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Geography and Library Data

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Presentation on Open Geographic Intelligence and Library Data.

Me

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Half-time **Library Systems Officer** LibrariesWest - do things with maps and map data.

Libraries West

We are publishing our Open Data at https:///www.librarieswest.org.uk/opendata

Also see our open data book.

Why Geography (or GIS)

Everything happens somewhere.

Geography data is becoming increasingly important, because there is so much we can use *about* locations. Examples include:

- deprivation statistics and need of areas which include: income, education, work, services;
- population density and rural/urban split;
- number of young/old people;
- government, local government boundaries (and all sorts of other boundaries);
- the history of a place;
- natural environment such as flood plains, climate, and biodiversity.

Not only is geographic intelligence powerful and essential to data analysis, but it is fun!

Location vs. Place

What is the difference between location and place? We tend to use *'Location'* when talking about exact defined points or areas. For example, a local government boundary, or the location of a library. *'Place'* is usually more indefinable. It may be 'the North', or 'Abroad', or

'Home'.

GIS

Geographic coordinate systems

Wikipedia: Geographic coordinate systems

A geographic coordinate system is a coordinate system that enables every location on the Earth to be specified by a set of numbers or letters, or symbols...A common choice of coordinates is latitude, longitude and elevation.

Coordinate type	X	Y
Longitude and Latitude.	-3.106849	51.015344
Eastings and Northings.	322454	124580

Points, lines, and polygons

Typically when dealing with geo-spatial data, this will be in the form of Points, Lines, and Polygons.

- **Points** - Individual locations made up of a single coordinate set e.g. a Library.
- **Lines** - Linear features made up of coordinates e.g. a Road
- **Polygons** - Bounded areas (shapes) made up of coordinates e.g. a County Council.

Geocoding and reverse-geocoding

Geocoding and reverse geocoding are ways of matching address and location data with geo-coordinates.

- **Geocoding:** Address -> Geo-coordinates. Example: Putting a library on a map from it's address.
- **Reverse geocoding:** Geo-coordinates -> Address. Example: taking coordinates retrieved from GPS to determine current location.

GIS software

The traditional way of working with GIS data is through Desktop applications

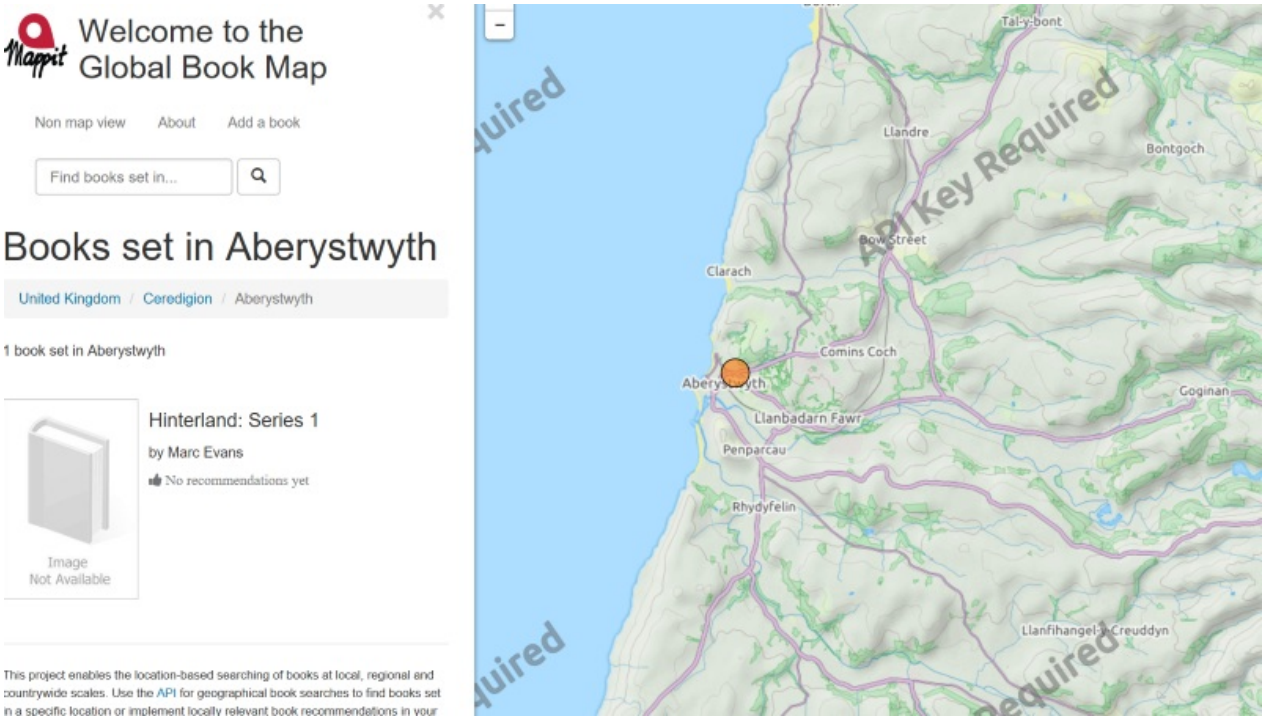
- ESRI ArcDesktop - World leader for GIS software
- MapInfo - Acquired by Pitney Bowes Business Insight
- Quantum GIS - Open Source option. Brilliant.

Download and install: Quantum GIS

Book set in a location

Data that includes geography and libraries is always fun!

A web application called Mappit creates a **'Global Book Map'**.



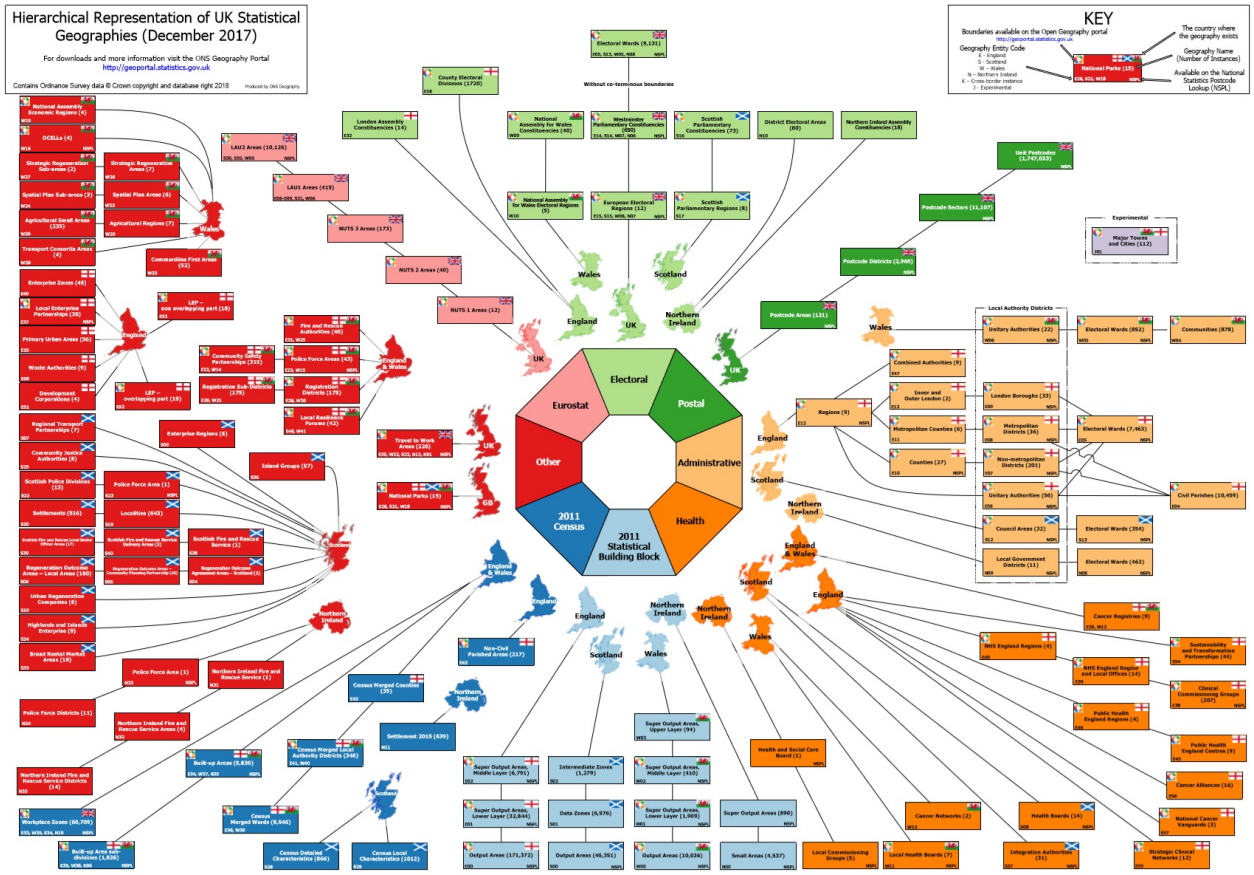
You can see books that are published in your local area. Or maybe places your're visiting.

This uses crowdsourced data from Open Library and LibraryThing.

Also see British National Bibliography data for books published in different locations.

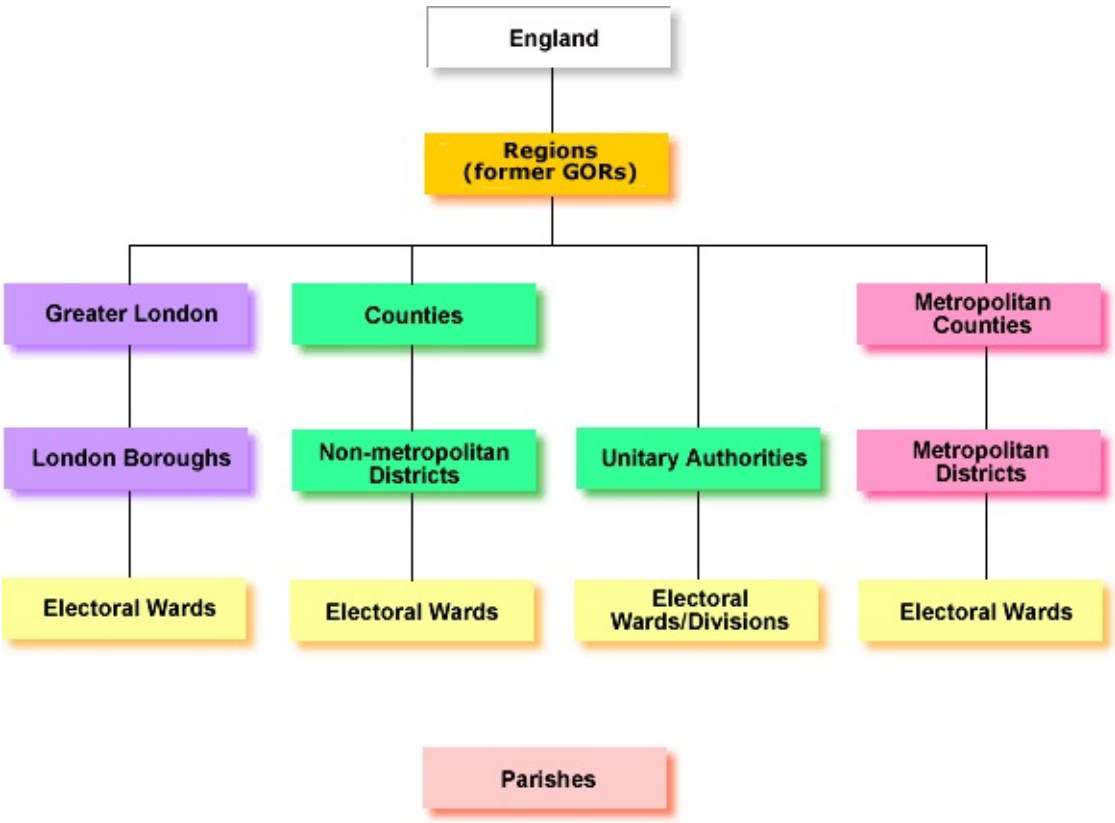
Geographical boundaries in the UK

The UK has many different geographical boundaries and they are complex!



Many of these are available to download at the Office for National Statistics Geoportal

Libraries in the UK are administered by a mix of County Councils, Metropolitan districts, London boroughs, and Unitary authorities.



Area profiling

These are some common geographies used when profiling areas.

Area type	Description
Census	Base unit areas called 'Output Areas' make up the ONS statistical 'Super Output Areas' released at two hierarchichal levels: Lower (contain ~1500 people) and Medium (contain ~7500 people). These are designed to fit within administrative, ward, and parish boundaries and are very useful for local government. Statistical data are released for these areas such as deprivation, age ranges, and ethnicity.
Postcode	Postcode geographies are at Area, District, Sector, and Unit level. For example, the Somerset Postcode Unit **TA1 3XZ** is in the **TA** Area, the **TA1** District, and the **TA1 3** Sector.

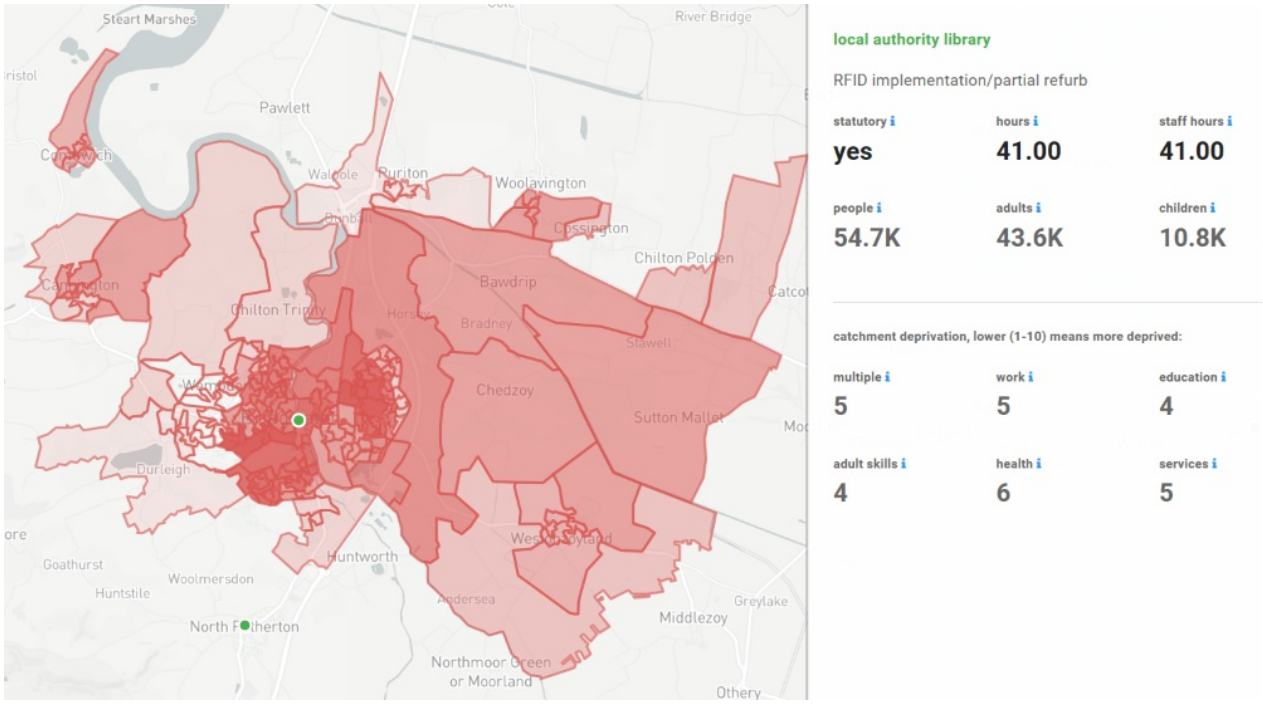
So, what associated data can be gained from using these area definitions? A few are shown below.

Data	Area	Description
Deprivation Indices	LSOA	Deprivation indices are comparative levels of deprivation for Lower Layer Super Output Areas (LSOAs). These are by deprivation type, for example health, education, and income. An index of multiple deprivation (IMD/WIMD) summarises all deprivation types to produce an overall ranking.
Estimated population	LSOA	Annual mid-year population estimates are released by the ONS, broken down by age and gender and released at Lower Super Output Level.
Rural/Urban	Output Area	There are classifications of each area of 'rurality' ranging from 'Major Conurbation' to 'Hamlets and Isolated Dwellings in a Sparse Setting'

Public Libraries in England

Using the Libraries Taskforce Libraries in England dataset, England LibraryData is a dashboard to explore different aspect of the location of libraries. Including:

- Percentage of the population within certain distances
- Estimated catchment areas of the libraries, and the profile of the population within that catchment
- Comparisons between authorities such as number of libraries relative to area, or relative to population



Demo: England LibraryData

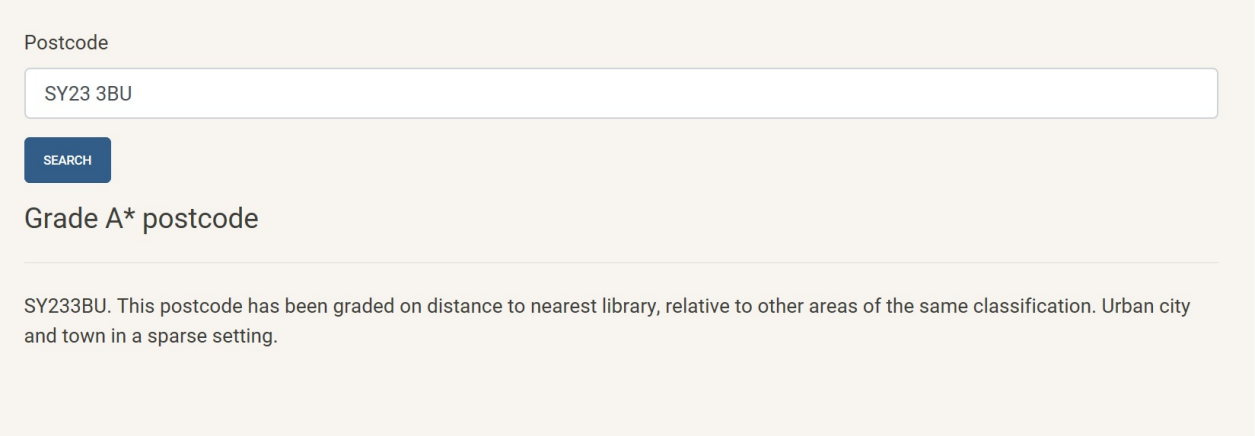
Postcode lottery

One difficulty in assessing locations of libraries is that 'how close' a library is is not comparable between different areas.

- People in very rural areas don't necessarily expect very **close** access to a library (though they should have access to library services).
- People in urban areas may expect a library to be part of the immediate services in their town/city.

Taking data from urban/rural classifications this projects converts a postcode to an Output area, and then assesses the distance to a library compared to areas in the same rural/urban category.

Demo: Wales Library postcode assessment



Routes and travel

GIS data allows for quick analysis of distance.

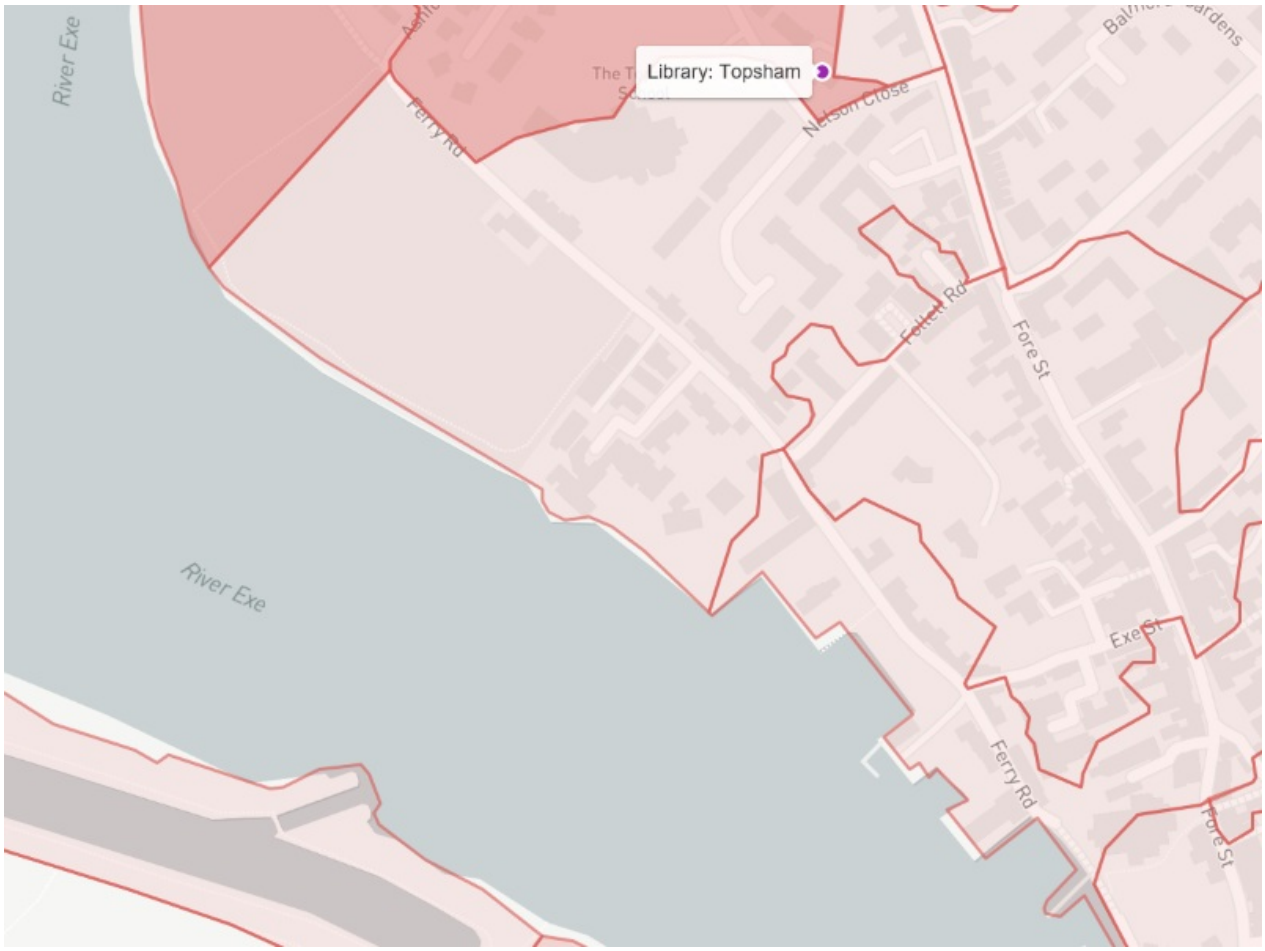
- The library postcode application assesses areas by distance to a library
- The England Library visualisation creates catchment areas based upon assigning each area to a nearest library

These 'straight line' distances are often used in analysis of locations of libraries, particularly during times of consultations.

An easy option is to simply plot a radius around each library and ensure the whole authority is with X distance to a library.

There are problems with this though:

- What if there is a big river between you and a library? It may be the nearest, but it may also be a long round trip to get there.
- What about different travel types and accessibility? 3 miles on a motorway is very different to 3 miles across a city. Some routes may not be pedestrian.



Travel time and real travel distance is often more important than just straight line distances.

Open Street Map

Open Street Map is a huge online database of GIS data to create a map of the world. It includes all you would expect on a map such as roads, paths, places, buildings, and green spaces.

Having open road data means we can do more complex route analysis.

- Road speeds give an indication of how fast cars can travel on a road.
- Road inclination will give further data. Cars may not care too much about steep hill, cyclists certainly will!
- Historic traffic data can be used to give further indications of travel times.

Open Street Map data is used in Open Route Service, open source and developed by the University of Heidelberg. Free APIs are also included to calculate routes and route times for different travel types.

With this data we can look at travel times around a library for different travel types: walking, driving, cycling, etc.

Somerset Mobiles

Mobile library daata is fascinating.

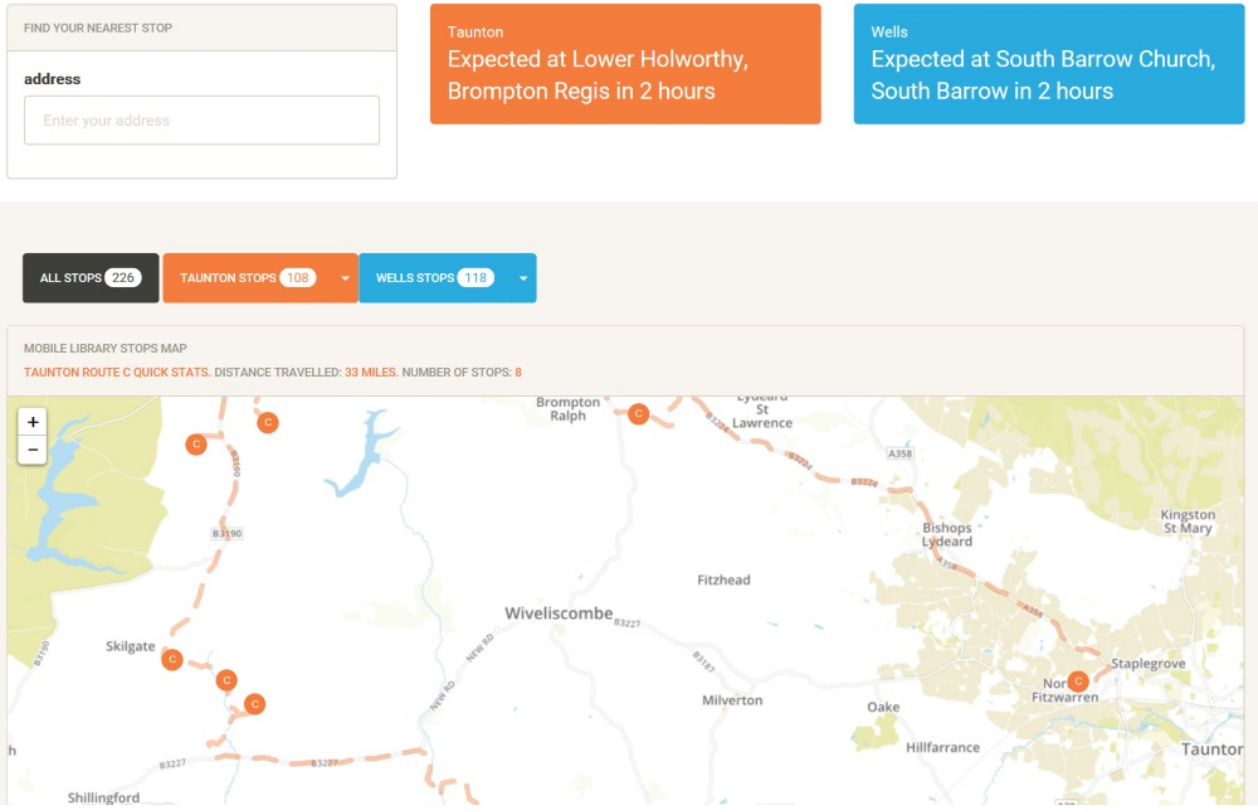
Some locations have no real address data. 'Opposite the Willow Tree'!

Taking open street map route data I wanted to visualise the routes that I would expect mobile libraries to take.

Demo: Somerset Mobiles

It would be interesting to explore this further:

- Track mobile libraries in real time and allow people to 'book' or 'hail' the library en route.
- Use routing data to plot the 'perfect' route that limited travel time.



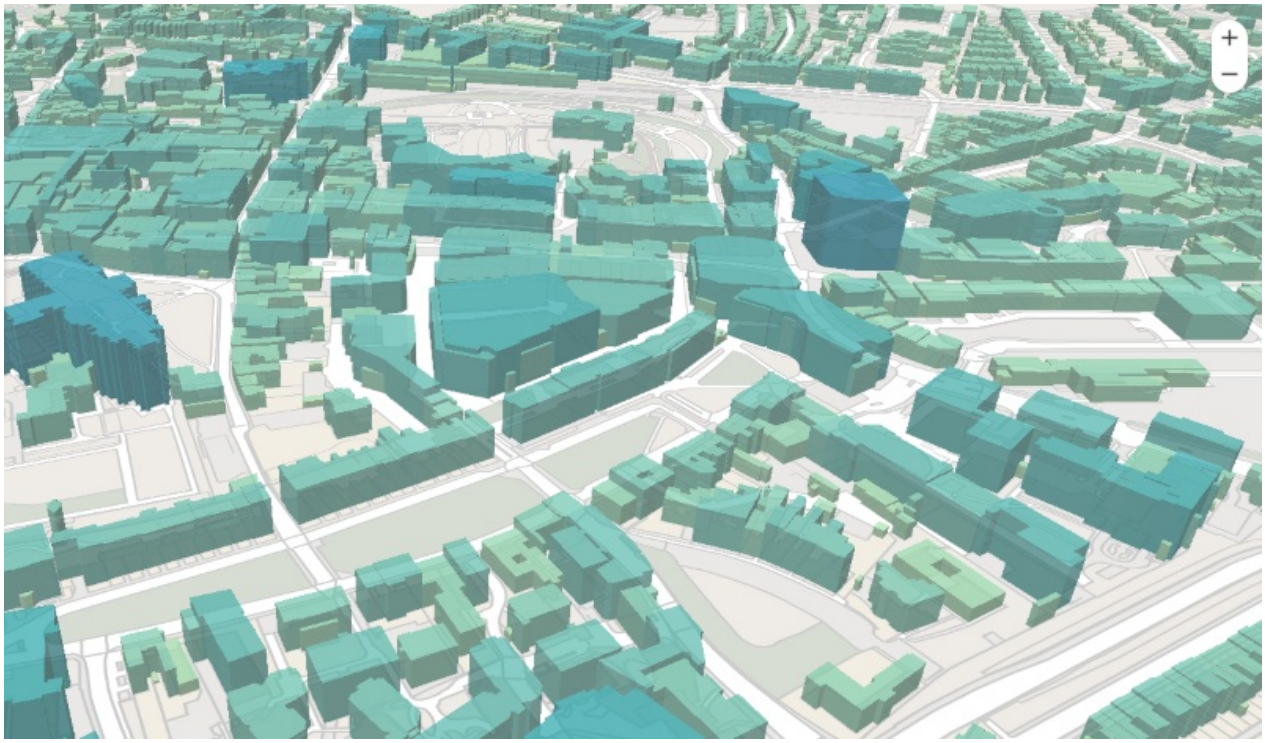
LIDAR

Light Detection and Ranging (LIDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground.

Environment Agency Open data includes *'digital elevation data derived from surveys carried out by the Environment Agency's specialist remote sensing team.'*

3D buildings

We often have GIS polygon data to represent building 'footprints'. Using LIDAR data we can determine an average height for buildings, which aids in creating 3D maps that display building heights.



Plymouth 3D

The company Emu Analytics used LIDAR data to create 3D building data for across the UK.

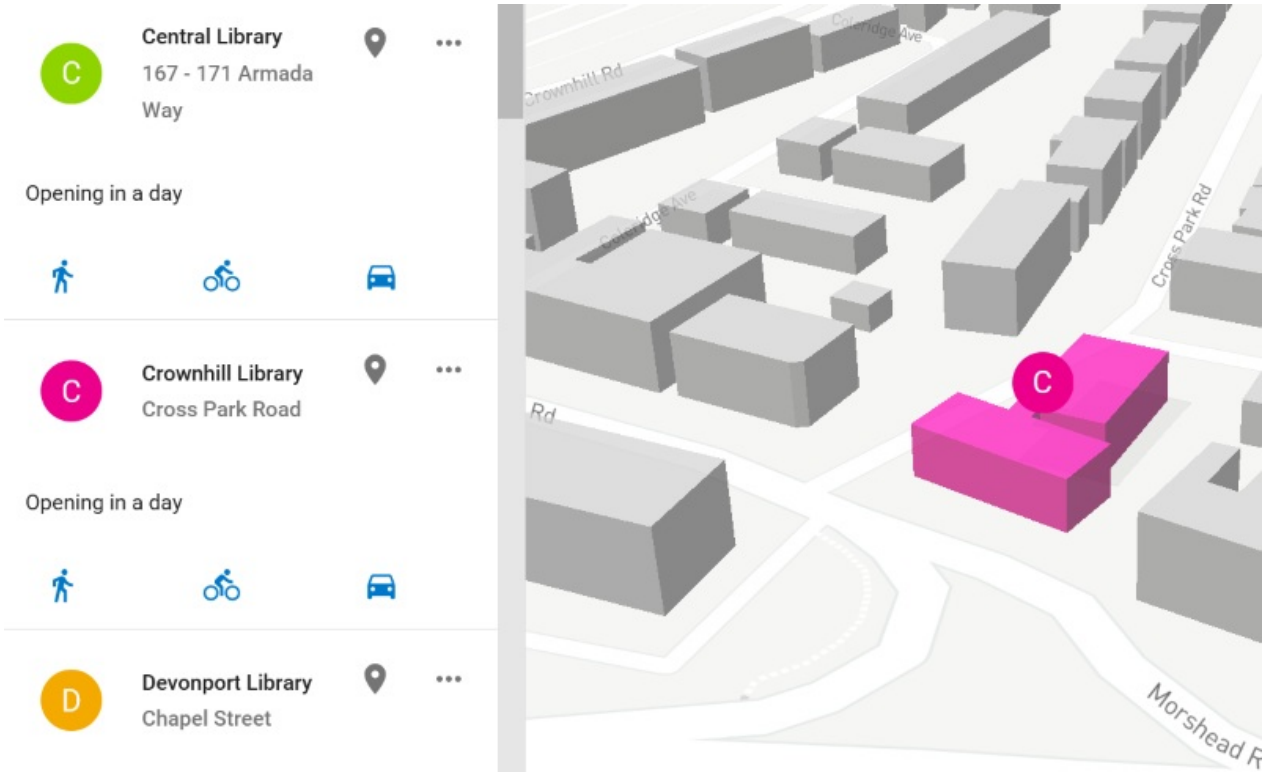
These are not all made available as open data but a select number of cities have been made available.

One of these was Plymouth.

Plymouth release open data on the locations of libraries (and opening hours, and services offered), available at Plymouth Open data.

Library Finder

Taking the 3D building data, the Plymouth Library Finder project is designed to highlight the library building rather than put points on a map. And use the opening hours and services to provide some interactive functionality.

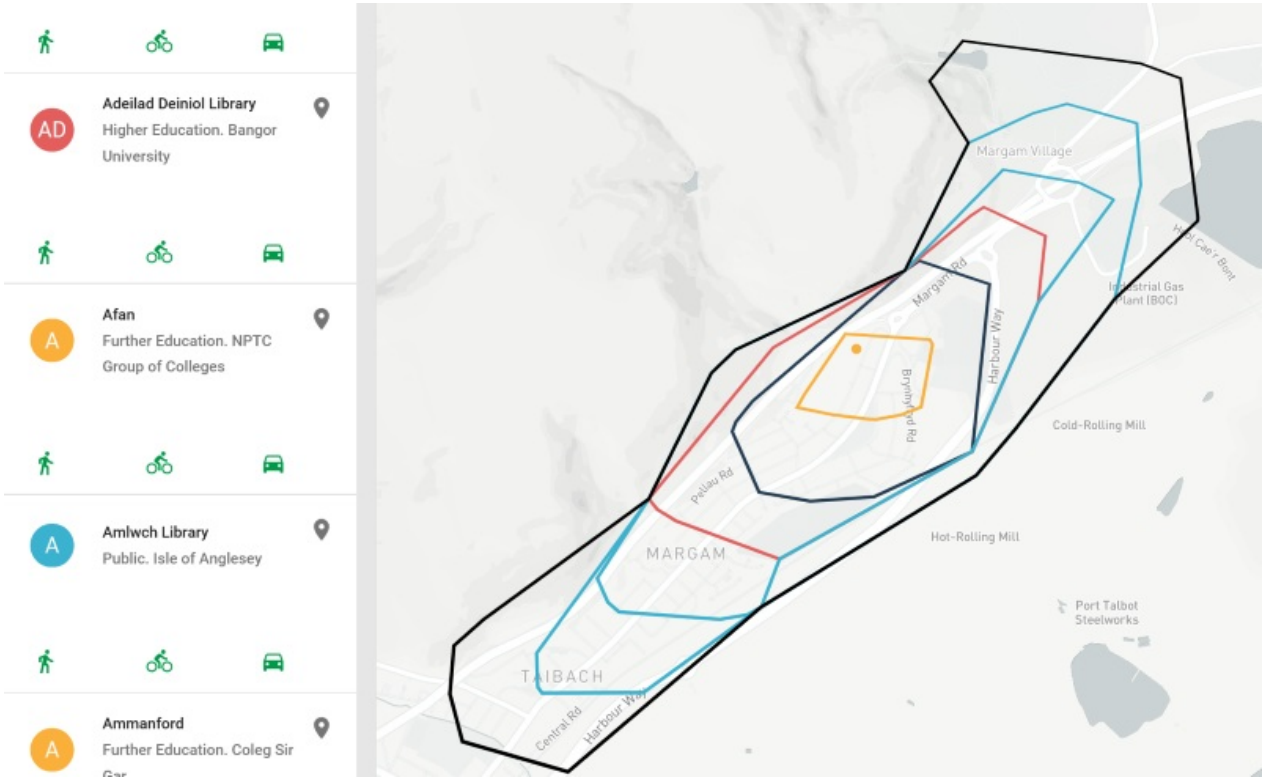


Demo: https://plymouth.librarydata.uk

Wales

CILIP in Wales have been compiling a list of libraries (Further Ed, Higher Ed, Health, Public, Research) and loading these in to WikiData so they can be maintained by anybody.

Library Finder



Taking the Wales Library data, this project is designed to list the libraries on the map and also show driving/walking/cycling times at 5 minute intervals around each library.

Demo: https://wales.librarydata.uk