Project LEO Programme Update

September 2020 — No. 3

Year 2 Q1 & Q2

Local Energy Accelerating Net Zero

Project LEO aims to test how opportunities can be maximised and unlocked from the transition to a smarter, flexible electricity system, with a focus on renewable and low carbon energy.

Welcome to the third 'Programme Update' for Project LEO (Local Energy Oxfordshire), providing an update on activities undertaken in the project since March 20. Programme Updates are posted on the Project LEO website providing insights into the activities, outputs and research being generated as part of the demonstrator project.

Project LEO is redesigning the energy system at a local level to facilitate the transition to a zero-carbon energy future and is a collaboration between 9 project partners, each operating within very different areas of the wider energy ecosystem.

This Programme Update provides an update of the energy mapping work being undertaken by Project Partners. This work has led to the development of an early stage Integrated Land Use Mapping tool, which will aim to aid and inform in decision making within the planning system, particularly in relation to energy assets.

Development of the Integrated Land Use Mapping Tool

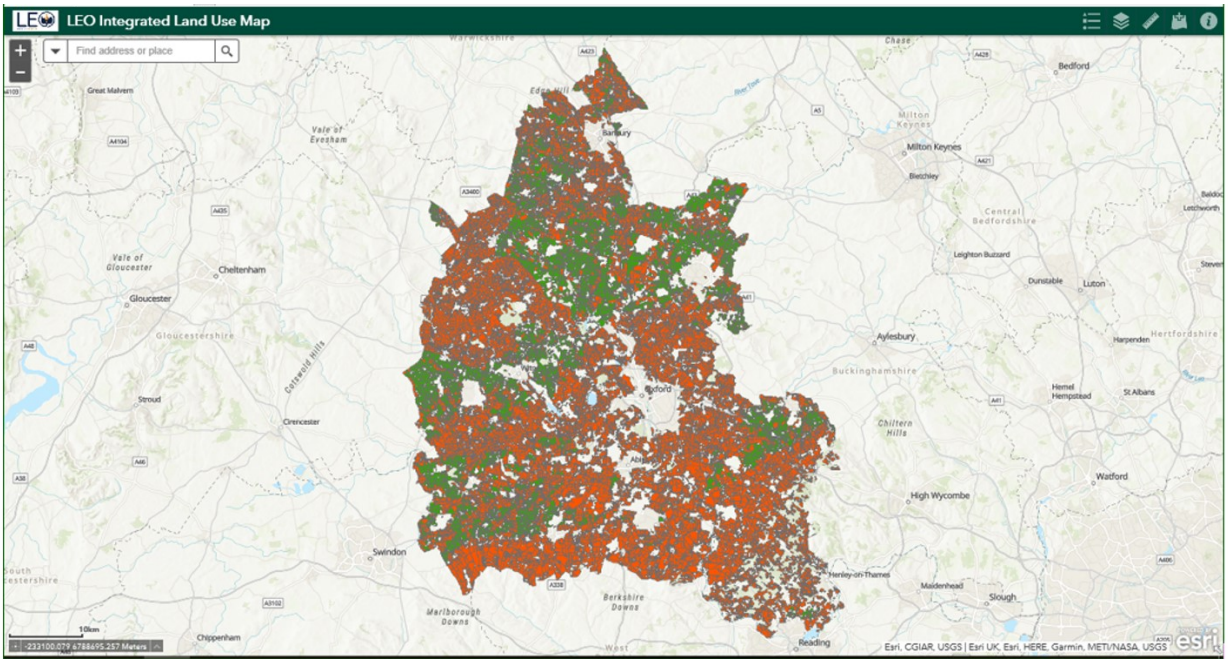
LEO's Work Package 4 focuses on 'Future Energy System Planning'. Within this, in Work Package 4.1, Oxfordshire County Council (OCC) is working alongside Oxford Brookes University (OBU) to provide spatial energy mapping intelligence to:

- aid in the identification of locations for smart grid and capacity testing
- support decisions to optimise the use of existing infrastructure
- aid in the identification of location and potential capacity for low carbon energy generation
- identify communities and households for targeted energy efficiency programmes to reduce energy demand.

As well as supporting decisions in LEO the mapping work will provide evidence to support strategic planning given within Oxfordshire Plan 2050[1] (the county's emerging Joint Statutory Spatial Plan) and delivery of the Oxfordshire Energy Strategy[2].

The LEO Integrated Land Use map is the first step towards an intelligent spatial energy mapping tool. The map draws together into a single space a wide range of information on land use (including environmental and landscape designations, agricultural grade, flood risk zones, planned housing and employment growth) and energy assets in Oxfordshire. It has been created in consultation with partners and stakeholders across the county and will continue to be developed over the coming year to add further datasets, functionality and analytical tools – based on user requirements and learnings from other relevant projects in the UK and elsewhere.

We explain our approach and give a more detailed description of the LEO Integrated Land Use map below and conclude with a review of existing energy mapping models and tools.



Creating the map

The minimum viable systems approach used across Project LEO has also guided the development of the Integrated Land Use Map. The work has been led by the Energy Insights team at Oxfordshire County Council (Anitha Sampath and Inga Doherty), working in conjunction with the council's GIS and Digital Data team. Oxford Brookes University (Professor Rajat Gupta and Dr Angelines Donastorg Sosa) provided support and reviewed the map prior to its release to all LEO partners.

Identifying data and user requirements

A data survey conducted by Oxford Brookes University and University of Oxford in Summer 2019 confirmed that most of the data layers relevant for the Integrated Land Use map were held by or already available to OCC. The Data Workshop in September 2019 provided an opportunity for LEO partners to shape the development of the map. Discussions highlighted additional data requirements and considered: how to link spatial data with temporal and metering data being used by the Technical MVS; ownership and replicability within a local authority remit; and business models for the long-term sustainability of an energy map or energy tool. We also consulted energy and planning officers in the other Oxfordshire local authorities as key users of the mapping tool.

Local Energy Oxfordshire

Data processing

Having negotiated use of data with teams across the council, the list of mapping layers was handed over to the GIS team to build an online version of the LEO map on the ESRI platform. The web application, once created, was tested by OBU, who provided an impartial review of the integrated land use map in terms of user interface ease and layer positioning[3]. Their recommendations were used to refine the final iteration of the map.

Sharing the Integrated land use map web application

OCC has an enterprise partnership with ESRI which allows us to host our data on the ArcGIS web application through our Oxfordshire Online Map Portal. The data in the online Integrated Land Use map is shared through the Public Sector Geospatial Agreement (previously the Public Sector Mapping Agreement).

Introducing the LEO Integrated Land Use Map

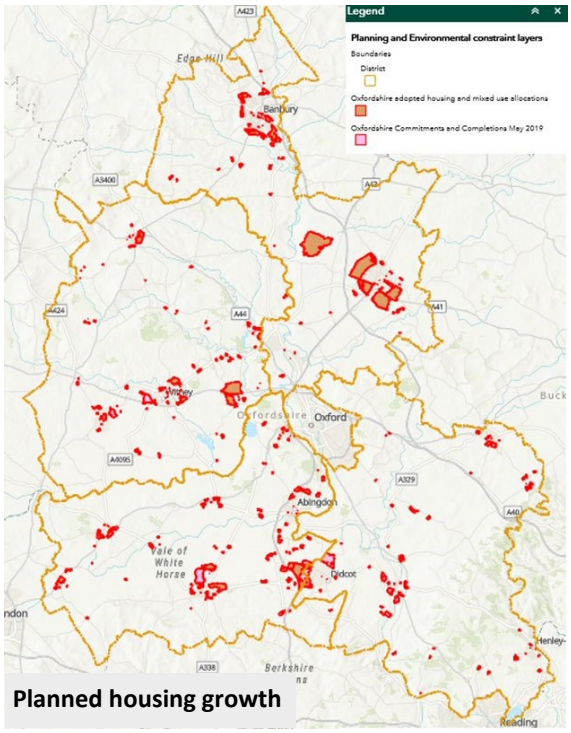
Over forty data layers drawn together for the LEO map have been organised into three categories for ease of use:

Electricity Network Layers	Planning & environment	Renewable generation potential

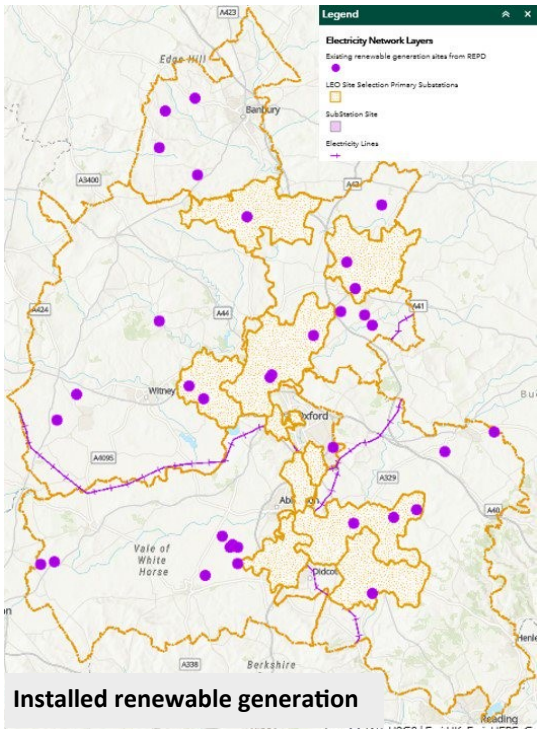
The Planning and Environmental layers include the locations of planned housing and employment growth and details on planning constraints (e.g. areas with nature conservation designations, flood risk zones).

The Renewable Generation potential layers are a new data set created for the LEO project by Energeo Ltd.

The map also includes aerial photography for all areas of the county.



Planned housing growth



Installed renewable generation

Examples of mapping layers

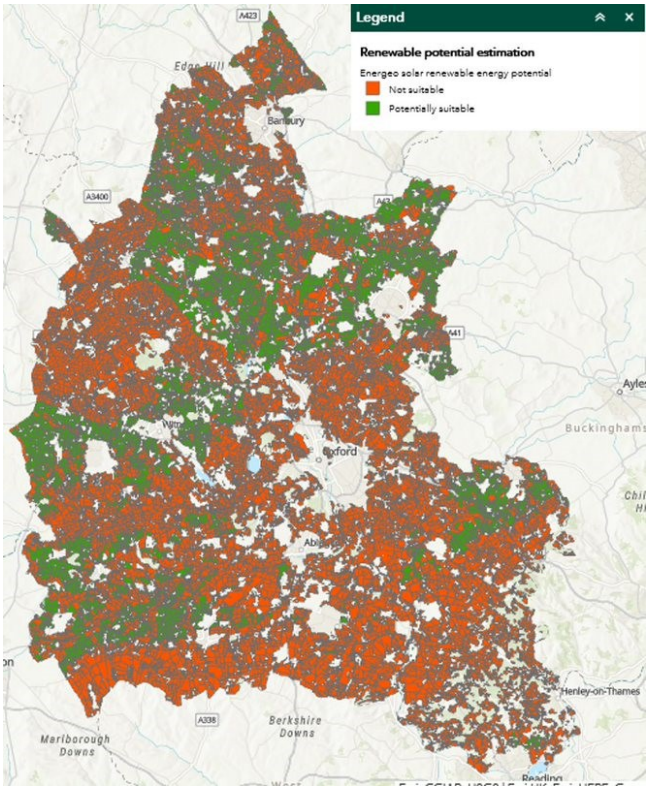
Local Energy Oxfordshire

New data – renewable generation potential

Analysis commissioned for the Oxfordshire Energy Strategy identified the need to increase renewable energy generation – at all scales from household to strategic sites - to meet countywide emission targets. Energeo Limited were commissioned and undertook desk-based analysis:

- To assess all individual land areas across Oxfordshire of 0.5 hectares or more to identify areas suitable for solar and / or wind generation.
- For each suitable area identified, estimate the potential generation capacity of the installation.

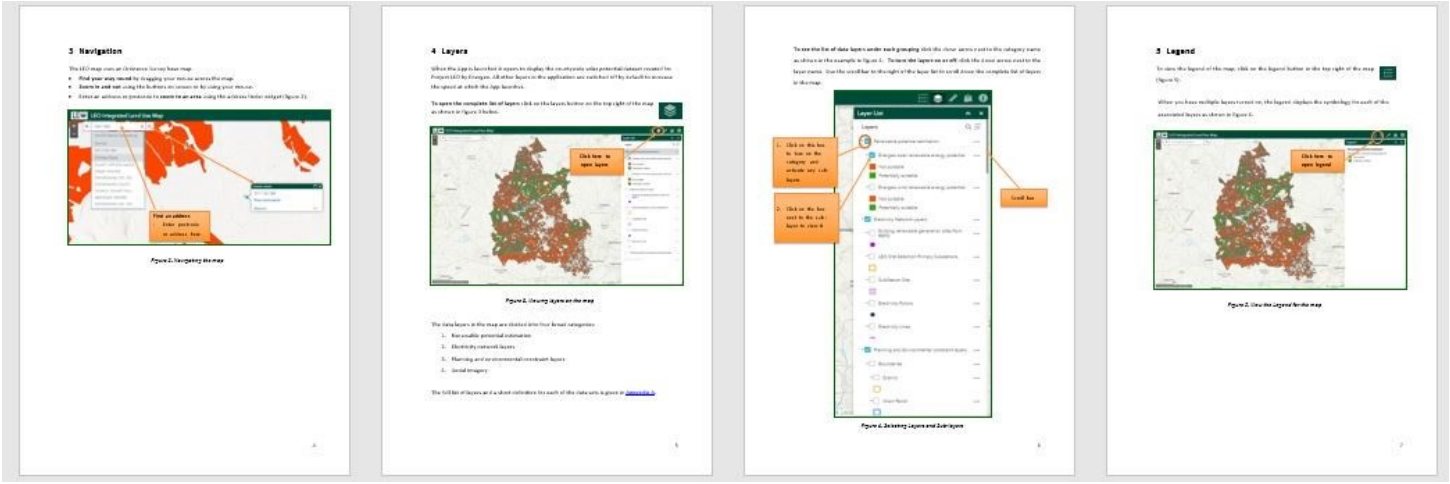
Based on agreed criteria, Energeo assessed 32,096 parcels of land across the county of which 9,520 land parcels, a total area of approximately 46,095 hectares, were estimated to be suitable for solar generation and 517 land parcels over approximately 2,122 hectares of land suitable for wind generation. The dataset is intended as an indicator of potential suitability and will inform selection of areas for deeper investigation and will be of particular interest to the county's strategic planning team.



Assessment of ground mount solar suitability across Oxfordshire

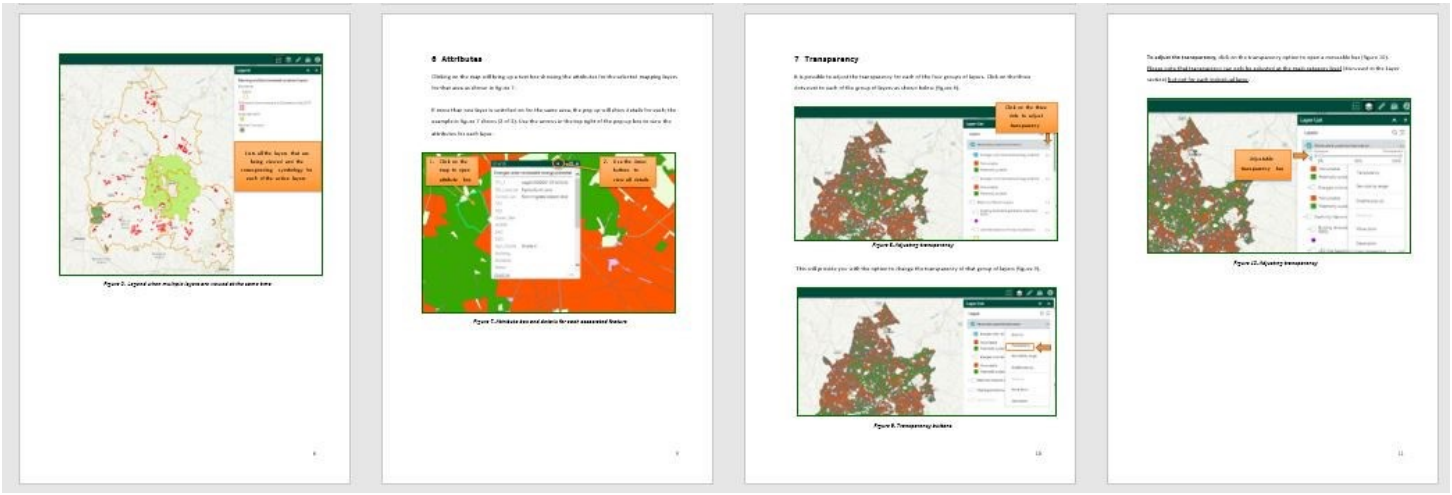
Using the map

The Integrated Land Use map is now available under licence to LEO partners, and a user guide has been compiled for users less familiar with the ESRI mapping tool. We will be extending the access to colleagues in each of Oxfordshire's local authorities.



LEO Integrated Land Use Map User Guide Screenshots (cont over)

Local Energy Oxfordshire



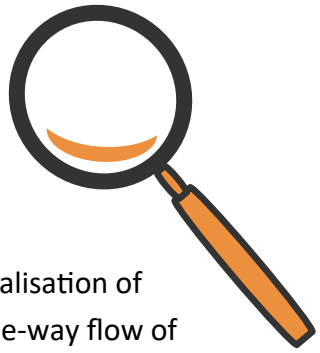
LEO Integrated Land Use Map User Guide Screenshots

Future Development

The LEO integrated land use map will continue to be developed in Year 2 of the project, initially to include additional data, for example energy use, network details, and socio-economic indicators. Further new data provided by Energeo will also be incorporated, including an assessment of the potential for domestic rooftop solar PV and ground source heat pumps for the largest built up areas in the county. Further development will create an energy mapping tool to provide descriptive and quantitative energy insights and will be informed by consultation with stakeholders to identify user needs and requirements.

Critical to the success of the mapping project will be ensuring its longevity beyond the funded LEO project. The County Council will continue to host and make available the data; throughout the development phase we will be exploring options to secure resources for ongoing maintenance and updates. Our colleagues at Oxford Brookes University have reviewed available energy mapping models and tools to assess their potential to inform our work and to highlight reasons why the models may not have endured.

Review of local energy mapping platforms & tools



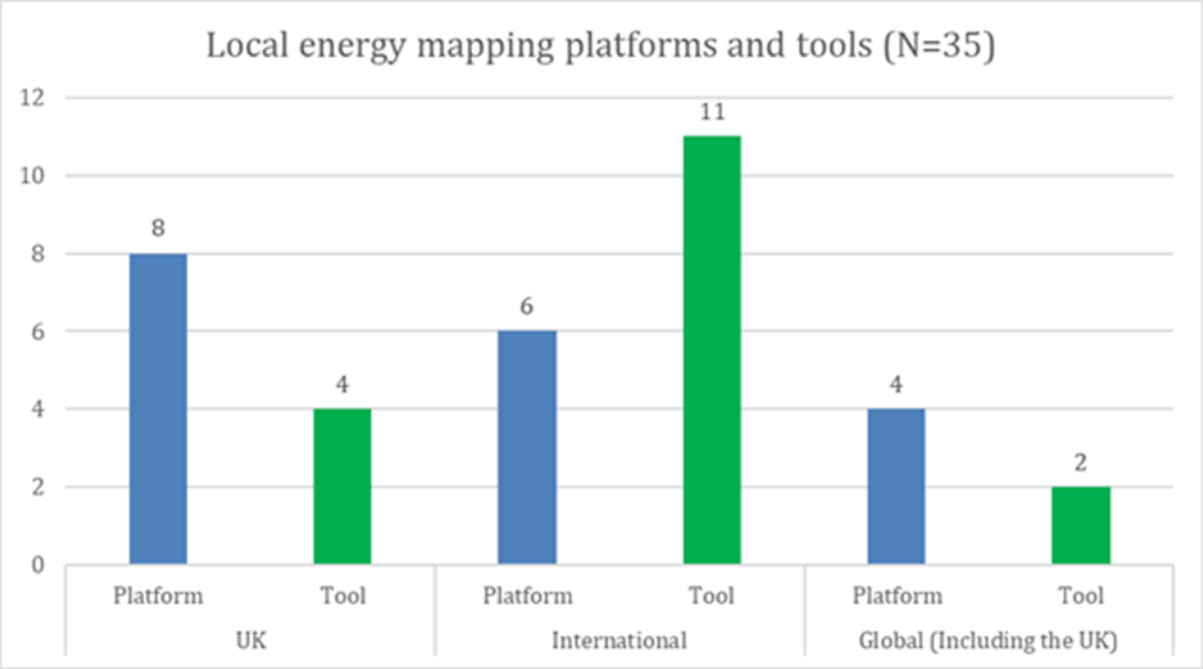
To inform the development of integrated land use mapping tools, Oxford Brookes University reviewed the available local energy mapping platforms and tools. The purpose of the review was to gain a deeper understanding of the scope, technical features and limits of local energy mapping platforms/tools, to inform the development of LEO's energy mapping tool.

Local energy mapping platforms are defined as online platforms that provide visualisation of spatial energy data with limited customisation of spatial data and usually offer one-way flow of information from the platform to the user. Local energy mapping tools are considered to be online, interactive tools that allow visualisation, analysis and customisation of available spatial energy data.

About 18 local energy-mapping platforms and 17 local energy-mapping tools were examined in detail.

Local Energy Oxfordshire

The figure below shows the locations of the platforms and tools identified as per location - covering the UK, international (outside the UK) and globally.



Local energy mapping platforms

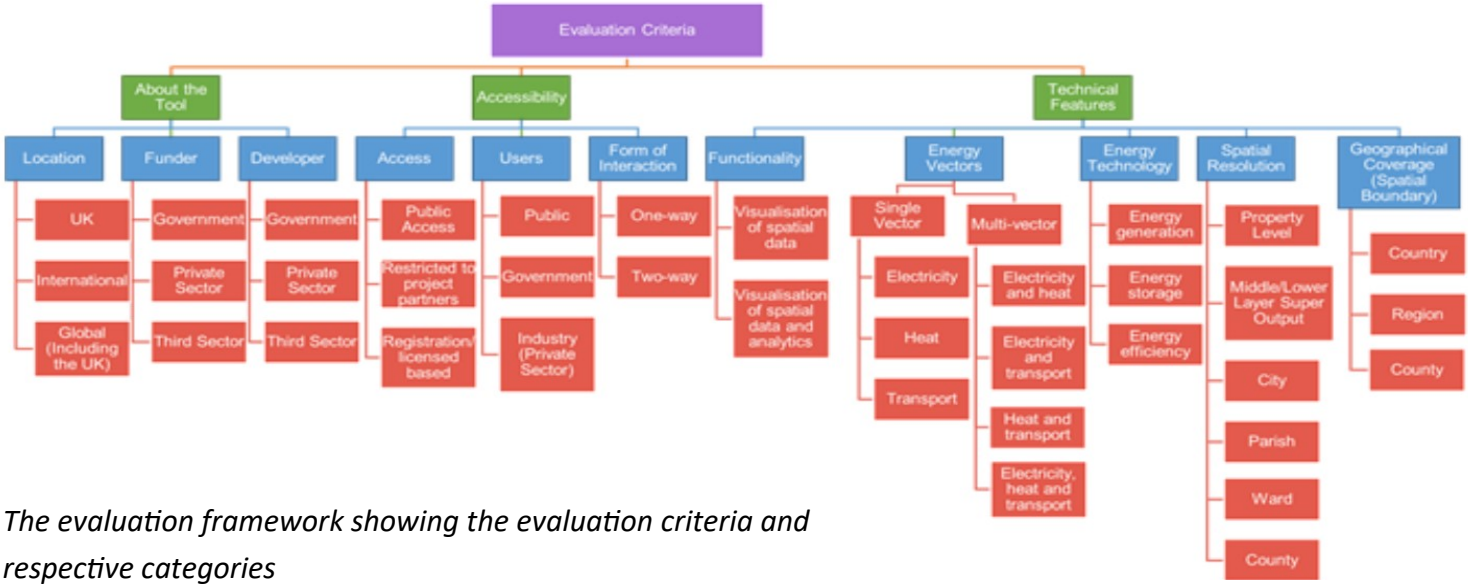
No.	Name	Location
	Platforms	
1	National heat map	UK
2	UK Renewable energy map	UK
3	Northern Power Grid Demand Availability Map/Demand Map	UK
4	SSEN Network Capacity map	UK
5	Western power distribution network capacity map	UK
6	Distributed generation Scottish power manweb heat maps	UK
7	Milton Keynes heat maps	UK
8	People Power Station	UK
9	Energy action and systems for the Mediterranean local communities (EASY)	International
10	Facilitating Multi-level governance for Energy Efficiency	International
11	Solar PV Status	International
12	OEIRAS E-City	International
13	Project of Common Interest (PCI)	International
14	National Solar Radiation Database: International Data (USA and India)	International
15	Project Sunroof (Google)	Global (Inc. the UK)
16	ENTSO-E transmission system map	Global (Inc. the UK)
17	Global solar Atlas	Global (Inc. the UK)
18	Global wind Atlas	Global (Inc. the UK)

Local energy mapping tools

No.	Name	Location
	Tools	
19	National Grid Connectnow research assistant	UK
20	Energeo	UK
21	Domestic Energy Efficiency Mapping (DEEM)	UK
22	Local Energy East Project (LEE)	UK
23	Integrated Community energy mapping (ICEM)	International
24	Cities Leading through Energy Analysis and Planning (Cities-LEAP)	International
25	Solar Proof Suns Map (SunMap)	International
26	Accompany cities in energy strategy	International
27	Energy access Explorer	International
28	Energy Zones Mapping tool	International
29	SunSpot solar potential map (SunSpot)	International
30	Thermal Energy Resources Modelling and Optimisation System (Thermos Project)	International
31	Heating and cooling: Open Source Tool for Mapping and Planning of Energy Systems (HoTMAPS)	International
32	Integrated tool for empowering public authorities in the development of sustainable plans for low carbon heating and cooling	International
33	Renewable energy data explorer	International
34	ALTAMPS	Global (Inc. the UK)
35	Intelligent Community Design (ICD)	Global (Inc. the UK)

To characterise the local energy mapping platforms and tools, a framework comprising 11 evaluation criteria was developed and organised into three groups:

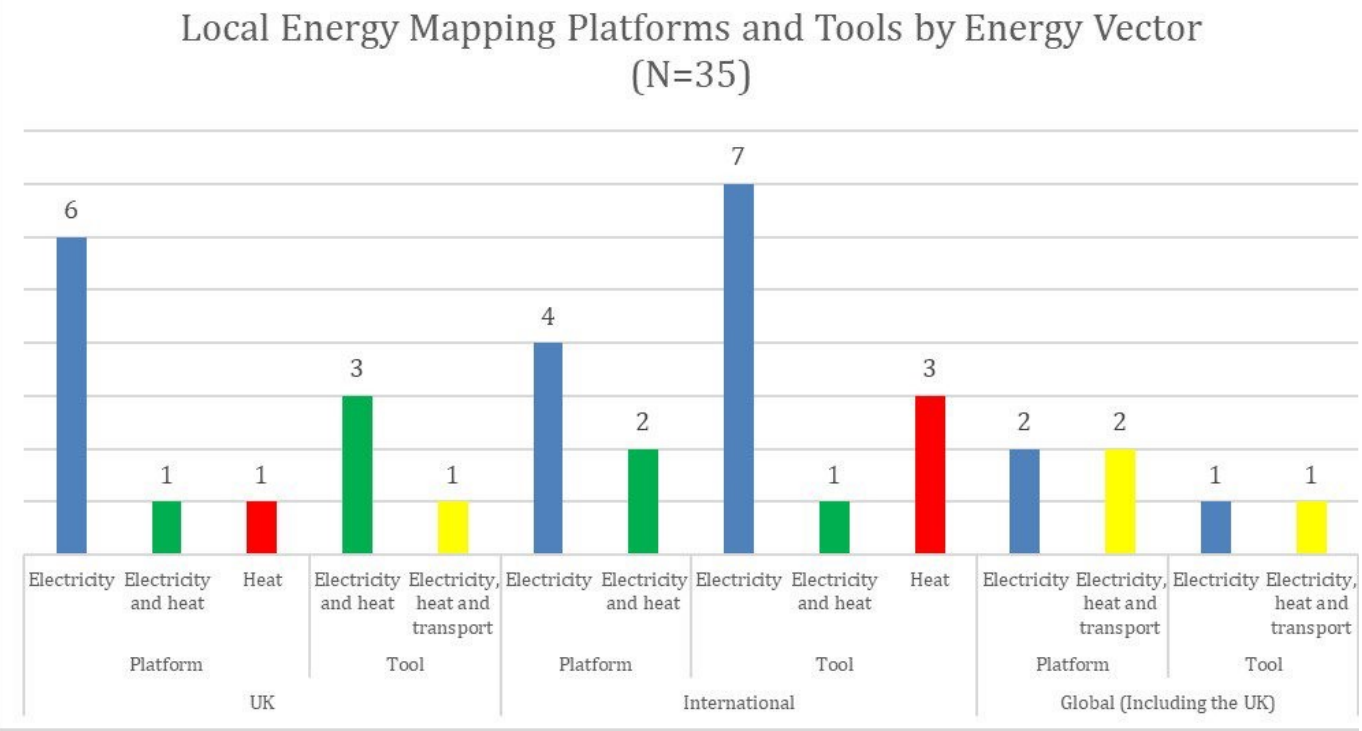
- About the tool
- Accessibility
- Technical features



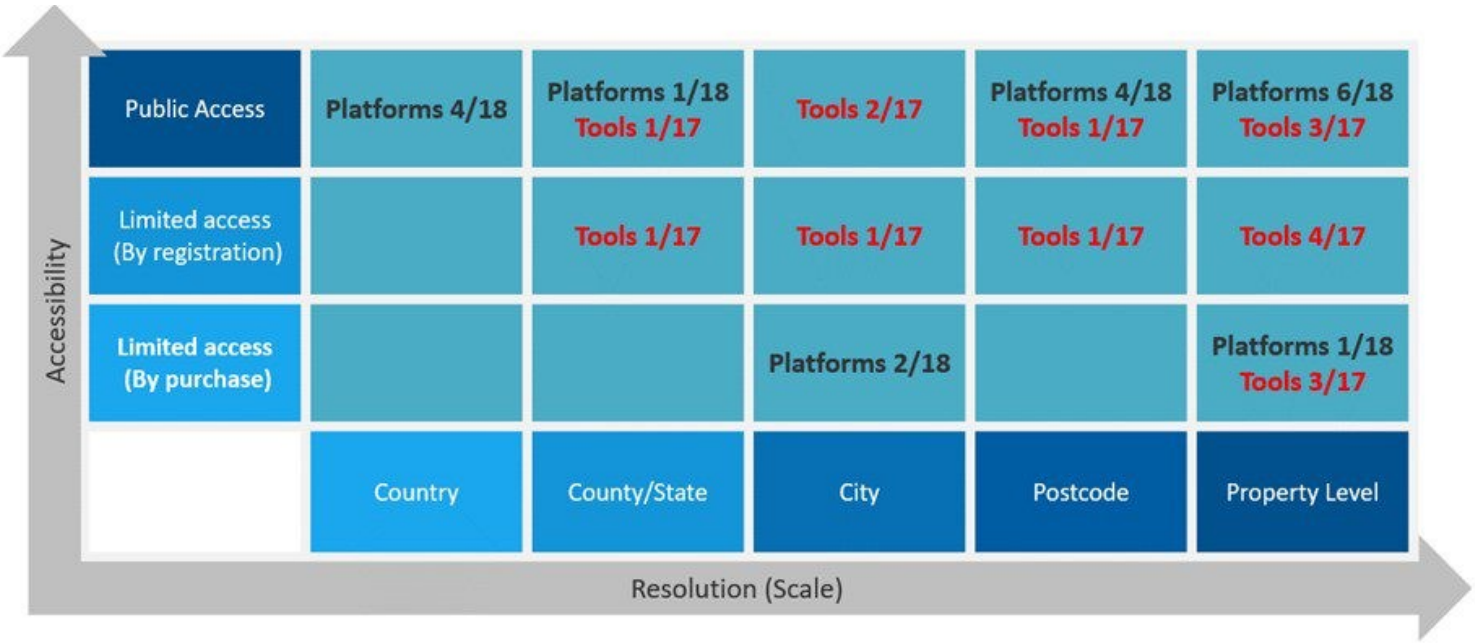
The evaluation framework showing the evaluation criteria and respective categories

Local Energy Oxfordshire

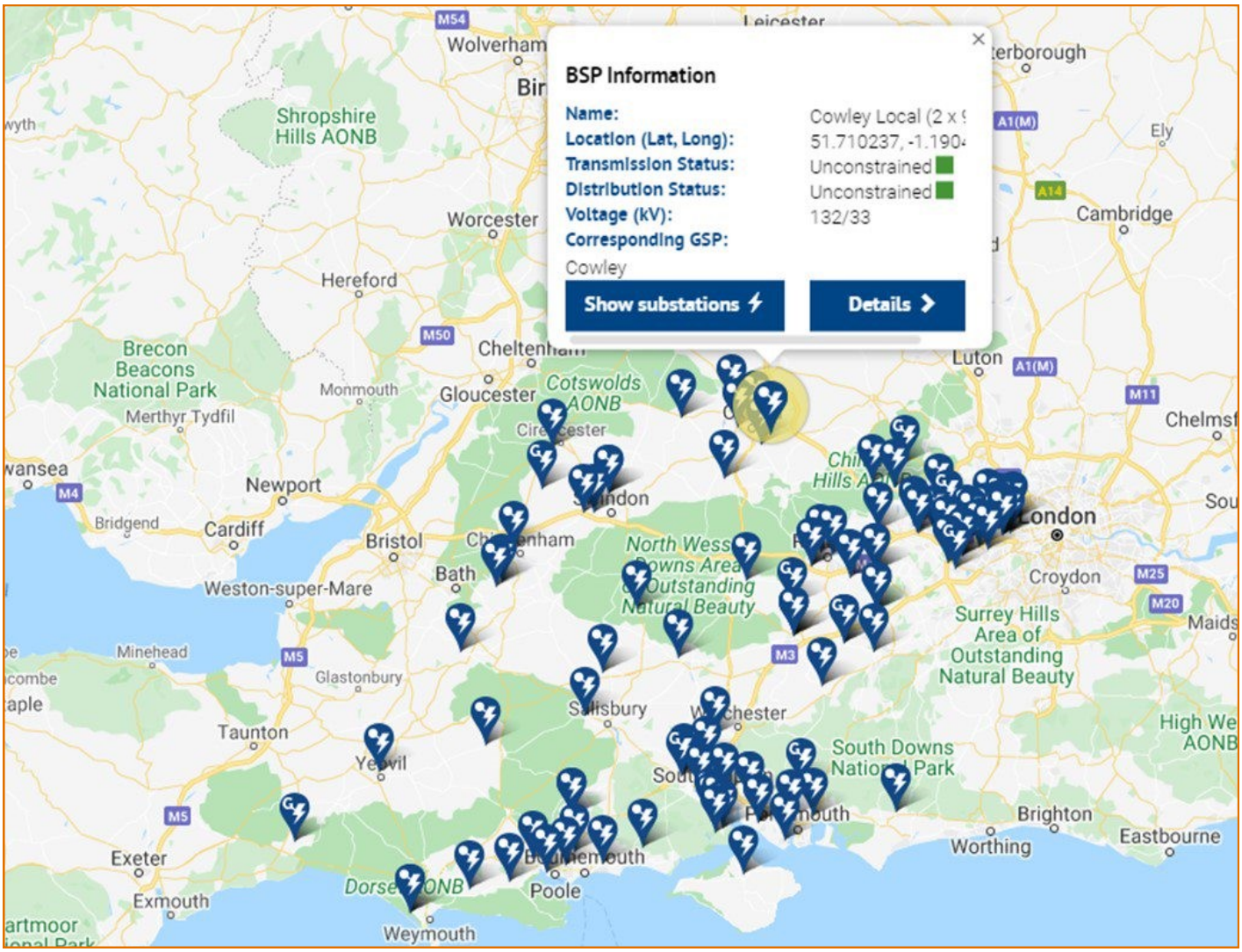
Most of the platforms and tools were about electricity as a single vector (n: 20) or in combination with heat (n: 4) and transport (n: 4). Only a few platforms and tools addressed heat (n: 4) on its own. The Heat map developed with support from UK Government was found to be no longer available for use.



The review identified relationship between the level of accessibility and the resolution (scale) offered by the local energy mapping platforms and tools, as seen in the matrix below. While most of the platforms had public access, the majority of local energy tools had limited access either by registration or purchase. While seven out of 18 mapping platforms show data at property level, nearly 10 out of 17 local energy mapping tools visualise spatial energy data at the property level. Most of the local energy mapping platforms and tools based in the UK and one global platform (Project Sunroof from Google) offered spatial information at high



On the other hand, the demand and capacity maps provided by distribution network operators (DNO) display substation level data with public access.



A summary of our key review finding can be found on the next page.

Local Energy Oxfordshire

Key review findings

Local energy mapping is an emerging area in the UK that has led to the development of a series of platforms and tools to support the visualisation and targeting of (smart) local energy initiatives.

The local energy mapping platforms and tools tend to focus on energy generation and energy efficiency, with limited focus on energy storage.

Government-funded initiatives are a key source for developing local energy mapping platforms and tools. However, development of these platforms and tools is usually undertaken by the private sector.

UK-based mapping platforms and tools are found to provide high-resolution scale (property level) spatial energy information.

Most of the local energy mapping platforms have some level of public access. Majority of local energy mapping tools having data at high-resolution scale, have restricted access either through registration or licence.

Majority of energy mapping platforms and tools have a single vector focus, predominantly electricity. Those addressing heat and transport are limited, indicating the need to develop platforms and tools to address electricity, heat and transport holistically.

Many local energy mapping platforms and tools have been either decommissioned or become obsolete due to lack of maintenance. It is vital that development of such platforms and tools carefully considers the maintenance requirement after the project has come to an end.

1 Oxfordshire Plan 2050. https://oxfordshireplan.org/

2 Oxfordshire Energy Strategy, 2019. https://www.oxfordshirelep.com/energystrategy

Local Energy Oxfordshire