popularity and are by no means climate savers, unless the electricity mix is decarbonized. Nonetheless, the market is moving in their direction so changing your old diesel or petrol car for an electric one will eventually pay off.

TRANSITION DIMENSION 4: COMMUNITY

(C4) Better Energy Communities programme (G)

Numerous SECs have used their community engagement in successful BEC grants projects, providing energy upgrade works for homeowners, community buildings and local businesses.

(C5) Local grant advisor

SEC teams have been able to assign one of their members to make themselves familiar with the various grants and supports, in order to be a local point of contact for advice on these schemes.

(C6) Energy awareness events

SEC teams regularly hold local energy awareness events, with the support of SEAI, to provide information and knowledge sharing to the local community e.g. energy clinics for business, breakfast briefings, Energy Awareness open days, SEC team stands and local shows.

POWERFUL COMMUNITY PATHWAY 2025

Transition model

The transition actions or investments presented here will each lead to or provide a saving in energy costs or reduction in CO_2 emissions. Based on the research carried out, conservative estimates of the savings for the typical household and private car have been calculated for the transitions. These estimates are then applied to target sectors and quantities of homes and cars in order to simulate a Transition Scenario of the community-wide effect. The Transition Scenario, our Powerful Community Pathway, stems from 3 sector simulations, outlining the first three Transition Dimensions (Knowledge, Houses and Transport). Community dimension has not been assigned a transition simulation of its own, being harder and aleatory to estimate numerically.

The methodology used is based on the model set up by IT Sligo. Every transition dimension is broken down in a list of actions, each one associated with an upfront cost of investment, monetary and energy saving involved, payback time and avoided emissions. Each simulation is conservative and intended to be realistic, hence the target numbers for homes and cars can be used as a starting point and should not be seen as a limit.

Transition model 1: Knowledge

Table 4: Transition simulation for the Knowledge dimension

				Investment	Savings (€/year)	Payback time (years)	Energy savings (kWh)	tCO_2 reduction
				€0	71,091	0.0	0	0
No.	ACTION	HOMES TARGET (%)	HOMES TARGET (N.)	COSTS (with grants where available)	SAVINGS (annual)	PAYBACK (years)	ENERGY SAVINGS (kWh)	tCO_2 REDUCTION
K1	Compile your Energy File	50%	562	€0	€0	N/A	0	0
K2	Submit meter readings	50%	562	€0	€0	N/A	0	0
K3	Switch electricity suppliers	70%	786	€0	€71,091	0.0	0	0
K4	Be your own energy manager	50%	562	€0	€0	N/A	0	0

Key points

- Switching electricity suppliers is likely to provide in excess of 10% costs savings in the first year. This should be repeated on an annual basis to maximise the ‘shopping around’ discounts.
- Just keeping track of your energy-related expenditures could trigger saving habits.

Transition model 2: House

Table 5: Transition simulation for the House dimension

					Investment (€)	Savings (€/year)	Payback time (years)	Energy savings (kWh)	tCO_2 reduction
					4,586,220	1,002,784	4.6	12,294,327	4,125
No.	ACTION	TARGET SECTOR	HOMES TARGET (%)	HOMES TARGET (N.)	COSTS (with grants where available)	SAVINGS (annual)	PAYBACK (years)	ENERGY SAVINGS (kWh)	tCO_2 REDUCTION
H1	Get a BER	Homes without current BER	64%	719	€71,872	€0	N/A	0	0
H2	Draught proofing DIY	Homes built pre 2006	64%	719	€107,808	€58,643	1.8	661,154	236
H3	Open fireplaces – install a chimney blocker	Homes with open fireplaces not used regularly	33%	371	€11,118	€12,095	0.9	136,363	49
H4	Open fireplaces – fit a solid fuel stove	Homes with open fireplaces not used regularly	33%	371	€741,180	€46,365	16.0	14,084	201
H5	Attic insulation	Homes built pre 2006, with less than 100mm insulation	45%	505	€353,745	€164,933	2.1	1,859,495	664
H6	External cavity walls - cavity insulation	Homes built pre 1990, with no cavity insulation	35%	393	€275,135	€160,352	1.7	1,807,842	645
H7	Internal insulation on solid walls	Homes built pre 1960, with no wall insulation	16%	180	€754,656	€73,304	10.3	826,442	295
H8	External insulation on solid walls	Selected terrace housing	2%	22	€177,434	€9,163	19.4	103,305	37

H9	External cavity walls - 2nd measure internal insulation	Selected housing	1%	11	€47,166	€2,749	17.2	30,992	11
H10	External cavity walls - 2nd measure external insulation	Selected housing	1%	11	€88,717	€2,749	32.3	30,992	11
H11	Heating controls upgrade only	Homes paying €600 or more on oil	70%	786	€314,440	€94,332	3.3	1,597,301	411
H12	Combined boiler and controls upgrade	Homes paying €1,500 or more on oil	30%	337	€774,870	€202,140	3.8	3,422,788	880
H13	Combined boiler and controls upgrade	Homes paying €1,000 or more on oil	16%	180	€413,264	€71,872	5.8	1,216,991	313
H14	LED lighting	Homes with no LED lighting	30%	337	€67,380	€45,701	1.5	198,098	87
H15	Switch from coal to local wood fuel supply	Homes with solid fuel stoves and room for bulk deliveries	7%	79	€0	€0	N/A	0	142
H16	Install a Solar thermal hot water system	Selected housing - south facing roof, daily hot water use	5%	56	€185,295	€35,602	5.2	187,974	70
H17	Deep retrofit	Selected housing	2%	22	€202,140	€22,785	8.9	200,506	74

Key points

- The calculated payback for external insulation measures (H8, H9 and H10) is based on a conservative investment cost.

- The combined payback for all home transitions is less than 5 years.

- The considerable kWh savings may be tradable for additional financial support from obligated Energy Suppliers. This will further offset the investment costs and reduce the payback periods.

- Some of the investment costs will contribute to the local economy.

- This simulation does not factor in some other alternatives for space heating and electricity. For example, heat pumps and the use of PV system for electricity self-consumption are excluded. Both investments, for which grants are available, can generate further savings and emission reductions.

Transition model 3: Transport

Table 6: Transition simulation for the Transport dimension

					Investment (€)	Savings (€/year)	Payback time (years)	Energy savings (kWh)	tCO_2 reduction
					1,741,100	351,678	5.0	493,558	372
NO.	ACTION	TARGET SECTOR	HOMES TARGET (%)	HOMES TARGET (N.)	COSTS (with grants where available)	SAVINGS (annual)	PAYBACK (years)	ENERGY SAVINGS (kWh)	tCO_2 REDUCTION
T1	Public transport	All	0%	0	N/A	€0	N/A	0	0
T2	Car pooling	All, focusing on commuters	5%	76	N/A	€44,895	N/A	329,038	86
T3	Work from home	Commuters	5%	76	N/A	€22,448	N/A	164,519	43
T4	Switch to hybrid cars	All new car buyers, focusing on homes with 2 cars	5%	76	€75,700	€14,965	5.1	0	72
T5	Switch to electric cars	All new car buyers, focusing on homes with 2 cars	10%	151	€151,400	€134,685	1.1	0	86
T6	Switch to electric cars	2nd hand car buyers, focusing on homes with 2 cars	10%	151	€1,514,000	€134,685	11.2	0	86

Key points

- The combined payback for all transport transitions is 5 years.
- T4 and T5 are based on new car buyers in which case the investment cost is largely neutral.
- T6 is based on car buyers who typically spend €10,000 on the 2nd hand market when changing cars. For the purpose of assessing this transition, an investment cost of €15,000 has been assumed for the additional cost of a new EV.
- Hybrid cars are more suited to town and city driving and tend to provide fewer savings for long commutes.

Transition scenario

Combining the effects of the transition dimensions into one transition scenario results in annual savings of:

- €2,428 thousand from reduced house energy needs (heating and electricity)

- €352 thousand from reduced transport costs

and reduction of carbon footprint by:

- 4,497 tonnes of avoided CO_2 emissions

In the 2019-2025 time horizon.

Transition timelines

The Powerful Community Pathways reduces the carbon footprint of Boyle households by 41% by 2025 compared to 2019 emission level.

Associated savings exhibit an increasing trend over the considered time span. Cumulative savings from 2019 to 2025 are estimated at €6.1 million. Most of it originates from home energy efficiency upgrades. This money can be reinvested in projects that raise living and health and standards, create (green) jobs and foster entrepreneurship opportunities for satellite activities. Savings will continue to flow annually beyond 2025.

Figure 26

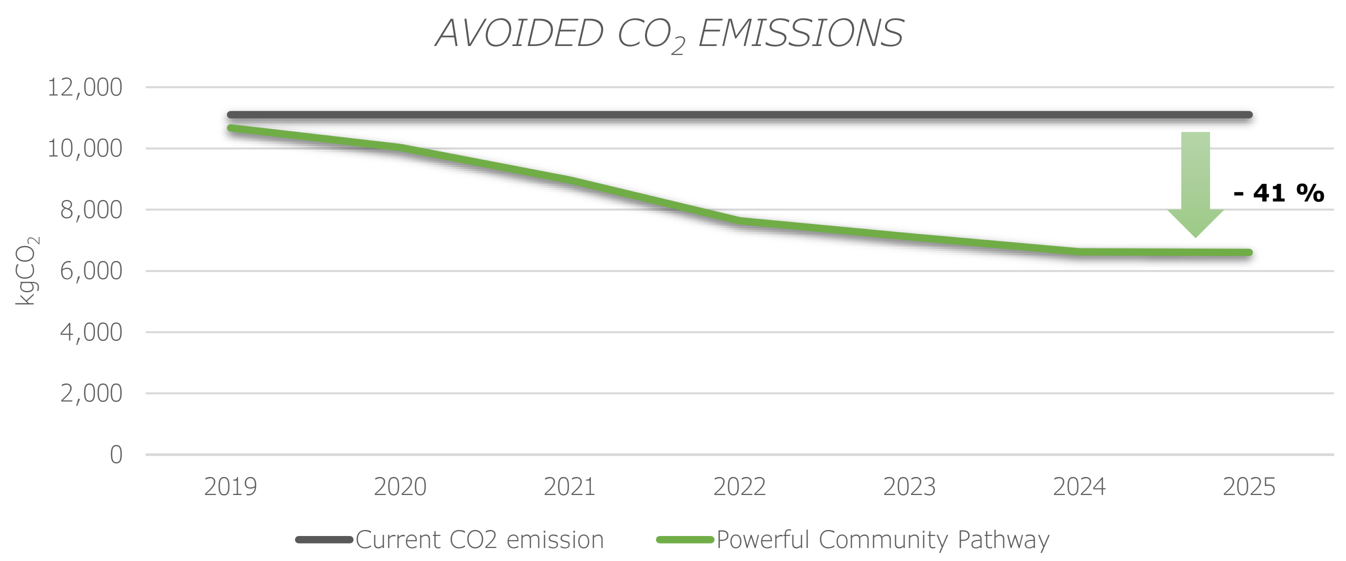
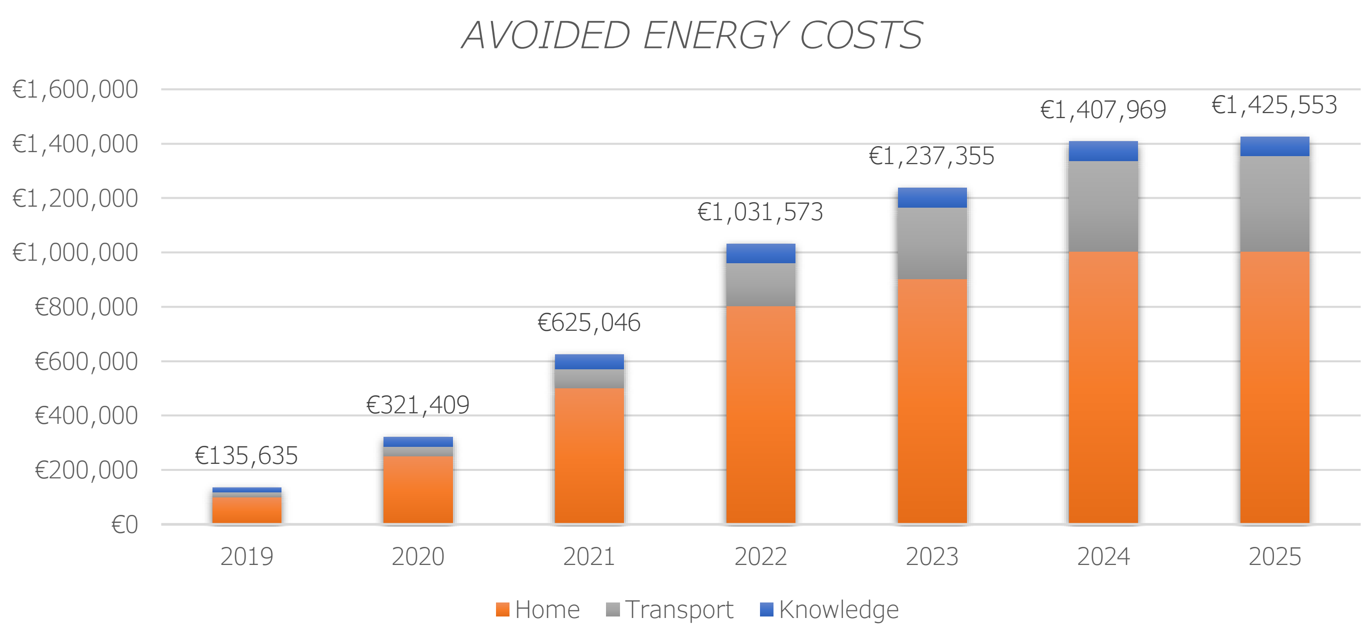


Figure 27



Concluding remarks

Survey outcomes highlight the huge economic and social benefits that could be unlocked in the short-term for the community of Boyle by adopting our Powerful Community Pathway. Irish households have the highest carbon footprint in Europe. With this comes a set of downsides that impact people health and standard of living. Currently, the town spends €4.1 million per year on energy needs, the vast majority of this earmarked for fossil fuels, which revenues flow out of the local economy. On the other hand, a clean energy transition centred on the household can unleash a high potential for sustainable local development.

The proposed actions in the areas of behaviour and knowledge, house retrofitting and transport generate increasing monetary savings: according to our projections by 2025, the community as a whole can cut €6.1 million from energy costs without drastic measures. This is money that could be reinvested to improve quality of life at a household level. At the same time, a just energy transition can create shared value for the local community in terms of associated activities, green jobs, lifting people out of energy poverty and spreading other non-monetary spill-overs. Tapping into community sense of ownership, the transition builds momentum, becomes fully doable and can give an example of good practice for other communities to follow.

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