EnergyREV

Local area energy mapping for planning smart energy initiatives

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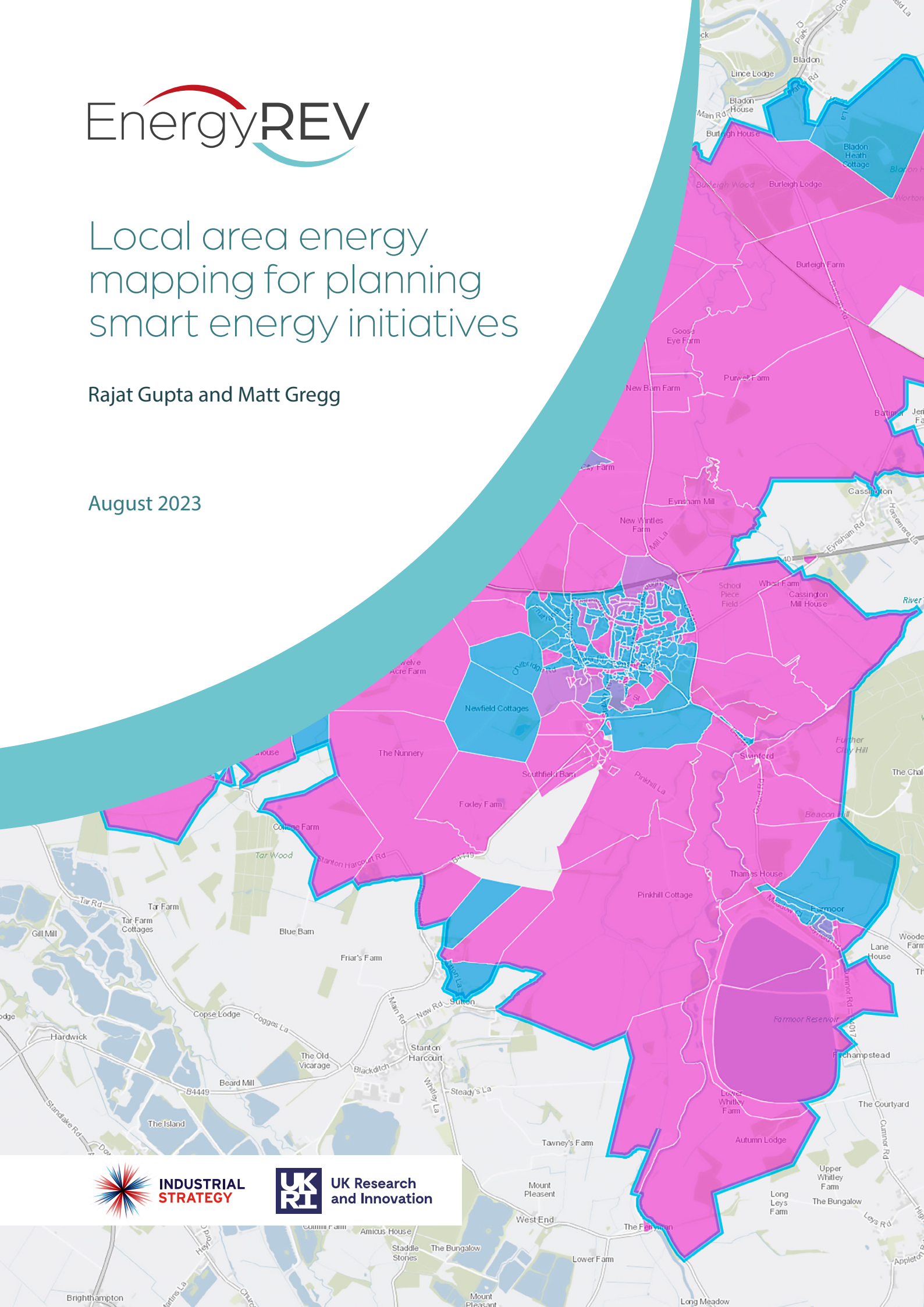

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Contents

Summary

This report presents the use of an innovative local area energy mapping approach (LEMAP) to map baseline energy demand, low carbon resources, technical and social capabilities, and potential for low carbon technologies (LCTs) in Eynsham, Oxfordshire, as part of Project LEO, one of the smart local energy demonstrators. Building the LEMAP tool involved the assessment of 69 datasets covering GIS boundary definitions, socioeconomic conditions, and energy consumption, among others. A suitability assessment evaluated the existing building related characteristics for deployment of LCTs. The capability assessment added technical and socio-economic data to identify how likely households are to adopt LCTs. Results show that Eynsham had high mean annual electricity and medium-high mean annual gas consumption from 2015-19. However there was an 8% and 4% reduction in electricity and gas consumption respectively over the period. The potential for deploying heat pumps in Eynsham area was found to be high. Technical, financial, and social capabilities of the area were found to be moderate. Digital capability was low indicating need for training in using smart energy technologies. The combined mapping of technical suitability and capability assessment is intended to help community energy project developers, local authorities, and community groups to plan for appropriate local and smart energy initiatives.

Introduction

This report presents the use of a local area energy mapping approach (LEMAP) to map technical and social capabilities in a smart and fair neighbourhood (SFN). LEMAP was developed to provide spatial analysis and communication of baseline energy use, energy resources and potential for take-up of low carbon technologies (LCT) at property, postcode, and neighbourhood level. The intent was to help stakeholders such as community energy project developers, local authorities, and local community groups to plan for localised smart and fair energy initiatives in the focal neighbourhoods. The findings are also useful for the district network operator in energy system planning.

Project LEO – Smart and fair neighbourhoods approach

As the UK Government has legislated net zero by 2050, decarbonisation will place more demand on the electricity network. The need for technology and the ability to balance demand on the network at different periods provides opportunities for new markets to be created, and new demand to be accommodated through a smarter, secure, and more flexible network. Project Local Energy Oxfordshire (LEO) seeks to model the network of the future to better understand decentralised relationships and grow an evidence base that can inform how we manage the transition to a smarter electricity system.

LEO is a holistic smart grid trial with the intent to improve understanding and maximise opportunities from the transition to smarter, flexible electricity system for the benefit of communities, their businesses, and households. At the community level, the increase in small-scale renewables and low-carbon technologies (LCTs) is creating opportunities for consumers to generate and sell electricity, store electricity using batteries, and integrate the use of electric vehicles to alleviate demand on the electricity system.

Project LEO brings together an exceptional group of stakeholders as Partners to deliver a common goal of creating a sustainable local energy system. This partnership represents the entire energy value chain in a compact and focused consortium and is further enhanced through global leading energy systems research brought by the University of Oxford and Oxford Brookes University consolidating multiple data sources and analysis tools to deliver a model for future local energy system mapping across all energy vectors.

Local area energy planning approach: LEMAP tool

LEMAP is a versatile mapping tool designed to be at the heart of a Local Area Energy Planning approach for Project LEO. The ultimate purpose of LEMAP is to present the domestic energy related findings in a geographical / visual way so that stakeholders can visualize and target key areas for immediate action.

LEMAP brings together public, private, and crowd-sourced data on energy demand, energy resources, building attributes, socio-demographics, fuel poverty and electricity networks within a geographical information system (GIS) platform. The analyses of these data were mapped at relevant scales (e.g., dwelling, postcode, LSOA (lower layer super output area)) in LEMAP and organised around four technical divisions of GIS presentation. These are:

- **Baselining** – presents current energy related aspects of a specific area including fuel poverty statistics, recorded electricity and gas consumption, and local energy resources.
- **Targeting** – presents surveyed data on interest in, and suitability for LCTs (specifically photovoltaics, heat pumps, batteries, electric vehicles).
- **Forecasting** – presents modelled projections of consumption and production for the targeted LCTs.
- **Capability profile** – presents socio-economic and technical data on the capability of households to adopt LCTs. The capability profile assessment is the specific focus of this briefing report.

In addition to these, LEMAP also includes three user engagement elements. These are Participatory mapping to allow residents to visualise modelled energy demand profiles showing energy demand patterns during a typical day in heating and non-heating seasons, Storymap for creating blogs on local energy flows, and Forum to enable discussion amongst users of LEMAP and project stakeholders.

Local case study: Primary substation level

Eynsham case study in Oxfordshire

The Eynsham SFN is a 102km2 area located in the West Oxfordshire District. The SFN covers five wards (Eynsham and Cassington, North Leigh, Freeland and Handborough, and Cumnor), 10 LSOA, and 325 postcodes (figure 1). The SFN contains approximately 6,780 properties (domestic and non-domestic) and 3,600 dwellings.

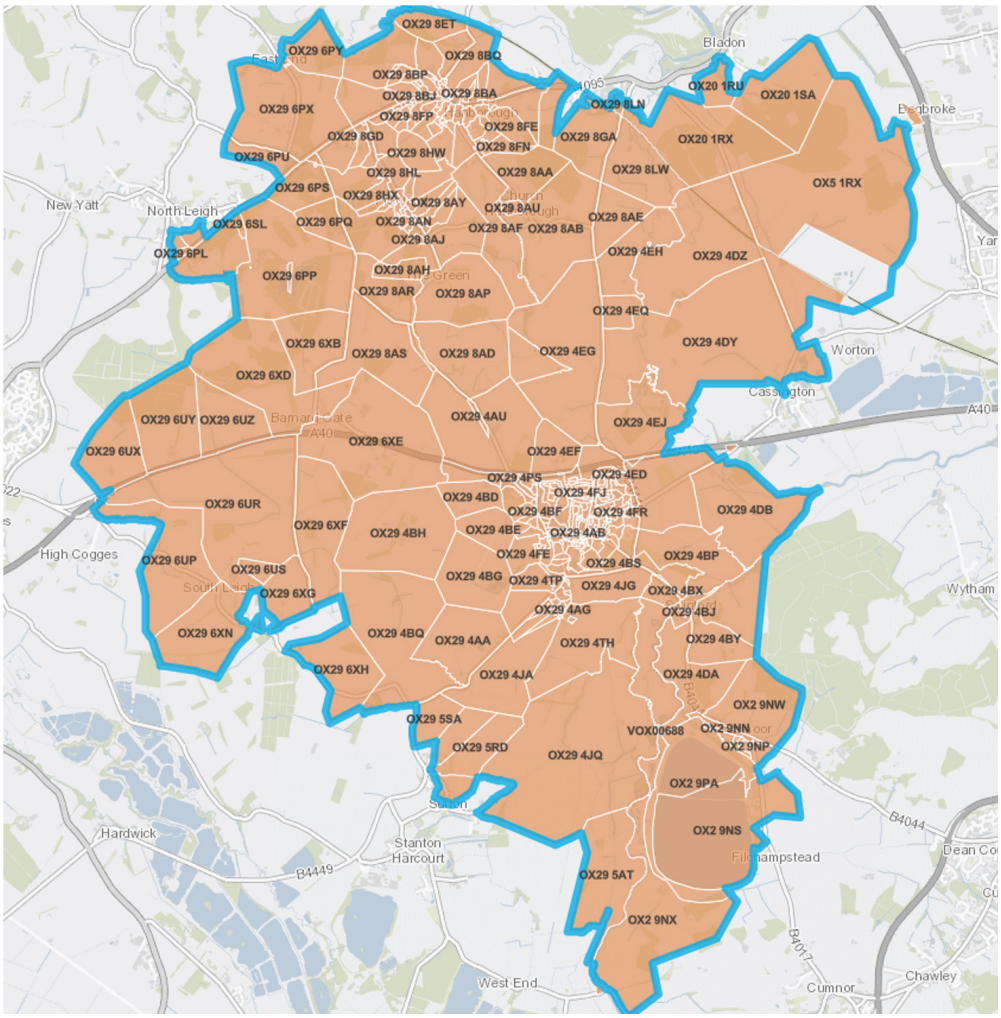

Figure 1: Eynsham SFN map with postcode divisions

Case study characteristics

The Eynsham SFN contains a predominance (77%) of owner-occupied homes indicating an established area. In addition to this 10% of the households are socially rented. A total of 408 (6%) households in the SFN are fuel poor. The proportion of households experiencing fuel poverty ranges between 5-8% among the LSOAs.

The average age of the population in the SFN is in the range of 35-64 years (43%) commonly referred to as the working-age group. The second-highest age group are 65+ or retired (22%). The predominance of the working-age group is validated by the employability of the area with 69% of the population employed in either part-time or full-time work activities. The unemployment percentage of the area (2%) is half of the UK's national average, which has averaged about 4% since 2018 (ONS, 2021).

Education and social grade play an essential role in the adoption of innovative / new technologies. The predominant social grade in the SFN is A/B, at 36% of the population. This A/B social grade indicates that the population is in high or intermediate managerial, administrative, or professional occupations (National Readership Survey, 2016). This clustering of A/B social grade is relatively high, as only 27% of the population of the UK is under this social grade. Table 1 presents statistics for the area. Overall, the Eynsham SFN would be classified as socially and economically stable, with small-medium pockets of deprivation.

Table 1: Eynsham SFN socio-economic profile

Eynsham socio-economic profile							
No of residents	14,941						
Age group (%)	**0-15 age**		**16-34 age**		**35-64 age**		**65+ age**
	17		18		43		22
Economic activity (%)	**Employed**	**Unemployed**		**Retired**		**Students**	**Other**
	69	2		17		3	9
Tenure (%)	**Owned**		**Social rent**		**Private rent**		**Rent other**
	77		10		11		2
Car availability (%)	**No car**		**1 car**		**2 cars**		**3+ cars**
	12		39		34		15
Qualifications (%)	**None**	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Apprenticeship**	**Other**
	19	12	14	10	36	5	4
Social Grade (%)	**A/B**		**C1**		**C2**		**D/E**
	36		29		20		15

In 2020 the Energy Performance Certificate (EPC) database held 2,433 properties' EPCs within the Eynsham SFN. (2,268 domestic and 165 non-domestic). This covered only 36% of the properties in the SFN and the average rating of these was a D. Table 2 presents the breakdown of EPC ratings for both domestic and non-domestic properties in the SFN.

Table 2: EPC rating numbers

	A	B	C	D	E	F	G
Domestic	7 (<1%)	482 (21%)	525 (23%)	814 (36%)	346 (15%)	77 (3%)	17 (<1%)
Non-domestic	1 (<1%)	7 (4%)	35 (21%)	59 (36%)	33 (20%)	12 (7%)	18 (11%)

Based on EPC data most dwellings were of semi-detached built form (37%). The remaining were detached at 32%, terraced at 30% and 1% were undefined. Houses (including bungalows) were dominant at 90%, flats and maisonettes made up 9% and 1% of the remaining respectively.

Considering construction:

- 74% of domestic properties had double glazing, 24% of dwellings were not identified, and the remaining 2% were split among those with single glazing, secondary glazing, and triple glazing.
- 56% were insulated with internal or external insulation; the remaining 44% had partial or no insulation.
- The most common wall type was cavity (filled or not) (58%), the remaining were solid wall at 10%, sandstone at 10%, timber at 1%, and the remaining system built, cob or granite at <1%. Wall type for 20% of dwellings were not identified.
- 70% of dwellings had a pitched roof; 19% were not defined. The remaining 11% had roof rooms (5%), had a dwelling above (5%), flat or thatched.
- 73% of dwellings were estimated to have less than the minimum suggested roof insulation (220mm).

Methodology

Data sources

Building the LEMAP tool involved the assessment of 69 datasets in total. These could be roughly categorised into GIS boundary definitions, land use, building use, socioeconomic / lifestyle, energy consumption / network, and transport. Key to this report were the following datasets (table 3).

Table 3: Key datasets

No.	Data layer	Description	Spatial resolution	Source
GIS boundary definitions				
1	LSOA boundaries	Lower Layer Output Super Area boundaries - average population of 1500 people or 650 households	LSOA	UK Gov
2	Postcode boundaries	Postcode boundaries	Postcode	UK Gov
Land use				
3	Environment Agency layers	Extent of flood risk from surface water	Postcode / dwelling	UK Gov
Building use				
4	UK buildings	Building use, age, and form	Dwelling	OS Mastermap / Verisk Geomni
5	Listed buildings	Buildings listed by Historic England	Dwelling	Historic England
Socioeconomic / lifestyle				
6	Experian Mosaic	Consumer classification based on several socioeconomic / lifestyle factors	Dwelling	Experian
7	Sub-national fuel poverty	Aggregate fuel poverty statistics	LSOA	UK Gov

No.	Data layer	Description	Spatial resolution	Source
Energy consumption / network				
8	Sub-national electricity consumption	Aggregate energy data	LSOA / Postcode	UK Gov
9	Sub-national gas consumption	Aggregate energy data	LSOA / Postcode	UK Gov
10	Off-gas postcodes	Postcodes with no gas network access	Postcode	CSE
11	Energy Performance Certificate (EPC)	Modelled (estimated) annual energy consumption (and carbon emissions); space heating demand; water heating demand; total floor area; dwelling type; insulation levels, glazing types, heating type and lighting details.	Dwelling	UK Gov
12	People's Power Station	Renewable generation and energy efficiency projects in Oxfordshire	Dwelling	Low Carbon Hub
13	Potential for photovoltaics (PV) / GSHP	Identification of potential locations for PV based on the rooftop area of the properties / location for GSHP	Dwelling	Energeo
14	Renewable Heat Incentive (RHI),	Dataset of renewable heat installations	Local authority district	UK Gov
15	Feed-in Tariff (FiT)	Dataset of renewable electricity installations	Local authority district	UK Gov
Transport				
16	Electric vehicle (EV) charging points	List of EV charge points, type and capacity	Postcode / Dwelling	UK Gov / Oxford City Council

Energy, targeting suitability, and capability

The following sections of this report cover:

- energy use in the SFN,
- existing renewable energy resources,
- potential for smart energy technologies (suitability assessment) and
- capability assessment.

Energy use and resources in the SFN

The LSOA datasets provide a general overview of the Eynsham SFN as the SFN boundary crosses several LSOAs. That is, three LSOAs (West Oxfordshire (WOx) 006D, WOx 011A and WOx 011B) are fully contained within the boundary of the SFN and seven LSOAs (WOx 005D, WOx 006A, WOx 006B, WOx 006C, WOx 011B, WOx 011C, and Vale of White Horse 001A are partially contained within the boundary.

Energy and energy resource data are sourced through the UK Government's sub-national energy consumption datasets, large renewable installation dataset, People's Power Station, and the Renewable Heat Incentive (RHI), and Feed-in Tarrif (FiT) datasets.

Suitability assessment

The targeting or suitability assessment used various datasets to evaluate potential for smart energy technologies. The following table 4 lists the assumptions and criteria for each technology evaluated and the data layer(s) used to evaluate suitability.

Table 4: Suitability criteria, assumptions and data layers

No.	Criteria / assumptions	Data layer used
General		
1	Private or social rented properties, listed buildings, flats will not install PV, heat pumps or EV charger.	OS Mastermap / Geomni / Mosaic / EPC / Historic England
Photovoltaics		
2	All houses will have at least one roof slope orientation that is suitable for PV.	OS Mastermap / Geomni
3	Properties with thatch roofs are not suitable for PV.	Geomni
4	EPC rating A – D are only suitable for PV (to claim the full Feed - In Tariff, properties must be rated EPC D or above).	EPC
5	Properties capable of improvement to EPC rating 'D' are marked as suitable after improvement.	EPC
Air source heat pump (ASHP) / Ground source heat pump (GSHP)		
6	Heat pumps are cost effective in insulated homes: (EPC above average insulation levels and double glazing).	Geomni / EPC
7	Properties using electric heating as main fuel type are prioritized for heat pumps.	EPC
8	Dwellings with gardens are suitable for GSHP as the equipment needs to be installed underground. Mid terraced dwellings are omitted as gardens are usually small and access to them is obstructed.	Geomni

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No.	Criteria / assumptions	Data layer used
9	GSHP are suitable for large dwellings, only properties with three bedrooms or more were considered suitable.	Geomni
Battery storage		
10	IF suitable for PV, then suitable for battery	Ref. PV suitability
11	It is assumed that council (social) dwellings are not suitable for batteries	EPC / Mosaic
EV charger		
12	Off-street parking is required	OS Mastermap / Energeo

Capability assessment

Capability assessment was based on the capability lens approach developed by the Centre for Sustainable Energy (CSE, 2020). The assessment helps identify how likely households are to adopt different LCTs and those who may be left behind based on their socioeconomic characteristics. The capability assessment for Eynsham was analysed and displayed (mapped) in four categories. Each category was divided into four levels to evaluate and grade each household related to their capability profile. The capability categories are described in more detail below; however, in summary:

Table 5: Capability weights

No.	Technical	Digital	Financial	Social
1	Full potential	High tech user	Happy investor	Fully convinced
2	Partial potential	Tech. savvy	Venturers	Motivated
3	Need improvement	Training required	Penny savers	Sceptical
4	Unsuitable	Other priorities	Deprived	Not interested

Technical capability

The grades for technical capability are:

- **Full potential** – Fully capable of adopting multiple low carbon technologies (LCTs)
- **Partial potential** - capable of adopting some low carbon technologies.
- **Need improvement** – capable of adopting technologies if relevant improvements are made to the dwellings.
- **Unsuitable** - dwellings unsuitable for low carbon technologies, such as listed buildings.

The technical capability grade was calculated based on LCT suitability for each dwelling (including GSHP, ASHP, PV, battery, and electric vehicle (EV)). The more LCTs that were technically suitable for installation in the dwelling, the higher the grade.

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Digital capability

The grades for digital capability are:

- **Hi-tech users** – households with cutting-edge hardware immersed in digital technology.
- **Tech savvy** – households composed of avid users of social media and smartphones that aspire to obtain cutting-edge hardware.
- **Training required** - households that only use digital technology for entertainment, shopping or practical purposes.
- **Other priorities** - households with limited, little or no interest in digital technology, preference given to non-digital approaches.

The digital capability grade was calculated based on the Experian's Mosaic digital group classification of households. The Mosaic digital group has 11 types ranging from 'Capital connections' to 'Tentative elders'. Table 6 indicates the alignment of Experian's types to LEMAP's digital capability grades.

Table 6: Alignment of Mosaic's digital groups and LEMAP

No.	Mosaic Digital Groups	LEMAP Digital capability grades
1	Capital Connections, Digital Frontier, Mobile City	High tech user
2	First-gen Parents, Aspirant Frontier, Online Escapists	Tech savvy
3	Upmarket Browsers, Savvy Switchers, Cyber Commuters	Training required
4	Beyond broadband, Tentative elders	Other priorities

Financial capability

The grades for financial capability are:

- **Happy investors** - households with ability to invest in LCTs without looking for a financial return.
- **Venturers** - households with access capital or funding to acquire LCTs and expect some economic payback or delay of payments.
- **Penny savers** - households that depend on loans, grants, or programmes to implement LCTs or change life patterns towards energy flexibility.
- **Deprived** - socially or economically deprived households with priorities beyond LCTs.

The financial capability grade is an average of Mosaic's affluence rating and equivalised household income band grouping. Mosaic's affluence uses several variables such as income, property value, council tax, outstanding mortgage, etc., to arrive at 20 bands. In addition, there are nine equivalised household income bands ranging from >£65,000 to <£10,000. Table 7 indicates the alignment of Experian's financial groups to LEMAP's financial capability grades.

Table 7: Alignment of Mosaic's financial groups and LEMAP			
No.	**Mosaic Affluence Groups**	**Mosaic Equivalised household income groups**	**LEMAP Financial capability grades**
1	Bands 17-20	>£50,000	Happy investor
2	Band 16	£30,000 – 49,999	Venturers
3	Bands 5-15	£20,000 – 29,999	Penny savers
4	Bands 1-4	<£20,000	Deprived

Social capability

The grades for social capability are:

- **Fully convinced** – households that prioritise activities towards the environment.
- **Motivated** - households with some interest and knowledge on the effect of flexible and LCTs on the environment.
- **Sceptical** - Households that need to be trained or guided to understand the benefits of implementing LCTs or making changes in their lifestyle to flexible energy patterns.
- **Not interested** - households with lifestyles that do not align with using low carbon technologies.

The social capability scale brought together EPC and Mosaic data combining consideration for existing LCTs as indicated by EPC assessments and Mosaic's consumer behaviour types labelled Financial Strategy Segments (table 8).

Table 8: Alignment of EPC, Mosaic's social groups and LEMAP			
No.	**EPC LCTs**	**Mosaic Financial strategy segment groups**	**LEMAP Financial capability grades**
1	At least one preexisting LCT (wind turbine, PV, solar hot water)	Money makers, Established investors	Fully convinced
2	No preexisting LCT	Earning potential, Growth phase, Deal seekers, Career experience, Mutual resources, Respectable reserves, Golden age	Motivated
3	No preexisting LCT	Family pressures, Small-scale savers, Single earners, Home-equity elders, Declining years	Sceptical
4	No preexisting LCT	Cash economy	Not interested

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Energy demand

From 2015-2019 Eynsham has maintained a high mean annual electricity consumption ranging from 4,720 – 4,360 kWh (Ofgem considers 4,300 kWh and greater high energy use) (Ofgem, 2023). This has however been an 8% reduction over the period. At an LSOA level the mean annual electricity consumption ranges from medium to high (3,384 to 6,908 kWh) and the decline in consumption from 2015 -2019 ranges from 3% to 13%. Currently the mean domestic electricity consumption for the area is around 4,300 kWh. Figure 2 shows the 2019 mean annual electricity consumption at LSOA level.

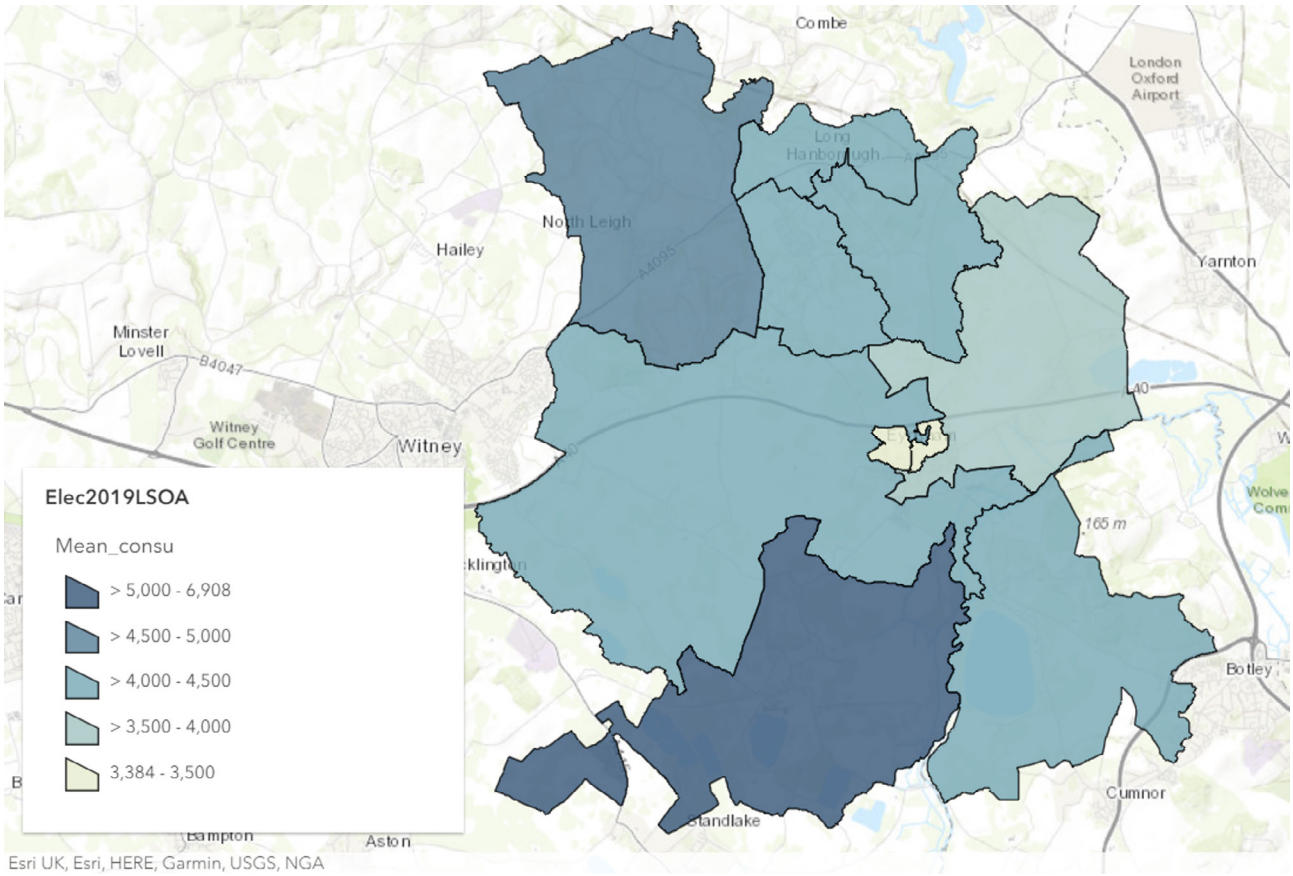

Figure 2: LSOA level 2019 mean annual electricity consumption

From 2015-2019 Eynsham has maintained a medium-high mean annual gas consumption ranging from 15,950 – 15,300 kWh (Ofgem considers 12,000 kWh medium and 17,000 high energy use) (Ofgem, 2023). There has been a 4% reduction over the period. At an LSOA level the mean annual gas consumption ranges from 12,890 to 18,140 kWh and the decline in consumption from 2015 -2019 ranges from 0% to 11%. Currently the mean domestic gas consumption for the area is around 15,300 kWh. Figure shows the 2019 mean annual gas consumption at LSOA level. One LSOA shows no data as 100% of properties in this LSOA are completely off the gas network.

Most of the properties in the SFN (n: 4,608) use central gas heating; however, oil heating is used in 554 properties and heating by electricity is used in 438 properties. Solid fuel and 'other central heating fuel' are used in 54 and 55 properties respectively. Additionally, 87 properties are reported as not having any central heating.

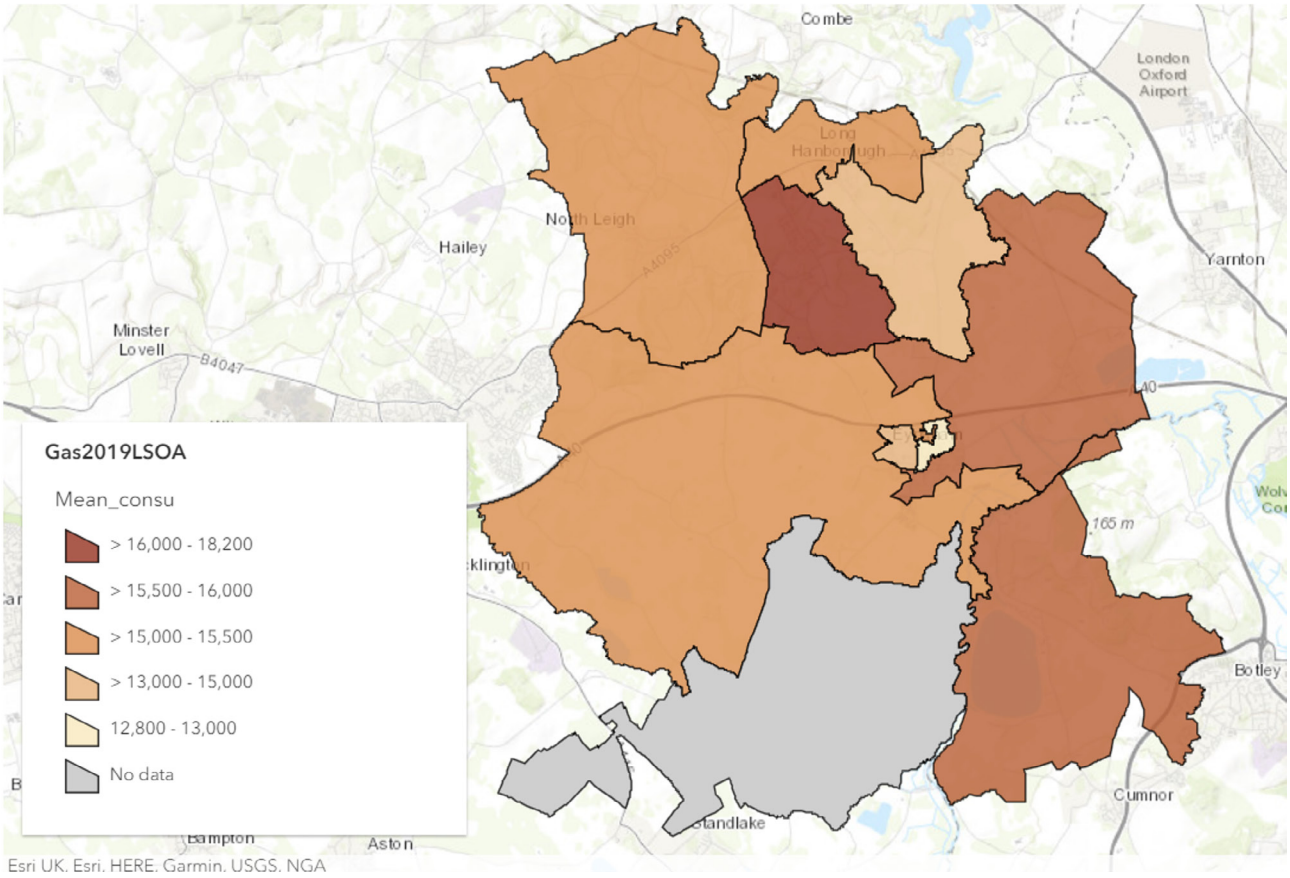

Figure 3: LSOA level 2019 mean annual gas consumption

Existing energy resources

The Eynsham SFN contains two large renewable generation sites, the Aurora solar farm with a 32MWelect installed capacity and the Eynsham solar farm with an installed capacity of 13.2MWelect. The People's Power Station (Low Carbon Hub, 2023) lists eleven community projects ranging in size from 1.2kW (domestic size) to 37kW (school installation) of installed capacity. The total installed photovoltaic capacity in the area is estimated to be 53.4MW. In addition, there is one domestic and one non-domestic hydroelectric installation.

There are 334 domestic properties (Installed capacity unknown) and 37 non-domestic properties with 5.4MW total installed capacity under the Renewable Heat Incentive (RHI) scheme. The technologies included in the RHI scheme include ASHP, GSHP, water source heat pump (WSHP), solar thermal, solid biomass boiler, and solid biomass CHP.

Potential for smart energy technologies

The following section breaks down the suitability assessment for the smart energy technologies. Note that though the statistical data covers the entire SFN, the following figures will focus on Eynsham Village as it has the highest density in the SFN and allows for better visualisation of the data being presented. Figure 4 shows Eynsham Village in relation to the SFN boundary.

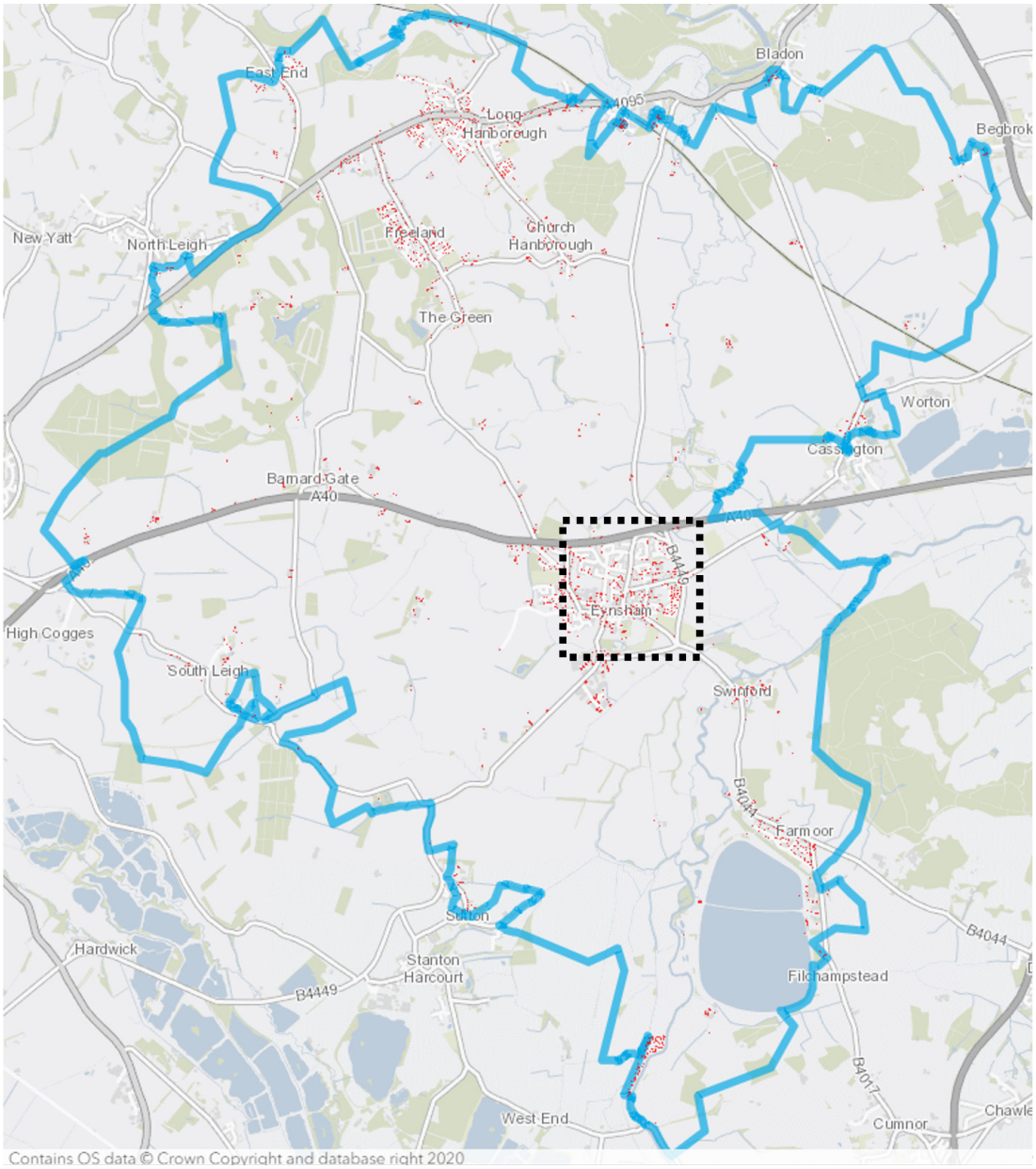

Figure 4: Eynsham SFN boundary with Eynsham Village identified

In the Eynsham SFN area 580 dwellings were considered suitable for PV systems, which corresponds to 16% of the dwellings analysed. It was also estimated that 3,100 additional dwellings could be suitable for PV systems if their EPC rating were improved (86% of dwellings in the area). Figure shows the dwellings suitable for PV and the dwellings that could be targeted for an improved EPC energy rating so that PV could be installed.

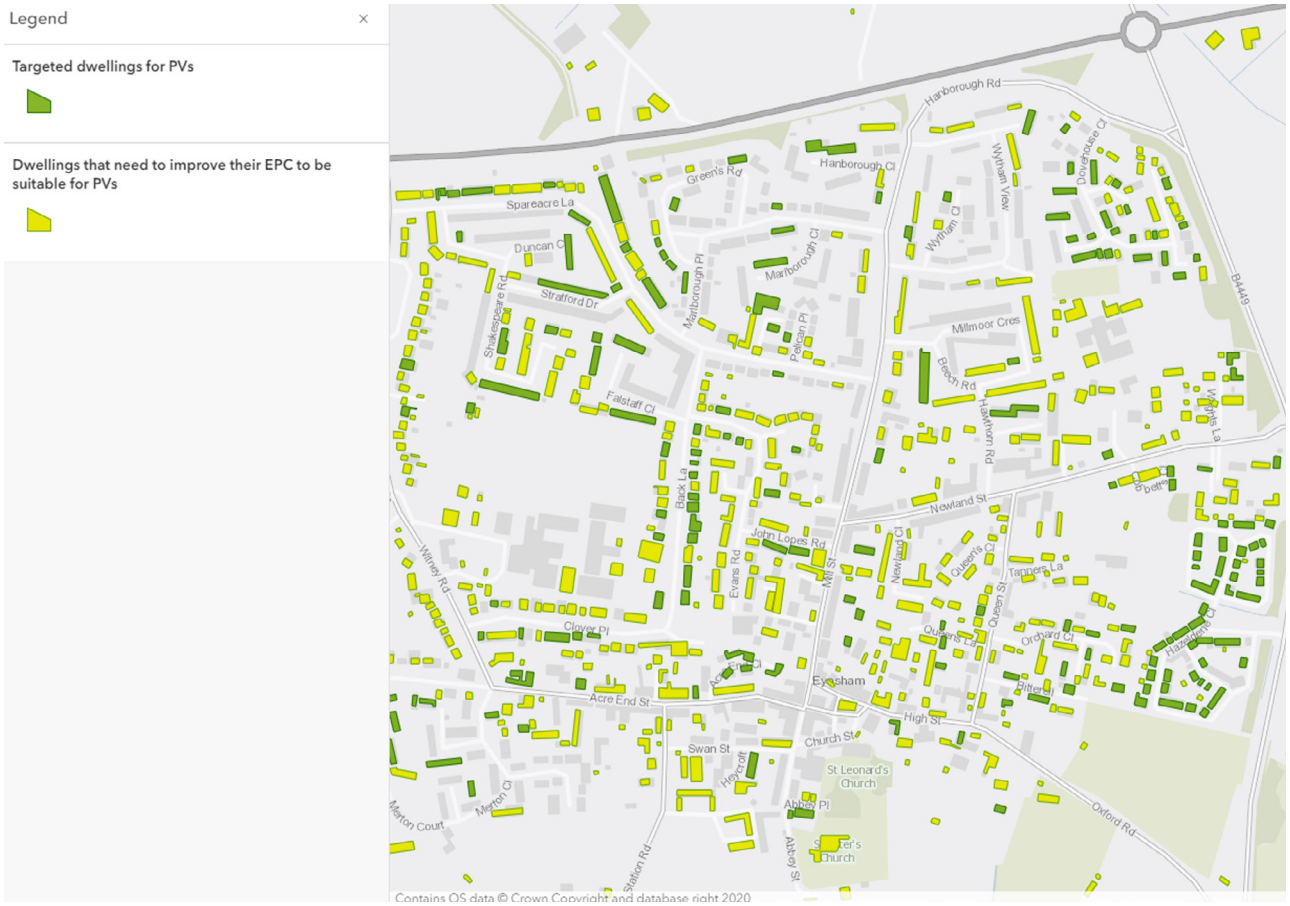

Figure 5: Eynsham Village PV suitability

The Eynsham SFN has high electricity and gas consumption, ASHP and GSHP can aid in the energy reduction and thermal comfort of the properties. Priority can be given to GSHP in relation to their efficiency; however, fewer properties are suitable for this technology as it requires appropriate garden space area and is best for airtight properties with good thermal insulation.

A total 2,100 dwellings were identified as suitable for GSHP, which corresponds to 58% of the dwellings analysed. A total 2,165 dwellings were identified as suitable for ASHP, which corresponds to 60% of the dwellings analysed. Figure 6 shows the dwellings suitable for ASHP or GSHP. Note: all dwellings suitable for GSHP are suitable ASHP.

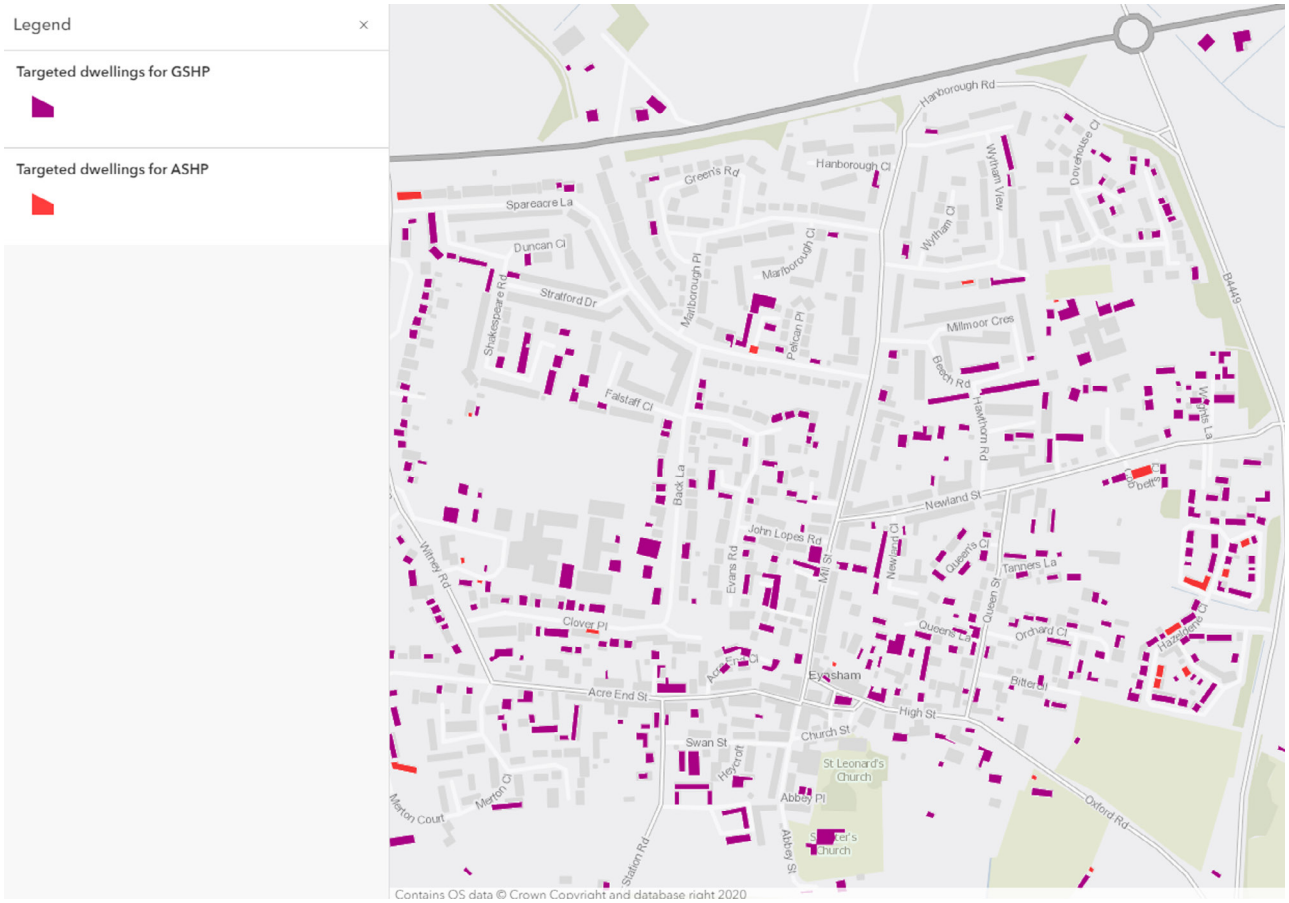

Figure 6: Eynsham Village heat pump suitability

A total 1,847 dwellings were identified as suitable for EV chargers, which corresponds to 51% of the dwellings analysed. Figure 7 shows the dwellings suitable for EV chargers in Eynsham Village.

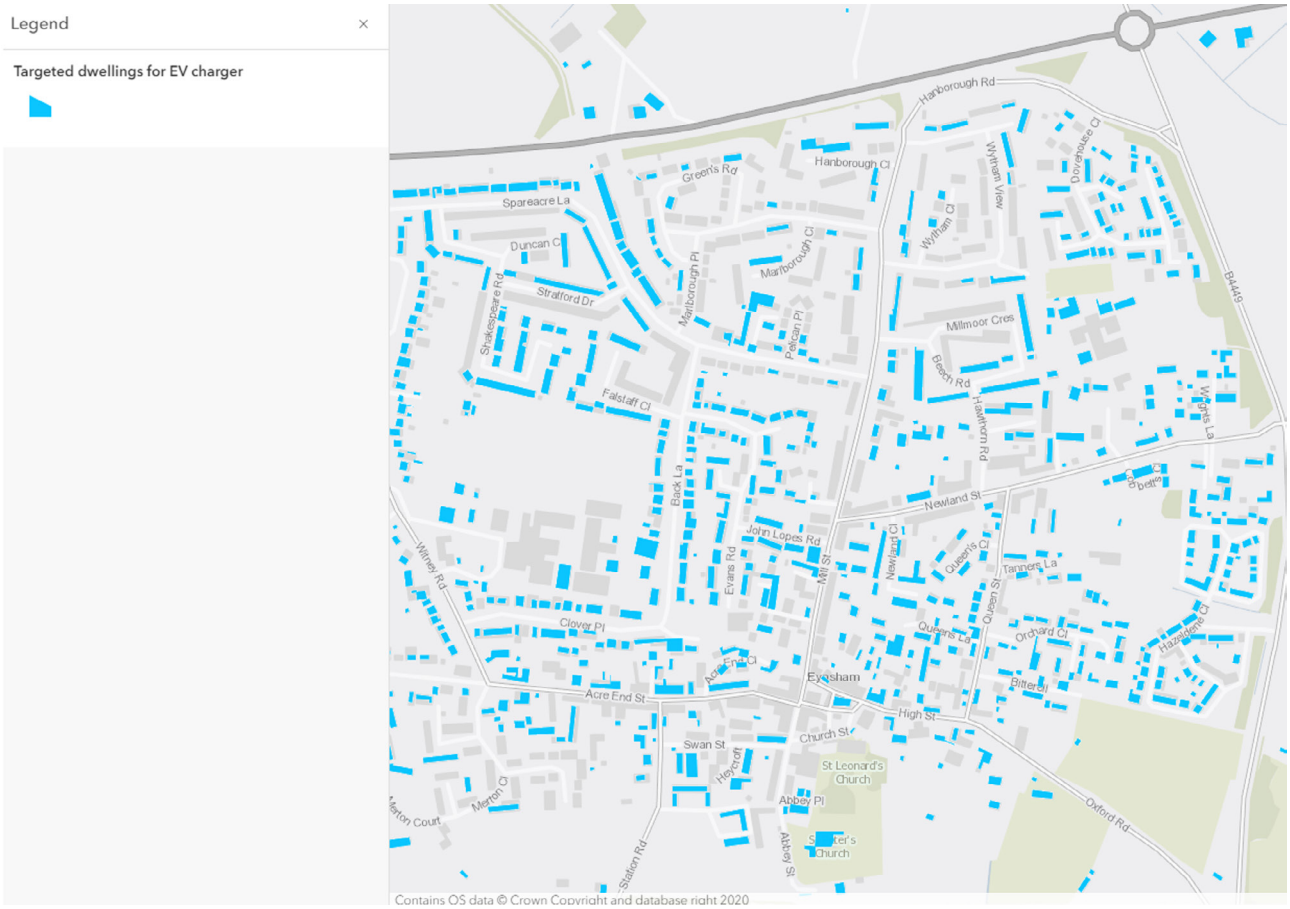

Figure 7: Eynsham Village EV charger suitability

A total 1,355 dwellings were identified as suitable for battery storage, which corresponds to 37% of the dwellings analysed. All 580 dwellings suitable for PV systems were identified as suitable for having batteries as well. In total for the SFN, only 153 (5%) dwellings were identified as suitable for an all-inclusive low carbon technology package of PV, heat pump, EV charging and home battery storage.

Figure 8 shows how the dwellings suitable for the LCT package are the dwellings with EPC A and B ratings indicating the need for fabric improvement to coincide with widespread smart energy technology solutions.

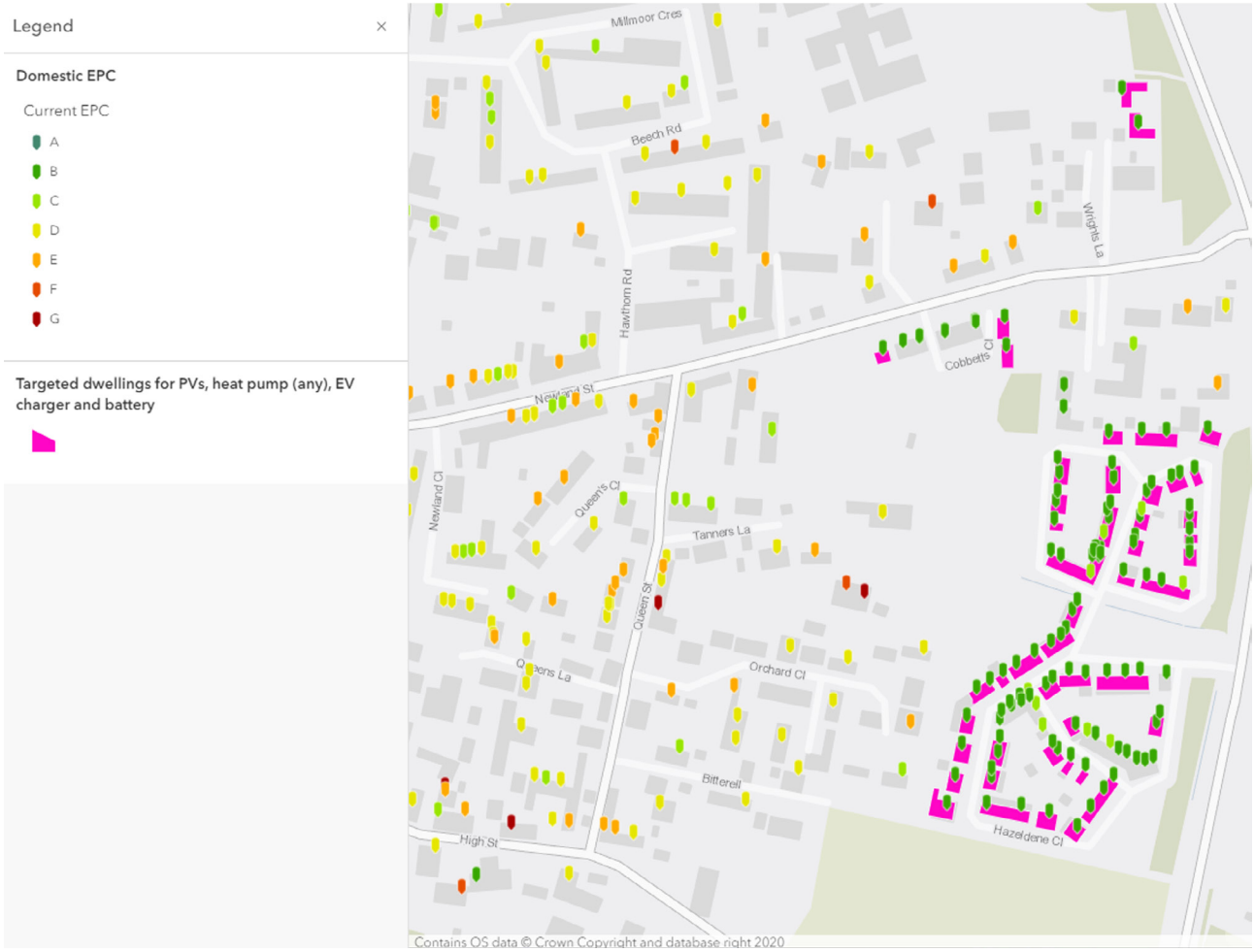

Figure 8: Eynsham Village full LCT package suitability with EPC rating tags

Capability assessment

The results of the capability assessment are described below for each type of capability. Maps are provided below showing the capability grade at the postcode scale. Figure shows the overall SFN for technical capability with Eynsham Village identified.

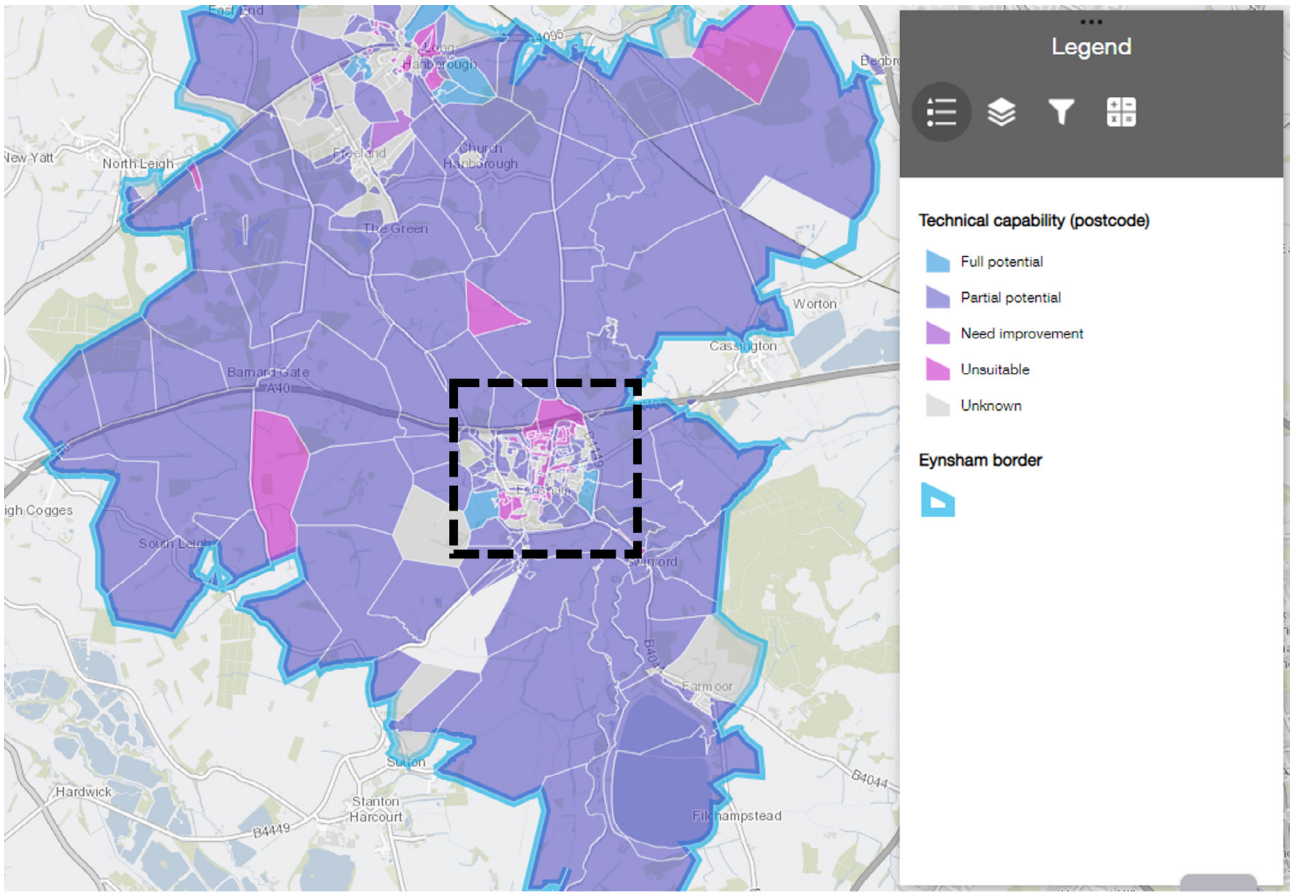

Figure 9: Eynsham SFN technical capability map with Eynsham Village identified

Technical capability

Over the past couple of decades there has been much effort in upgrading the building stock through government programmes like the Energy Efficiency Commitment (EEC) and the Energy Company Obligation (ECO) (Rosenow 2012). These resulted in improved insulation and glazing in many dwellings through the years, though there is still much to do. This effort can be seen here as a little over 50% of the dwellings are considered to have full or partial technical capability. Figure provides the mapped results and Table 9 shows the per cent of dwellings attributed to LCT suitability and technical capability (Note that the percentages apply to the entire SFN though the figures only show a portion, focusing on Eynsham Village). The 'need improvement' and 'unsuitable' areas are key areas on which to focus greater fabric improvement.

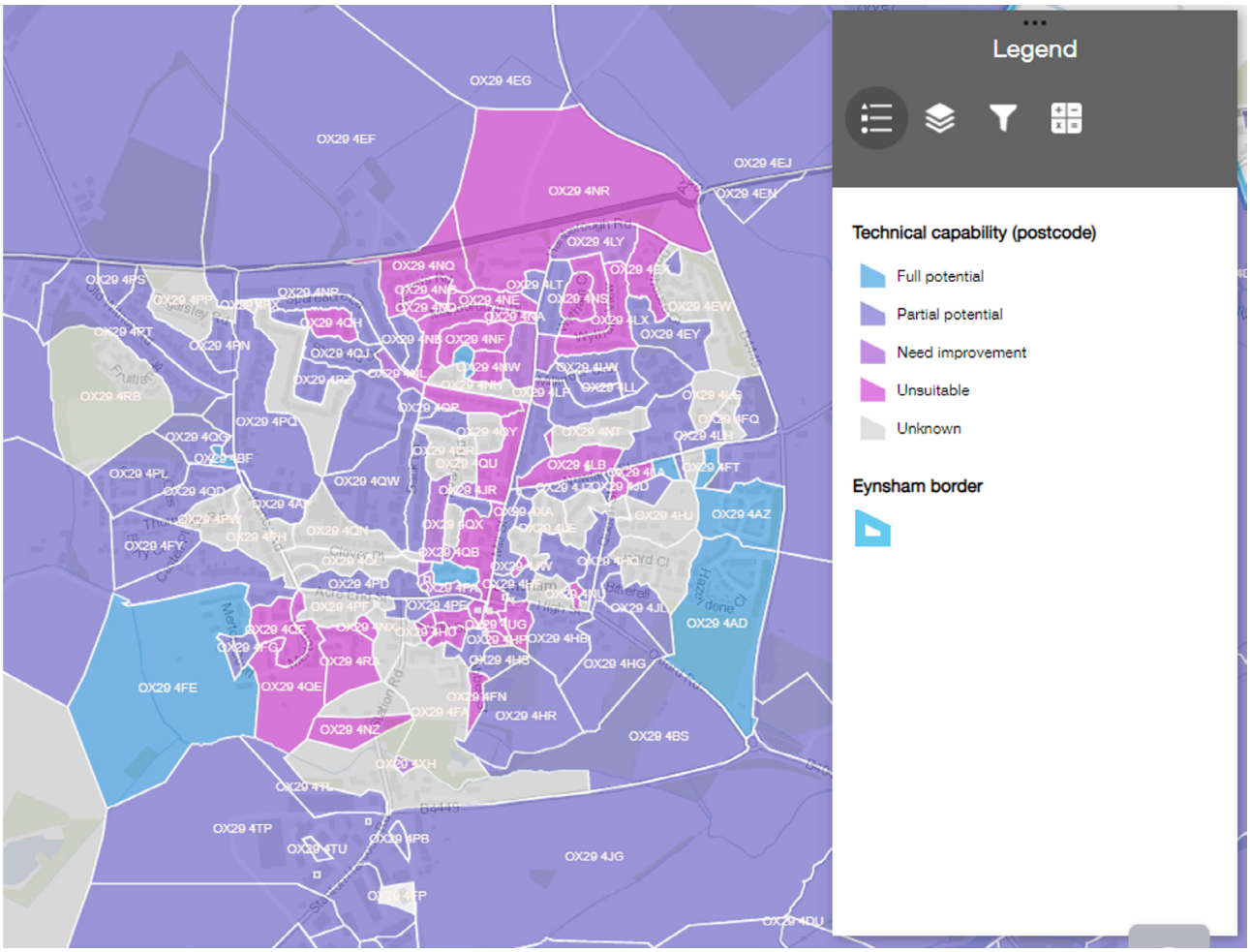

Figure 10: Technical capability map – Eynsham Village

Table 9: LCT suitability and technical capability percentages				
LCT Suitability				
PV	**ASHP**	**GSHP**	**EV charger**	**Battery**
16%	60%	58%	51%	37%

Technical capability			
Full potential	**Partial potential**	**Needs improvement**	**Unsuitable**
4%	48%	7%	13%

Digital capability

There is currently a low level of digital capability in the Eynsham SFN; it is the category with the lowest values. These classifications would suggest that householders will require a higher level of help, education, and training to accept technological solutions to energy and climate challenges, including the interconnectedness of solutions and their management. Figure 11 provides the mapped results and Table 10 shows the per cent of dwellings for each level of digital capability. Note: for digital capability a significant amount of dwellings' data were missing to calculate capability. These were mostly in the rural areas surrounding the villages (37% dwellings' data unknown).

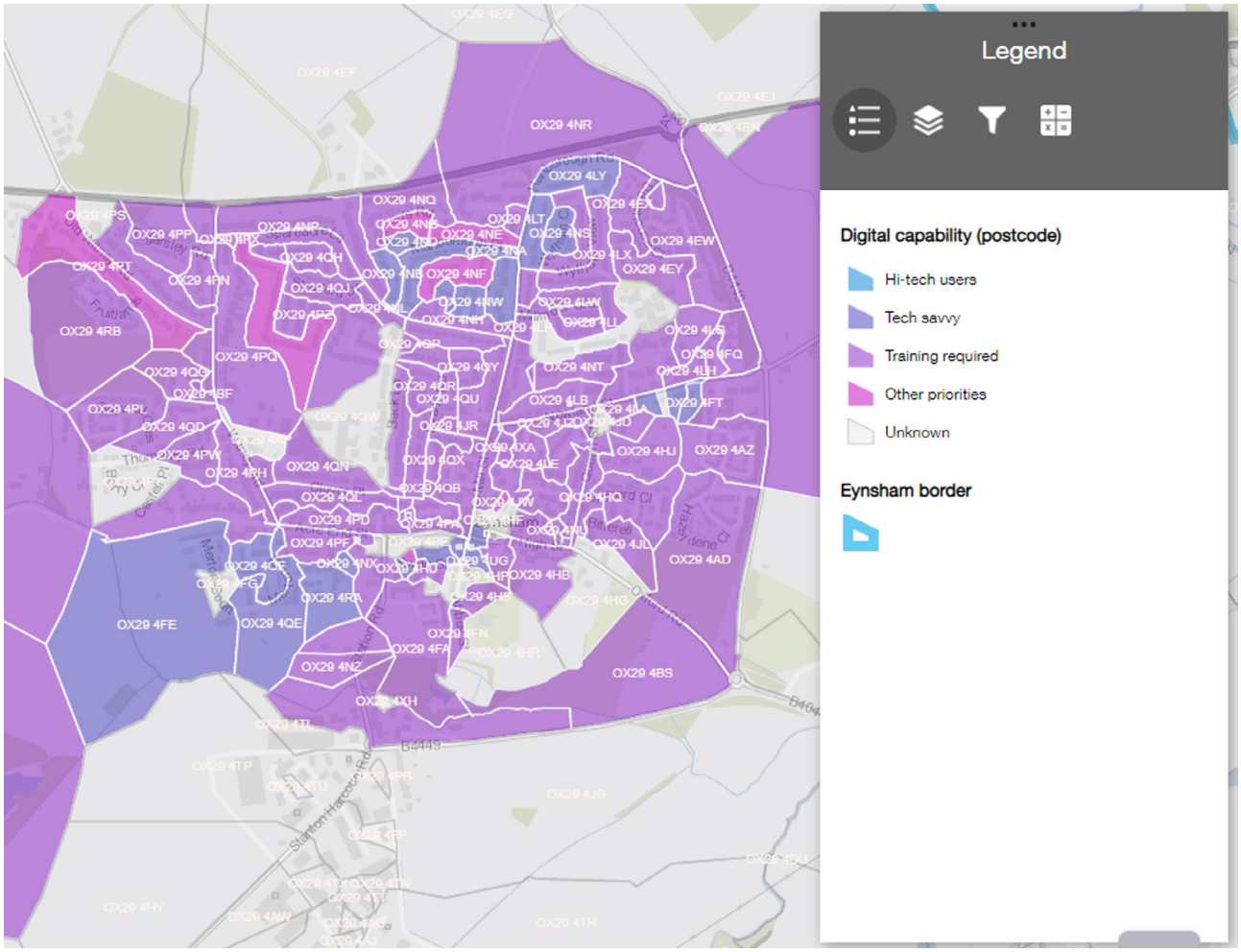

Figure 11: Digital capability map – Eynsham Village

Table 10: Digital capability percentages

Digital capability			
High tech user	**Tech. savvy**	**Training required**	**Other priorities**
<1%	6%	46%	10%

Financial capability

A borderline minority of households in the SFN are financially capable, i.e., happy investors or venturers; and a significant number of households are considered 'deprived (with equivalised annual income <£20,000). Figure 12 provides the mapped results and Table 11 shows the per cent of dwellings in the SFN attributed to financial capability. The map is notably quite segmented on a postcode scale. The villages have a higher concentration of Happy investors and Venturers, whereas the Deprived households are mostly concentrated outside of the village centres. Financial capability is particularly helpful whether seeking able to pay households or households qualified for income-based grants. Furthermore, fuel poverty can also be addressed using financial capability data.

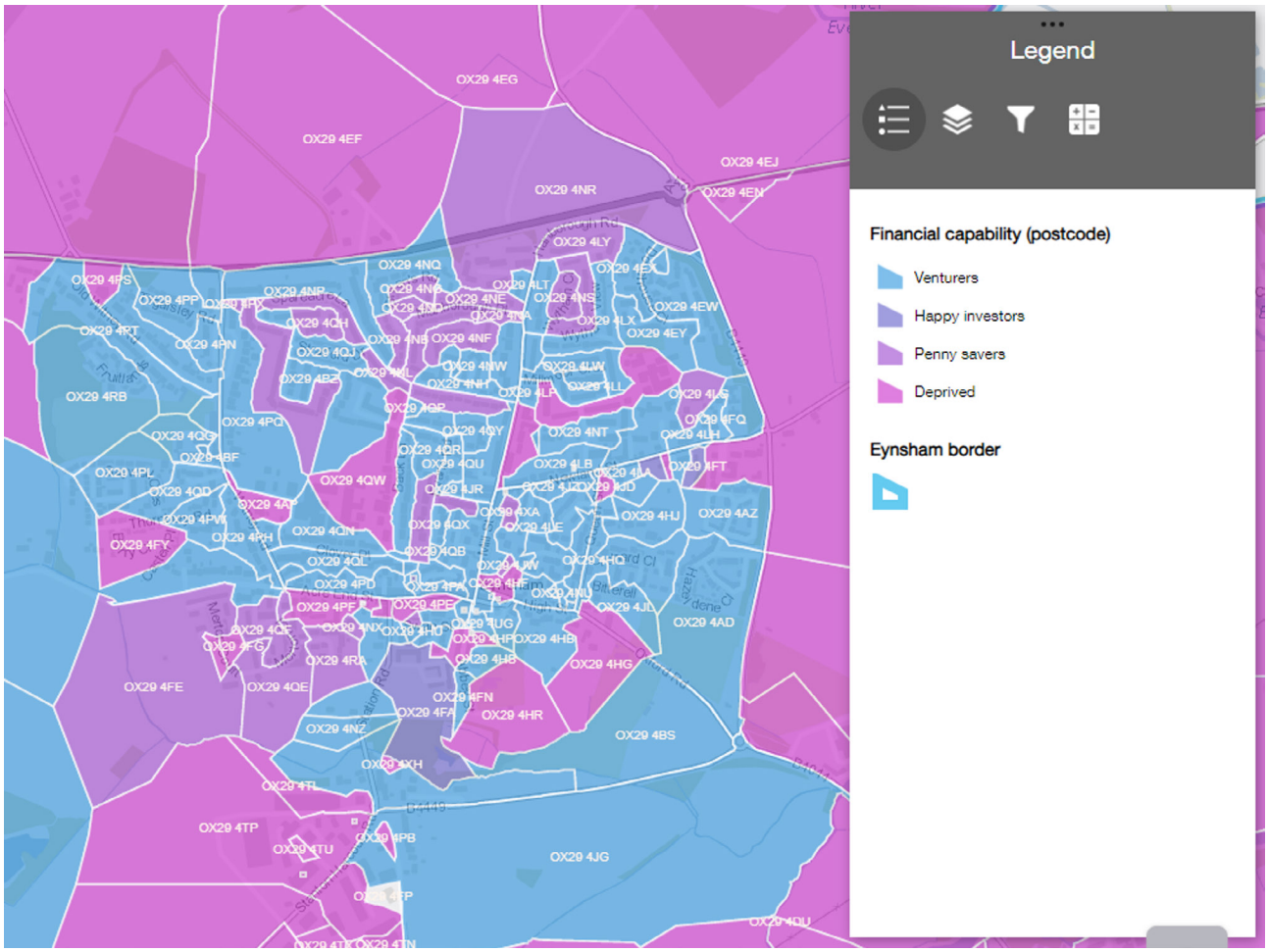

Figure 12: Financial capability map – Eynsham Village

Table 11: Financial capability percentages			
Financial capability			
Happy investor	**Venturers**	**Penny savers**	**Deprived**
7%	42%	12%	39%

Social capability

Social capability in the Eynsham SFN is relatively high. Both fully convinced and motivated make up 54% of the households; a small percentage are considered sceptical or not interested. Social capability, however, is likely the most speculative assessment as it does not include a direct survey to the householders regarding LCTs or energy and climate issues but uses broad categories based on national financial strategy segment groups - a view of UK consumer financial behaviour. Figure 13 provides the mapped results for direct targeting and Table 12 shows the per cent of dwellings attributed to social capability. Note: for social capability a significant amount of dwellings' data were missing to calculate capability. These were mostly in the rural areas surrounding the villages (37% dwellings' data unknown).

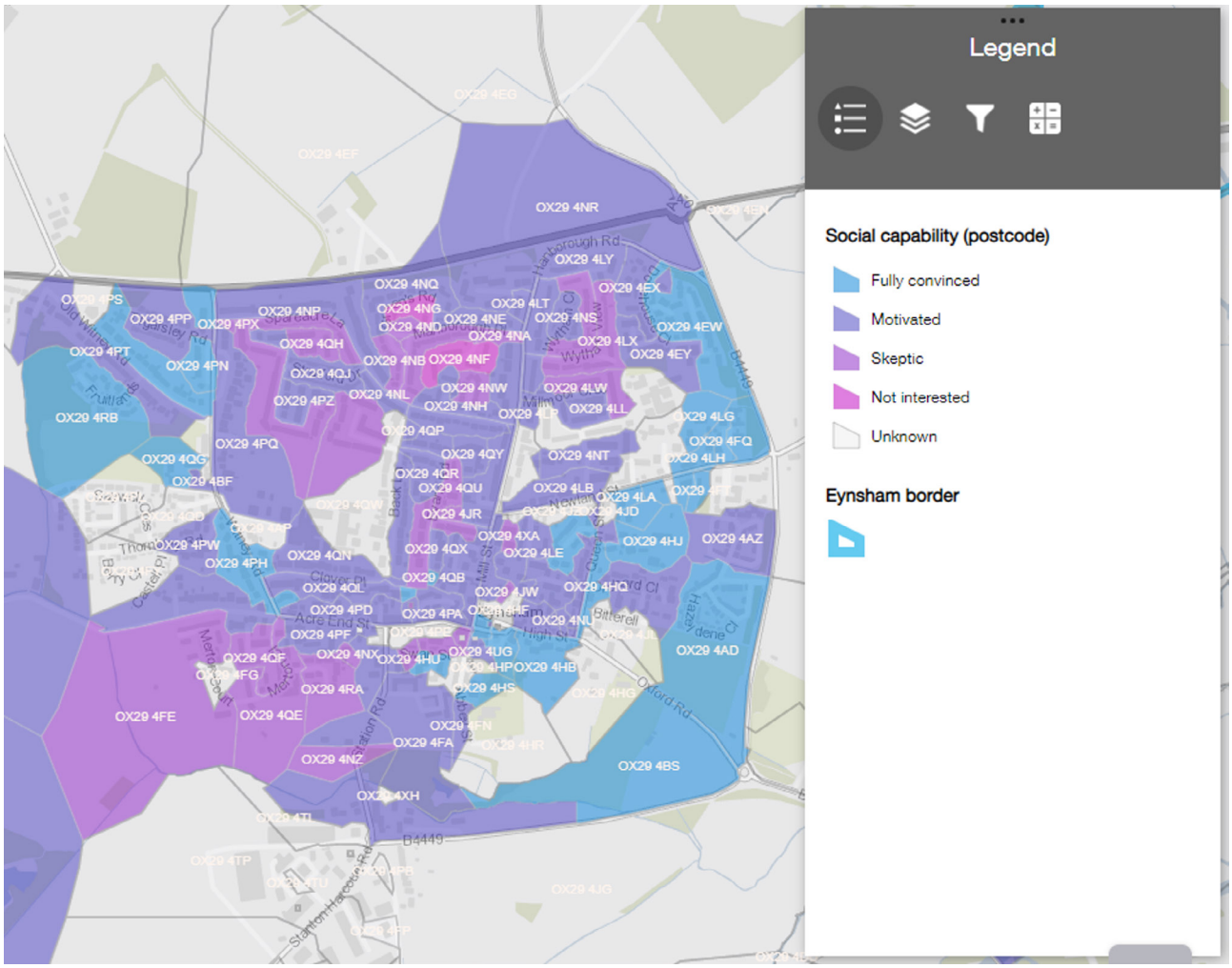

Figure 13: Social capability map – Eynsham Village

Table 12: Social capability percentages			
Social capability			
Fully convinced	**Motivated**	**Sceptical**	**Not interested**
23%	31%	8%	<1%

Summary of findings

This report has used a local area energy mapping approach (LEMAP) to derive spatial intelligence of a local area (Eynsham) to provide a deeper understanding of its baseline energy use, energy resources and potential for take-up of low carbon technologies to bring local energy flexibility. This will help stakeholders such as community energy project developers, local authorities, and local community groups to plan for local smart and fair energy initiatives in the Eynsham SFN. The findings of the study are also useful for the district network operator in energy system planning.

The key findings of the study are described below:

- The Eynsham SFN in Oxfordshire, crosses over the West Oxfordshire and Vale of White Horse Districts with an area of 101.72sqkm. The SFN contains 10 LSOA, 325 postcodes, approximately 14,941 people living in 6,780 properties and 2,711 buildings (domestic and non-domestic).
- Historically (2015-2019), the SFN LSOAs have had a high electricity consumption, which is and has been higher than 4,300kWh. Nevertheless, the LSOAs have experienced an average decrease of 8% in consumption in the past five years (2015-2019). With LSOA West Oxfordshire 011C leading with a 13% decrease.
- At postcode level, annual mean domestic electricity consumption has been measured up to 10,000 kWh. Additionally, many of these have increase over the past five years. These high consuming areas may be areas of prioritisation of LCT installation to aid in the reduction of electricity consumption.
- Historically (2015-2019), the SFN LSOAs have had a medium-high Ofgem classification based on their annual mean domestic gas consumption, which is and has been between 12,000 and 17,000kWh. However, the LSOAs have experience an average 4% decrease in consumption in the past five years. With LSOA West Oxfordshire 006B leading with an 11% decrease. Nevertheless, the reduction has not changed the medium-high consumption qualification from Ofgem, as it is still between that 12,000-17,000KWh, with one exception, West Oxfordshire 006D has and has had a high annual mean domestic gas consumption higher than 17,000kWh.
- Despite LSOA level reduction, several postcodes have seen an average consumption increase of 8% in the last 5 years. As with electricity consumption, these high consuming areas may be areas of prioritisation of LCT installation to aid in the reduction.
- The SFN currently has 36 LCT installations: 16 solar water heaters and 12 PV. There are also two large embedded renewable energy generation sites: The Eynsham (13.2MW elect) and the Aurora solar farm (32MW elect) for a combined installed capacity of 35.2MW elect.
- The boundary does not encompass any large, embedded energy storage facility.

- The 2020 EPC registry covers 32% of the properties in the area. Of these, 34% possess no wall insulation, and 83% possessing less than the minimum thickness of roof insulation. Most of the buildings lacking insulation are in the LSOA West Oxfordshire 011C. Highlighting this area for the possibility of retrofit installations to improve the energy consumption, thermal comfort, and energy efficiency of these areas, especially in houses, as they represent 84% of the properties with lacking insulation.
- Based on the LEMAP targeting approach, it was found that:
    - » Solar PV installations: 580 dwellings were identified in the SFN (16% of the dwellings). However, another 3,100 dwellings, counting for 86% of properties, could be suitable for PV installations if the EPC is improved to D rating. All 580 targeted properties were identified as also suitable for home battery installation.
    - » Heat pump installations: 2,100 properties (58%) were identified as suitable for GSHP, and 2,165 properties (60%) were identified as suitable for ASHP. All dwellings suitable for GSHP are also suitable for ASHP.
    - » EV chargers: the properties identified for PV and battery can be potentially targeted for EV chargers. Overall, 1,847 properties (51%) were identified as suitable for EV chargers.
    - » In total for the SFN, 153 (5%) dwellings were identified as technically suitable for an all-inclusive low carbon technology package of PV, heat pump, EV charging and home battery storage.

The application of LEMAP to the Eynsham area has demonstrated how spatial mapping tools can be used for local area energy planning to achieve net zero. Local authorities as a potential convenor of local area energy plans will need to be supported in their efforts. Support likely includes funding, staffing for planning and engagement, training, and support in making connections and coordination between stakeholders.

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