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DEAL WITH IT

Introduction

The aim of the workshop is to develop your knowledge and confidence in
“Utilising and integrating on line GIS into the curriculum to promote engagement and enjoyment”

GIS has the potential to enhance the learning opportunity so that pupils can progress and achieve and become successful learners. It can stimulate an interest in a complex and dynamically changing world as well as showing how people and their environments interact and are interconnected.

Geographical enquiry is a key way that GIS can be used in the curriculum and will encourage questioning, investigation and critical thinking about issues affecting the world and people’s lives, now and in the future. Fieldwork is an essential element of this. Pupils learn to think spatially and use maps, visual images and new technologies, including geographical information systems (GIS), to obtain, present and analyse information.

The examples covered in this workshop cover a range of scales and content deliberately. It is impossible to cover everything in less than 3 hours. However there are prompts included in the workshop booklet to direct to learn further.

KS3(11-14) relevance

The new Geography National curriculum at Key Stage 3 has a GIS requirement

The national curriculum for geography aims to ensure that all pupils:

- are competent in the geographical skills needed to:
- interpret a range of sources of geographical information, including maps, diagrams, globes, aerial photographs and Geographical Information Systems (GIS)
- use Geographical Information Systems (GIS) to view, analyse and interpret places and data

GCSE(14-16) relevance

All the current accredited and future GCSE geography syllabi make reference to the expected use of GIS, as with the current KS3 curriculum little specific reference is given how to actually use GIS although some of the syllabi do suggest particular use in controlled assessment and fieldwork.

Post 16 Relevance

All the current KS5/post16 geography syllabi make reference to the expected use of GIS, unlike with the GCSE syllabi there is more specific reference to how to actually use GIS although some of the syllabi do suggest particular use in research and fieldwork. All the new A-Levels to start in 2016 will have an expected use of GIS within them from a practical component and how it’s used in the real world including potential to use in the coursework component of the A2.

GIS skills covered in this workshop

Using online GIS sites including cloud based

Creating map: producing a map with data added that serves a purpose from data created by yourself and by others and from data downloaded from other sites.

Creating a free ArcGIS online public account

Using zoom in/zoom out tools

Using pan tool: being able to move the map around in the map viewer

Creating maps of appropriate scale and layout to fit in the screen and when printed out that has key features like scale, overview maps and legend.

Adding and removing layers:

Viewing multiple layers

Viewing real time data: data that is constantly being updated like the earthquake data.

Searching by point, line and polygon: this is whether you search for a feature by point such as by postcode.

Searching by attributes and filtering: this is when you ask the software to find results from the data that show particular characteristics.

Using info tool: this is a tool that allows to locate a feature and additional information about it will appear.

Creating layers of information particularly points & lines including symbol selection (symbolology)

Measuring tools

Creating buffer: a buffer is an area around a feature be it a point- city, polygon – state for example

Analysing patterns and trends: using hotspot analysis, density mapping, interpolation,

Acknowledgments:

I would like to thank the following organisations and people with the development of this workshop:

- Esri T3G institute and instructors
- The Goldsmith's Company who funded my visit to the ESRI T3G Institute in June 2013
- ESRI and ESRI UK
- Singapore Ministry of Education Academy of Singapore Teachers
- Raphael Heath FRGS C.Geog, Royal High School Bath

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Core elements of GIS

This sheet how GIS can be used to solve geographical problems.

Geographic inquiry process

When developing any geographical investigation it is important to take in to account the process involved

Instructional use of GIS

This information sheet is good to show how you can plan and develop using GIS in your teaching. The approach used in this training has incorporated this.

Core Elements of GIS



Create Geographic Data

Skills: Use GIS activities to hone students' understanding of data. Goals include

- Know the types and characteristics of spatial data
- Understand the capacities and limitations of different data types
- Generate, organize, and document spatial data using different technologies

What to do: Import latitude/longitude coordinates from GPS or tables; digitize and save map features; scan existing maps and register them to their location on earth; keep data, maps, and documents organized.

Why it's important: Location-based data is the heart of a geographic information system. Good decisions require good maps and analyses, which require good data. Characteristics of data influence what it can be used for. GIS users should be able to gather, create, understand, and use data for a wide variety of tasks.



Analyze Data

Skills: To gain a proper appreciation for GIS technology, students must experience its capacity to analyze spatial data. Goals include

- Understand analytical methods and use them appropriately
- Get information about features by pointing to them (in a map or table)
- Seek features matching specific attribute or location criteria
- Analyze data using different technologies

What to do: Extract meaning from spatial data through interactive query; plan logical analysis workflows including inputs and outputs; keep a log of analytical workflow used; draw conclusions from analysis results.

Why it's important: Without analysis, GIS is just cartography. Asking questions of the data allows GIS to be a problem-solving toolkit. GIS uses the power of the computer to analyze geographic relationships and patterns using spatial and quantitative methods that would otherwise be impossible to discover or describe.



Represent Data

Skills: Knowing how to represent data comes into play throughout the geographic inquiry process. Goals include

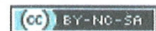
- Understand and use different classification methods, being conscious of the chance to emphasize or camouflage differences
- Understand and use different symbolization strategies
- Consider established cartographic principles and the ethics of communication
- Represent data using different technologies

What to do: Classify and symbolize spatial data; understand and create map legends; create maps, charts, and other elements to communicate geographic information for a particular audience or purpose.

Why it's important: Representing data in particular ways can highlight or obscure key elements. Doing it well enhances communication; doing it poorly confuses or disguises the story.



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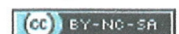
Geographic Inquiry Process



Step	What to do
1. Ask a geographic question	Ask a question about spatial relationships in the world around you
2. Acquire geographic resources	Identify data and information that you need to answer your question
3. Explore geographic data	Turn the data into maps, tables, and graphs, and look for patterns and relationships
4. Analyze geographic information	Determine what the patterns and relationships mean with respect to your question
5. Act on geographic knowledge	Use the results of your work to educate, make a decision, or solve a problem



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Instructional Use of GIS



Level

Features

1 Presentation or demonstration

- The teacher conducts a carefully planned presentation with GIS to highlight facts or concepts or to demonstrate a process
- The teacher can employ an interactive style of questioning and prompting to guide student discovery and coordinate content
- The group goes through the experience together

2 Scripted activity

- Teacher and students follow a set of precise instructions to explore a modest set of information about a topic or a place, learn facts or concepts, experience a process or see that GIS can help answer a question
- The data, procedures, and questions are provided, and the movement tends to be linear toward a predetermined result
- The script may support analytical thinking, but questions not central to the activity's mission are avoided in order to focus the instruction

3 Expanded script

- Having explored sets of data with GIS, teacher and students go outside the bounds of the instructions and questions from one or more scripted activities, following their own ideas with the provided resources
- The teacher may provide the question to explore, or teacher may provide general context with a realistic but broad strategy to provoke greater analytical thinking by students
- The mission is to open up the doorway for students to customize their explorations, strategies, analyses, and interpretations

4 Directed project

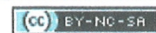
- Students create their own project according to a set of parameters the teacher provides; they experience a "beginning-to-end" process without wasting time searching for an appropriate task
- The teacher typically structures the general focus, design, duration, and degree of difficulty of the project, such as working with data from a broad but finite catalog of pre-selected contents, deciding the range of time students have to identify a specific topic and question, focus on some relevant data elements, and prepare an "end product" such as a poster or report

5 Custom project

- Students use geospatial technology while conducting a GIS project entirely of their own design
- Teachers guide students to tackle independently the processes of conceiving a question; seeking, sifting, and generating data; examining data in search of patterns and relationships to refine the question or improve the data accessed; integrating and analyzing the resources; and acting on the information gleaned



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Introduction to GIS PPT

Presenter info

- Geography Teacher [redacted]
Birmingham, UK (moving to King Edward VI Camp Hill School for Girls in Sept 2015)
- Fellow of Royal Geographical Society and Chartered Geographer(C.Geog)
- Member of ICT Special Interests Group of Geographical Association
- Geographical Association Consultant
- Been teaching with GIS for over 10years
- Recipient of Royal Geographical Society's Ordnance Survey Award for excellence in secondary geography teaching 2011

GIS: a formal definition

- "A system for capturing, storing, checking, integrating, manipulating, analysing and displaying data which are spatially referenced to the Earth. This is normally considered to involve a spatially referenced computer database and appropriate applications software"
- Chorley Report, 1987

Examples of GIS

- http://video.esri.com/watch/3623/what-is-gis_question
- <http://video.esri.com/watch/4285/the-power-of-maps>
- <http://geospatialrevolution.psu.edu/episode1>

What is Data?

Location Data

- **How Many? – What Kind? – Where?**

Scale of Data

- **Local to Global**

Data Presentation

- **Words, Charts, Graphs, Tables, or Maps**

Estimates are that 80% of all data has a *spatial* component

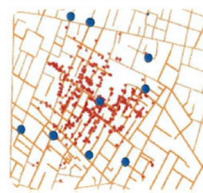
- **Data from most sciences can be analyzed spatially**

How can GIS aid teaching and learning

- GIS is a **powerful and versatile tool** for decision makers
- Enables **core geographical issues** to be investigated
- Provides opportunity to **explore spatial relationships**
- Improve students' graphical and statistical analysis skills**
- Supports development of a **wide range of skills**
- Ideal resource for **coursework**
- Increase **motivation and retention**
- Improve their **enquiry** skills
- Develop their **mapping** skills
- Appreciate how people, places and environments change over a period of time.
- Experience alternative images of people, places and environments change
- Improve the appearance of work

GIS concepts are not new!

London cholera epidemic 1854



Soho

- ✚ Cholera death
- Water pump

In the London Cholera epidemic of 1854 Dr. John Snow was able to locate the source of the outbreak by plotting the locations of fatal cases.

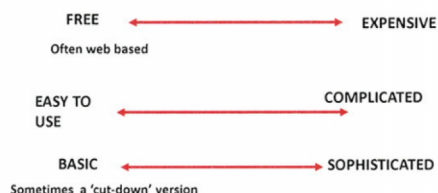
GIS is not just for Geography!

- Writing about personal experiences at different locations, scales or further a field in **English** e.g. What is it like looking down from space and what would you see as you travelled from one place to another?
- Comparing places in the past and present in **History**.
- Shape, Space, Measure, Trigonometry in **Mathematics**.
- Creating running/cycling routes in **Physical Education**.
- Observing the Earth from Space in **Science**.
- Analysing voting trends in **Politics**.
- Carrying out surveys of local areas in **Citizenship**
- Surveying of plant species in **Biology**
- Creating Art using mapping software

"The application of GIS is limited only by the imagination of those who use it."

Jack Dangermond, President of ESRI

Continuum



New ESRI ArcGIS Online

- Excellent potential to be very teacher and student friendly GIS.
- <http://www.arcgis.com/features/features.html>
- Excellent videos to show you its potential.
- Short article in GA's Autumn 2012 magazine
 - ArcGIS Online provides all the tools needed to create, access, manage and share maps, apps and geographic content with anyone inside or outside the organisation.
 - Discover content, collect and report data through the free ArcGIS app for smartphones and tablets, or simply use the browser.
 - Publish your data as web map, feature or tiled map services in the secure Esri cloud while maintaining all ownership and rights.
 - Add sharing and collaboration tools with the ArcGIS Portal API to your web and mobile applications.

• Skills based development	• Curriculum based development
• Here you develop first the ideas of skills for example: • Switching on/off layers • Basic tools like zoom in/out, pan • Using tools like swipe & transparency • Adding points, lines & polygons • Viewing multiple layers • Searching by attributes • Selecting an area to search within • Adding your own data to geographically referenced locations(points, lines & polygons)	• Here you would focus on curriculum opportunities as dependant upon your programmes of studies for example based upon our 7 SoW: • Map skills • My place • Connections • Microclimate • Global Cities • Why did so many people die in the Haiti EQ?

- Get to grips with the basic language
- Start small
- Keep it simple
- Keep practising
- Time
- Don't be afraid to ask for help
- Think beyond geography
- Make it real

What do you know about GIS?

How is GIS used in the wider world?

How do I think I could use GIS in the classroom?

What do I think GIS is?

ESRI ArcGIS Online

<http://www.esriuk.com/software/arcgis/arcgisonline>

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ArcGIS online training guide

<http://resources.arcgis.com/en/help/getting-started/articles/026n0000000v000000.htm>

<http://www.esri.com/library/brochures/pdfs/quick-start-arcgis-online-organizations.pdf>

<http://www.esri.com/library/brochures/pdfs/quick-start-arcgis-online.pdf>

<http://resources.arcgis.com/en/tutorials/>

Follow the following twitter feeds and blogs for further helpful hints on

AGOL: EsriMAPS Bernszukalski EsriCanada FitzpatrickC GISEd Esrieduc

GIS4Schools Josephkerski RHSB_Geography garrysimmons

<https://www.arcgis.com/home/> <http://edcommunity.esri.com/>

<http://blogs.esri.com/esri/gisedcom/>

<http://www.esriuk.com/products/arcgis-online-education>

<http://www.esriuk.com/products/arcgis-schools>

<http://communityhub.esriuk.com/schools-blog>

Schools using AGOL and tweeting: WellyTeamGeo Wellington College

Raphael Heath from Royal High School Bath has produced some excellent video clips on how to create ArcGIS Developer is an organisation account too!

<http://www.youtube.com/channel/UCfDHdvBLEbnGqKtqh7zW2Cw>

Garry Simmons from Wilmington Grammar School for Girls

<http://www.garrysimmons.org.uk/2015/05/using-story-maps-in-geography-lessons.html>



Creating an ArcGIS Public Account

You will need to create an ArcGIS Public Account to allow you to save the work you carry out in this workshop and in the following weeks as you develop using the web based software.

You can now sign up for a FREE school organisation account, see weblink: <http://schools.esriuk.com/>

NB: You can only use a web address once for any ESRI account so you may need to create a web email account to allow you to try it before you say create a full subscription account with your school, academic institution email.

Once created you can edit your profile by adding information such as contact info etc.

In your own area you can save your maps more easily

When you save your map you need to give it a name and also some important information including:

Tags , title, summary. Tags are keywords that are used to search maps created. For these workshops please include the TAG UCPGCEGEOG



Once saved you can share this map this is done by clicking the share tab next to the save tab. Here a box will open. In this box you have the choice to make you map able to be seen by everyone on the web, whether you want to link it to or embed the map into a web page. You can also make a web application that allows you to do some further stuff with the map.



Once ticked you can know embed or create a web application. If you copy the link address in the box you can link it in to a document or web page.



If you click the embed link a new box opens that allows you to choose the size and what appears on the map such as scale bar or zoom control. What you need to do is copy and the paste the HTML in to your website. An example of this can be seen in the following webpage where a map showing severe weather on May 19th May 2013 in USA was created from data downloaded from NOAA Storm prediction Center <http://www.spc.noaa.gov/> was created and embedded into the following website :

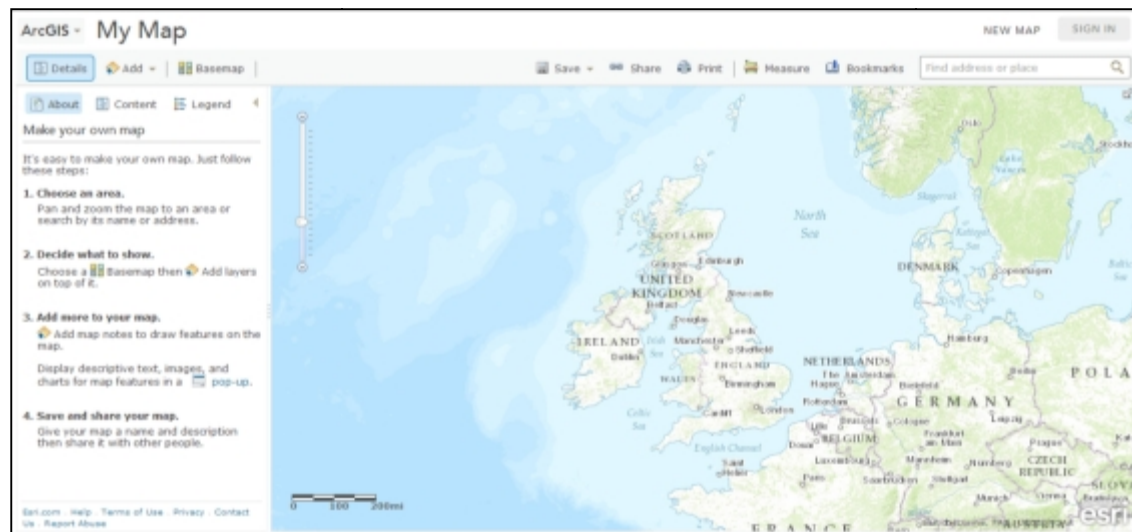


What do you know about the DATA you are using?

What other questions do I need to ask?	
What doesn't this source tell me?	
What can I infer? What guesses can I make?	
What does this source definitely tell me?	
DATA SOURCE	

Start using ArcGIS Online

Go to website <http://www.arcgis.com/home/> and click on the **map** tab.



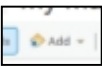
To go to a location type in your location into the search box in the top right of the screen and press return. The map will zoom to the location.

If you want to change the basemap click on the **basemap** tab and a variety of basemaps available will appear. Click on the one you want. Ordnance survey layers are included



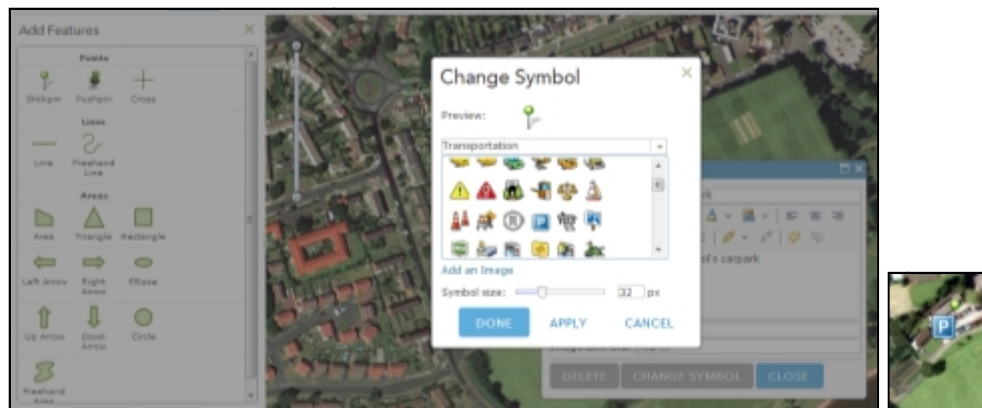
The first type of the data that we are going to add to the map is some simple point, line and polygons. We'll then move on to adding data that already has been created by someone else in different formats and then data that you have collected. With these data sets we will show how to change how the data is shown on the map. This will include a range of real time data and a range of topics that are being taught in the curriculum.

Click on **Add** tab found at the top left, then add **mapnotes** then give it a name then click

create 

A new box will appear allowing you a range of features that you can choose from to be added. To add a feature click on the chosen features

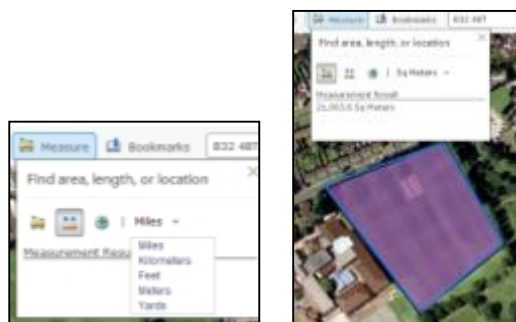
Drag it onto the map then click. A dialogue box will appear here you can add further information such as an image, a web link and a description. You can also change the symbol by clicking the change symbol tab. This will give you a range of basic or more specific symbols such as the transportation, car park icon. It is important to click apply then done as you do these.



To add a line or polygon repeat the same process. Again the style of the symbol can be changed.



Before we look at adding information to the map there is a measuring tool that can be used that appear at the top of the map. This example shows the size of the school's back field. The measurement can be shown in a range of measures. The measurement tool could be used to measure the length of a journey, the distance from a given point or the size of a given area such as a new planned development.

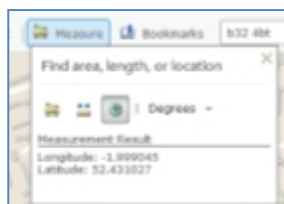


This simple type of map could be used to produce a simple land use map or sphere of influence map.

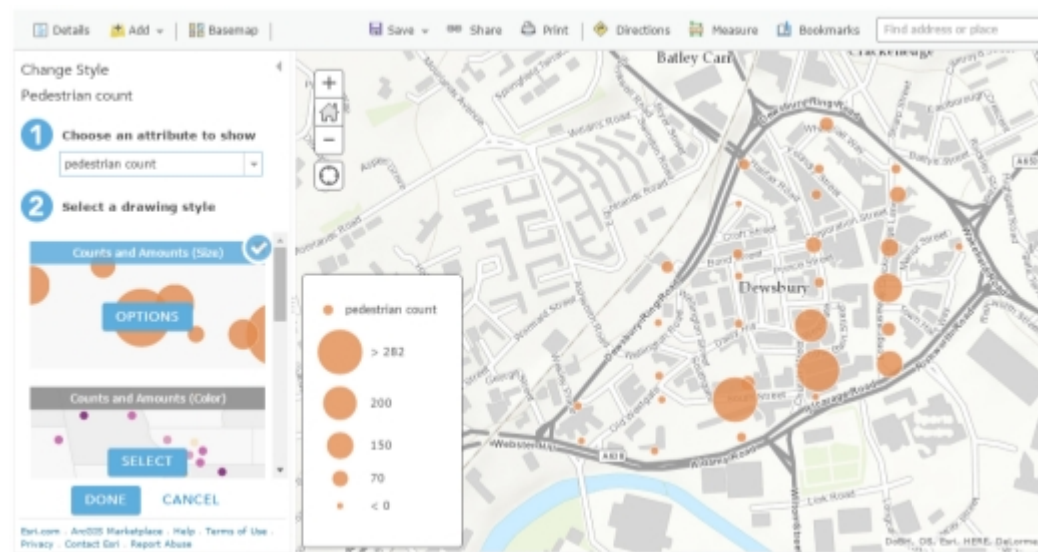
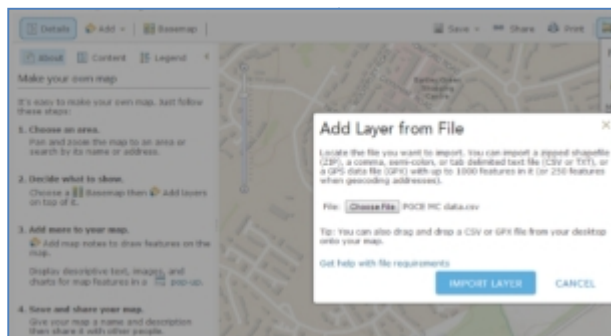
Creating a map using your own data

We are now going to add information created by yourself such as fieldwork data. To this you first need to create an excel spreadsheet where the data you have collected needs to be inputted. This data will need an latitude and longitude X,Y co-ordinate

This example uses a school microclimate but could be used with any field work situation where data is collected. The lat, long can be found out by using **the measure tool** covered earlier to locate a point. Click on a location and the latitude and longitude will appear. Copy the co-ordinates into the spreadsheet.

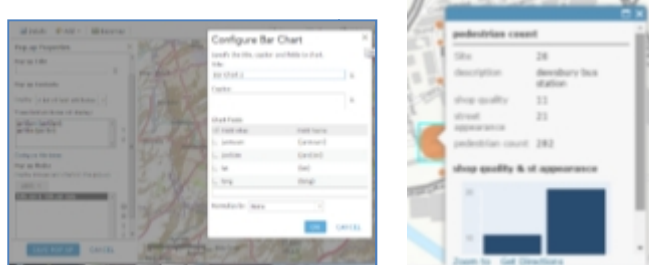


To add data in a spreadsheet go to the **add** data tab on the top tool bar click **add layer from file**. Then choose the file you want, in this example it's the pedestrian count file then click import layer and the data will load into the map.

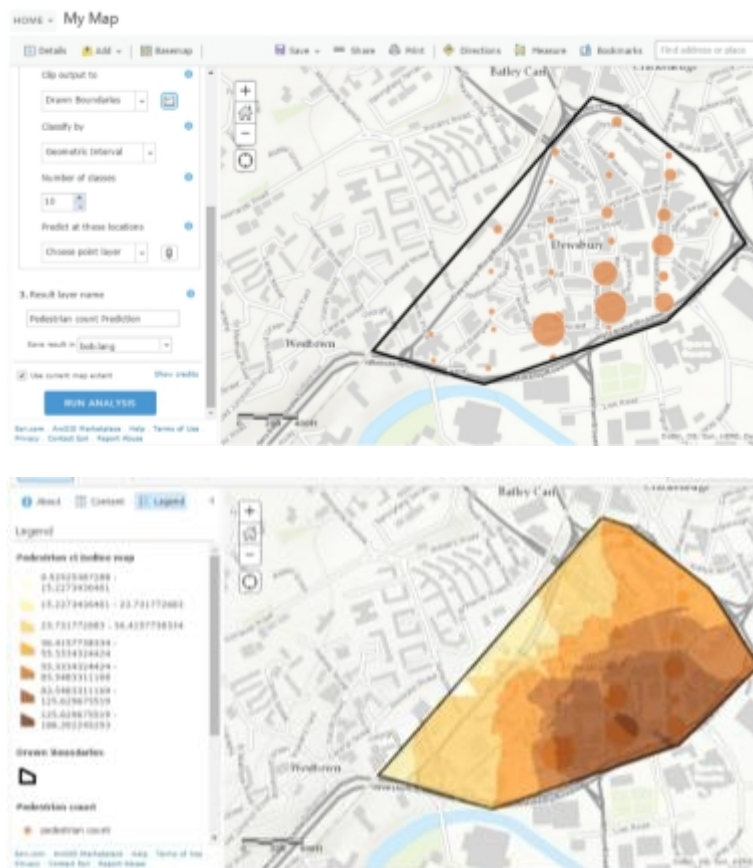


Using smart mapping you are then prompted to choose an attribute and how to display it.

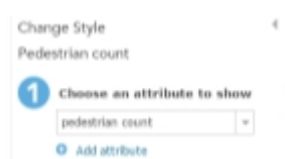
You can also configure the pop up attached to the data points. This is done by clicking the **layer** and the **configure** tab.



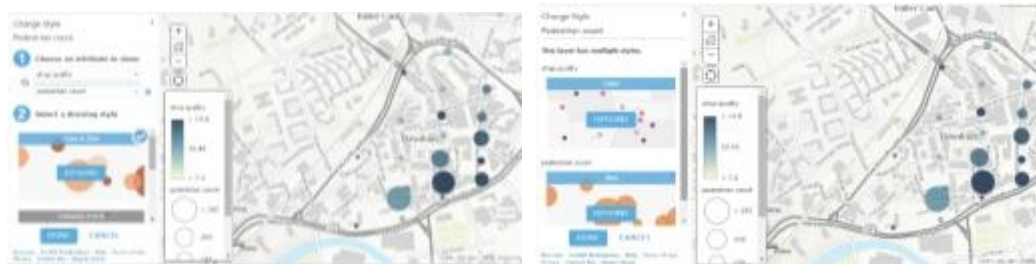
Point type data can be used to create an isoline type map, this is mentioned later in the workshop.



With the constant updates you can now plot two attributes at the same time such as pedestrian count and shop quality



Underneath the initial choose an attribute to show there is an **add attribute** button. **Click** this. Choose an attribute to show. In this example we've chosen **shop quality**



You can then decide which attribute is shown in which way. In this example size shows pedestrian count and colour shows shop quality.

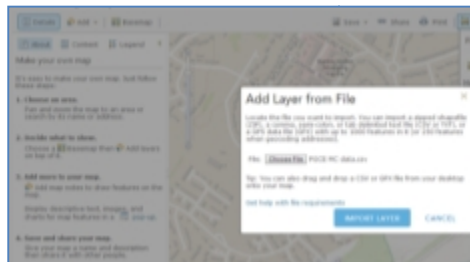
Click **ok** then **done**



Example 2 Microclimate

We are now going to add the microclimate information created by yourself. To this you first need to create an excel spreadsheet where the data you have collected needs to be inputted. This data will need an latitude and longitude X,Y co-ordinate. This then needs to be saved as an CSV file format.

To add data in a spreadsheet go to the **add** data tab on the top tool bar click **add layer from file**. Then choose the file you want then **click import layer** and the data will load into the map.

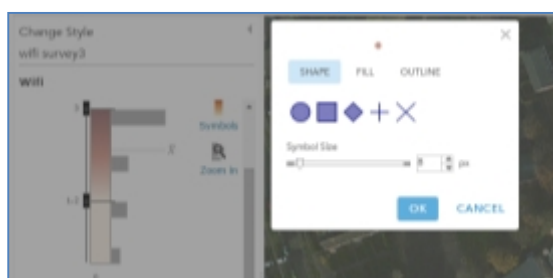


Alternatively you can open the file and drag and drop on to the map and the data will map. When first loaded the data will automatically appear like this below with a **change style** dialogue box allowing you a variety of ways of showing the information.

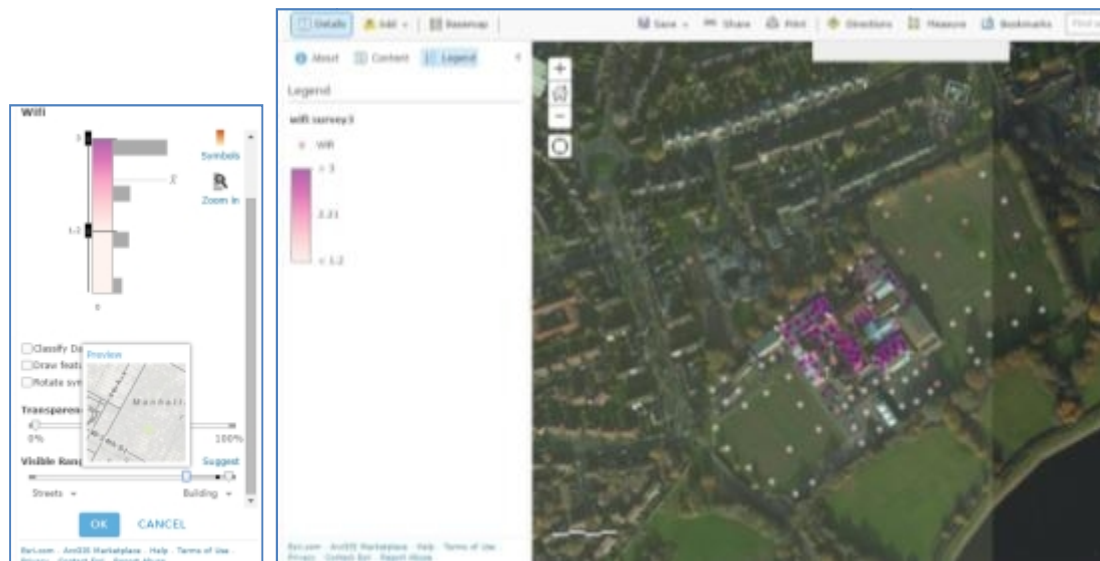
If you have added data via the collector app the data should already be loaded in to the map.



First choose **1. Which attribute you want to show**. Here choose a **weather variable such as temp**. Then choose **2. a drawing style**. For this task you have a choice. You could choose **counts and amounts** or **types(unique symbols)**. For this task you can choose either but counts and amounts is more suitable as you are dealing with changing values. Then **click options** to change the colour and style as well as when you can see it.



Click **fill** to change colour range, think here about the background your data is viewed on. Then click **ok**.



Then go to the bottom of this box to the **visible range slider** and move the left hand tab to the left so that when you zoom out your data will still be visible. Then click **ok**.

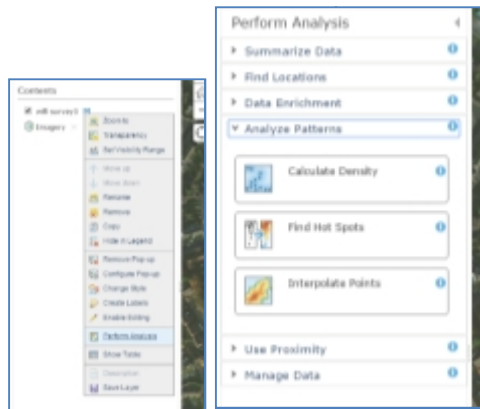
Then click **done** and your data will be saved and visible how you want it to be.

With data that has a **directional feature** to it like **wind direction** with the data plotting this can be shown. This is done by plotting first **wind speed** then **rotating the symbol** with respect to direction. Choose **wind speed** then change the symbol to an **arrow** by clicking on the **symbol icon**. Then

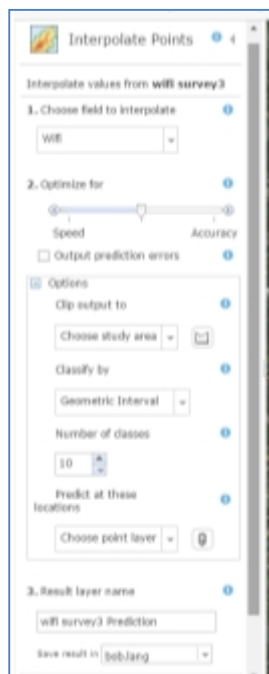


Then scroll down to the **rotate symbol** prompt and here **tick the box** and choose what attribute is the rotation based upon here **choose wind direction**. Choose clockwise. For this to happen the data must have data in degrees in terms of direction.

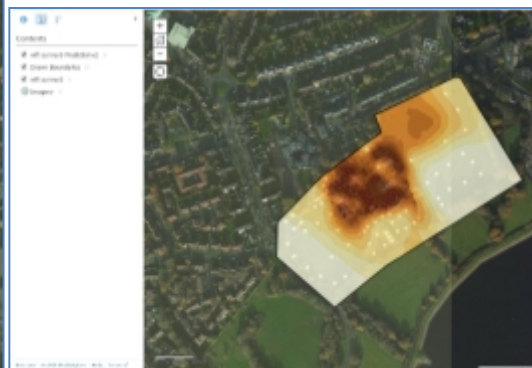
Next you are going to carry out some spatial analysis of the data you have collected. This is done by left clicking the little arrow on the layer of the left-hand side and clicking **perform analysis**.



Next click **analyze patterns** and 3 choices will appear. You are going to use the **interpolate points** tools. The interpolation tool produces an isoline map of the data a bit like a contour map that looks at all the data points and works out the values in between points to produce a map of all the area not just the point data.



First **1.** choose the field to interpolate. Here choose **temp for example.**
Then **2.** Click the **options box** to create a study area. This is done by clicking on the little icon and then clicking on the map the area you want to map, ie the school grounds. A black border will appear. Then give **your result layer a name** then click **run analysis.**
It will take a few moments for the data to be analysed and the layer produced.



Overlaying multiple layers may provide you with the opportunity to see relationships between weather features such as Windspeed vs temperature.

At this point you can also add data from GPS type devices such as if you use a run tracking device/app such as found on many smartphones. Here is an example that uses a GPX file type.



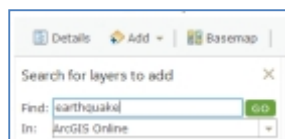
Creating a map with data created by someone else

The next example we will look at is loading information that has been created by someone else. With any data like this it is important to be aware who has collected, information literacy is very important, who has collected the data, when has it be collected is there information provided in the details.

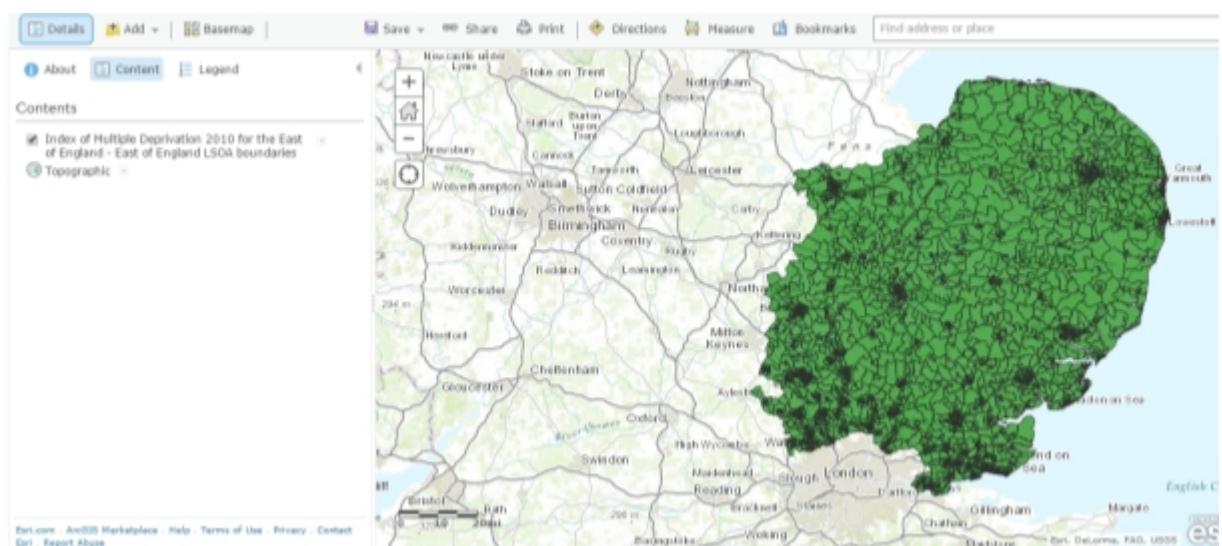
We will open up a new map and add data. The examples will look at a range of different types and sources including both physical and human examples.

Open a **new map** then click **add** tab. This time we will look at a uk census example focussing on population, a common topic studied.

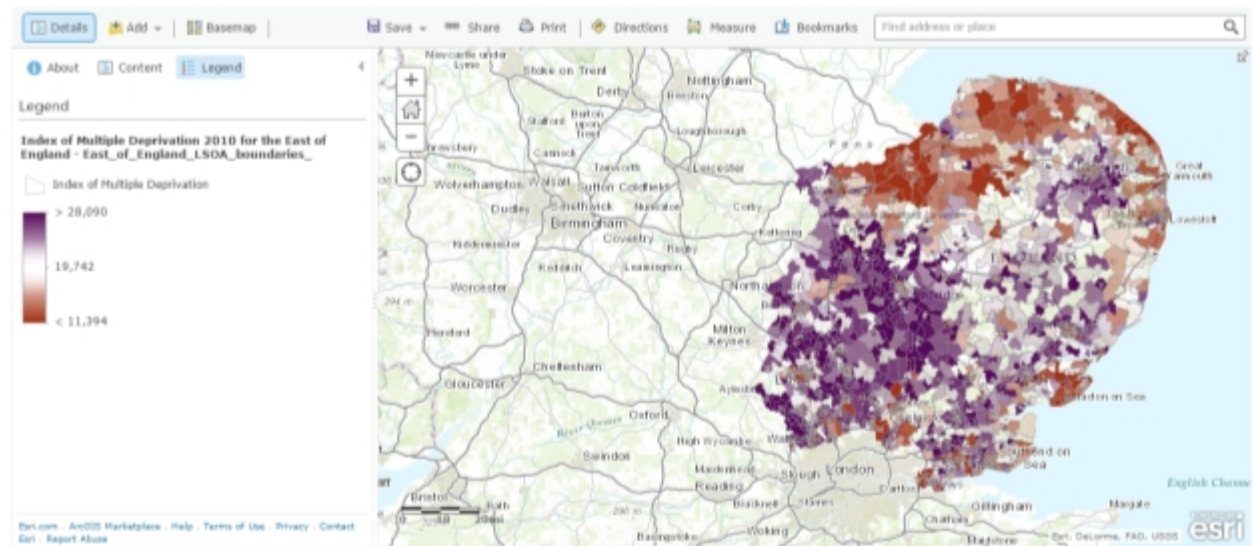
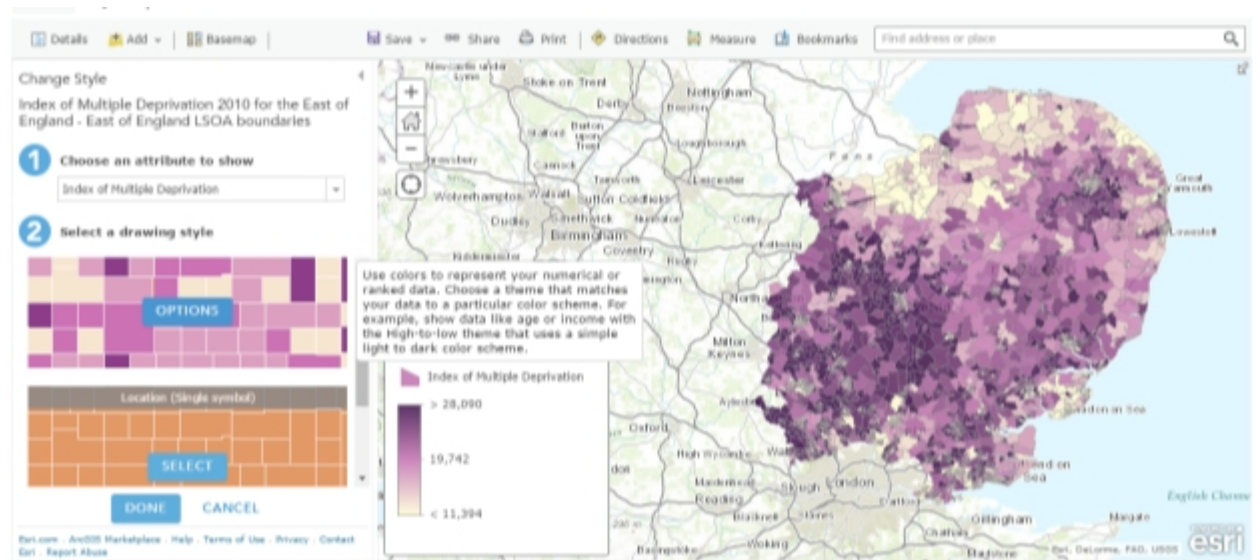
To allow the search of data to be global ensure the map is zoomed out to full world. This is a search control currently in the online software. **Click search for layers**. In the Find box enter the topic you want to search for then click **go**.



You will get a large number of results, click on a result by clicking **add** then click at the bottom **done adding layers**. When it is added you can set the symbology to show different types of information. With this example we have chosen to look at IMD data from 2010(Search IMD 2010).

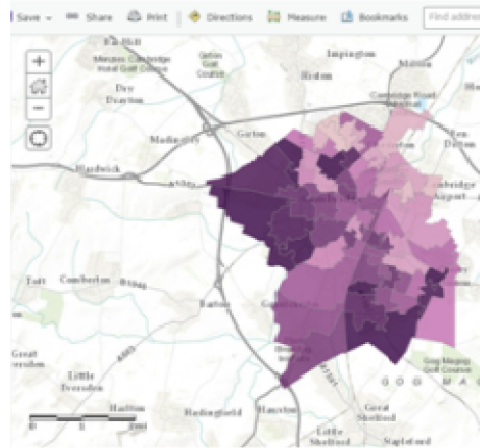


Next you will set the symbology of the layer. This is carried out by left clicking the layer in the content and then clicking the change symbol. With smart mapping the software will give you options on how you can display the data. Here choose first the attribute you want to display. In the exmample we will look at IMD. Then choose a drawing stlye. If you click the options further stlying can be carried out such as how the data is shown such as high to low or extremes. Then click apply then done changing and your map will be created.

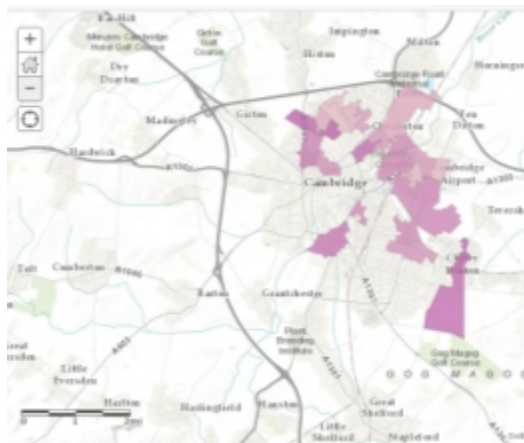


With some data sets you can also filter the data down to show certain information. This can be done via a table or via the filter tool directly. BY clicking the **show table tab** a table will open at the bottom of the map. The filter too is useful when dealing with a large data set that you want to analyse to show only certain data.

In this example, first we will filter the data set by area then by the value of imd. This is carried out by creating a filter. This will ask you to create an expression to display features in the area that match your requirements. So here I've asked it to display the features who LA name is Cambridge.



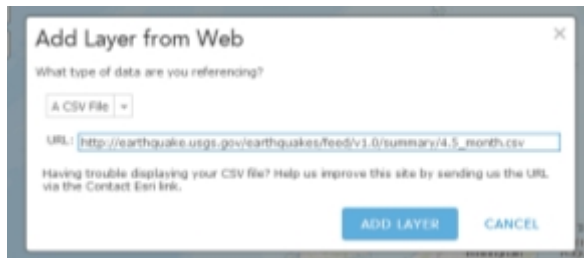
I then will add an additional expression based on imd value where it will show areas with an IMD value of less than 16000(the worst 50% of areas in England).



Within the table go to the table options tab found on the right hand side of the table.

You can also create a filter within the table option.

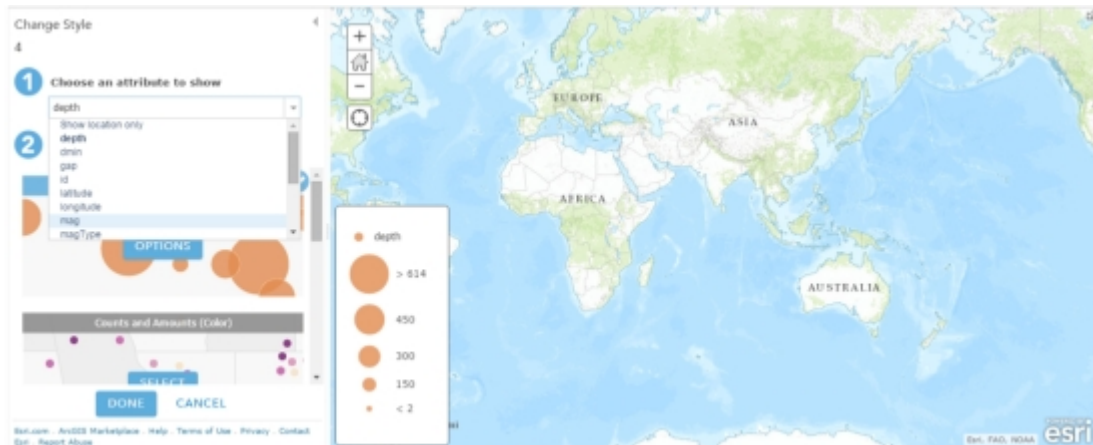
The next example will look at adding a data from the web. You click on the **add** tab but this time click on the **add layer from web**. You can access data from a wide range of sources.



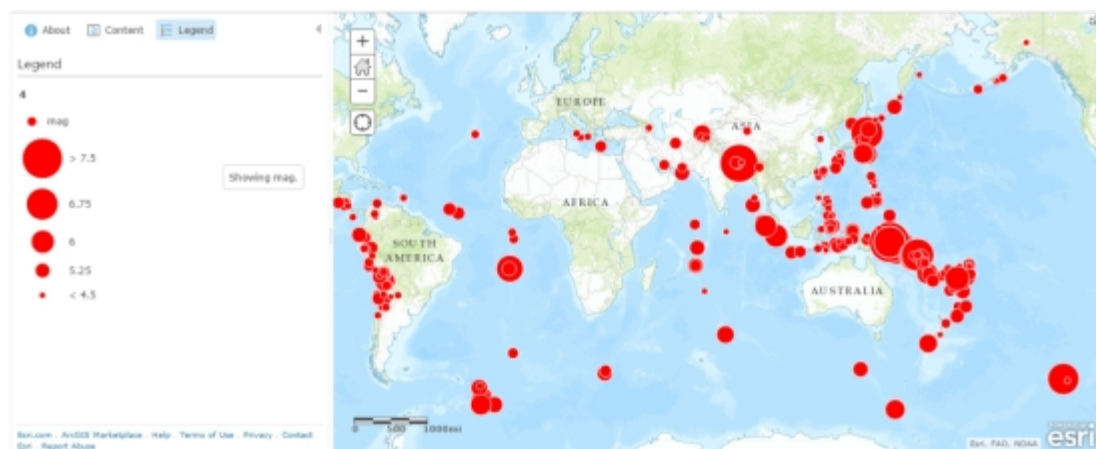
For this example we will look at a csv data file looking at earthquakes. Open a new web page and go to the following USGS website <http://earthquake.usgs.gov/> then click on realtime feed tab

http://earthquake.usgs.gov/earthquakes/feed/v1.0/summary/4.5_month.csv

go to the spreadsheet tab feeds and choose a selection **then copy the address** then paste it into the add box then click **add layer**.



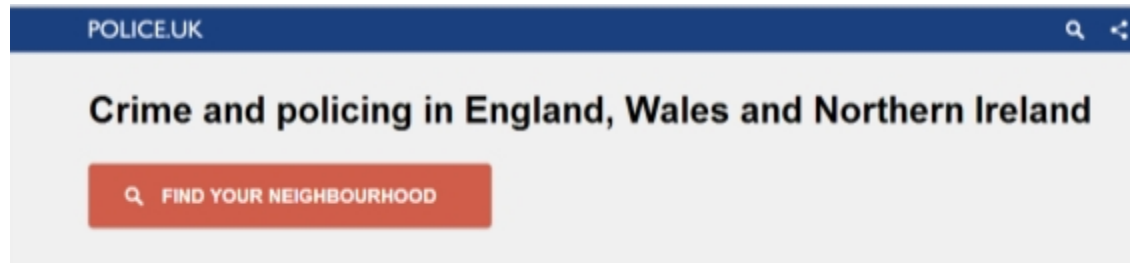
When the data is loaded the smart mapping asks you how you want to display the data. First choose which attribute you want to display then how you want to display it.



By the same process you can add a RSS feed by carrying out the same process.

The next example will look at adding data as csv file taken from another website. This example will use crime as the topic using the UK's Police website www.police.uk.

This task will focus on how to access local crime information for the UK using the new www.police.uk website.



Here you can search by postcode(a point), an area(polygon) and by street(line). The example below is a postcode search for CB2 8PH

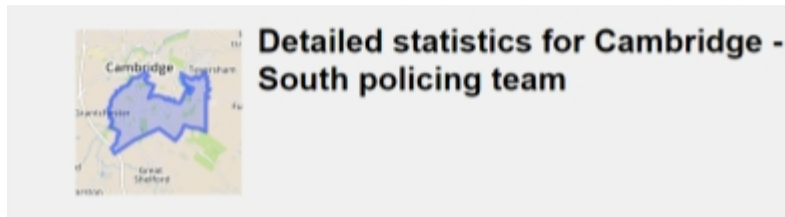


Clicking on the map opens a new window with much greater

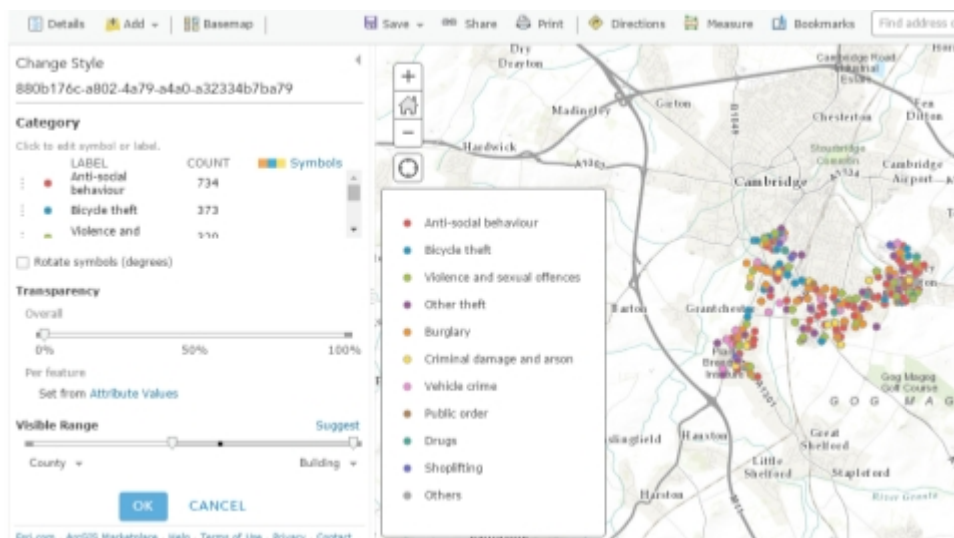


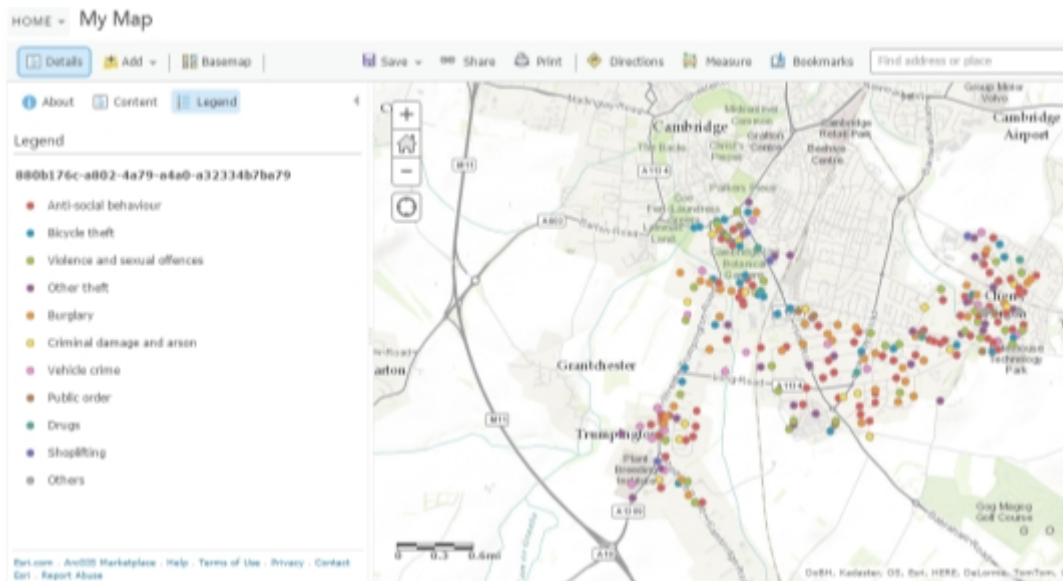
By clicking on a crime type you can see where particular crimes happen.

Click on **view detailed stats** tab. This will open a page that will allow you to download data as a CSV file. Click **save data as a csv file** and a file will be created and downloadable. **Copy this address** and post it into the add layer box and the data will load.
South Cambridge February 2015

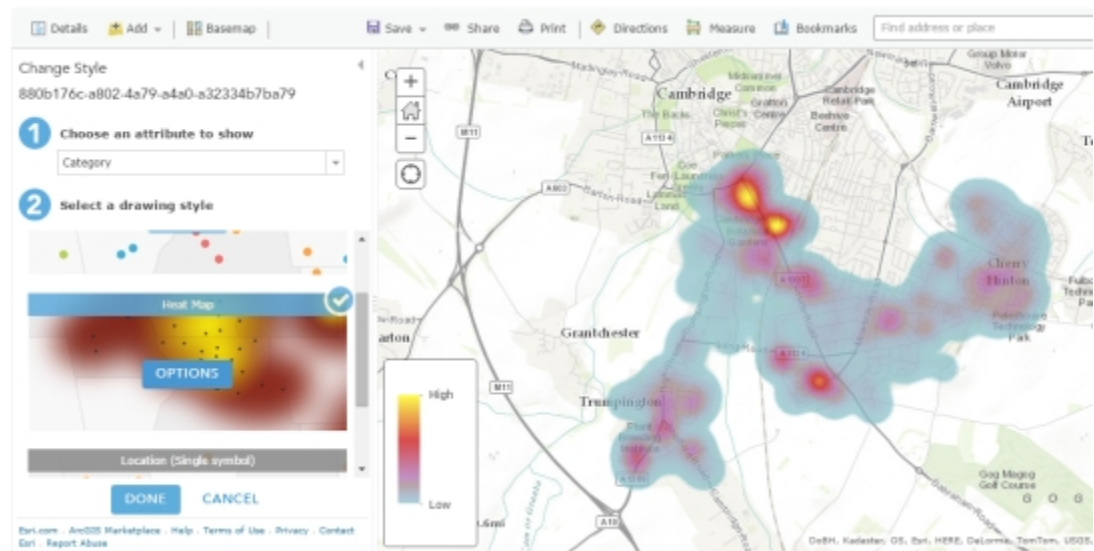


With this data set you can change the data

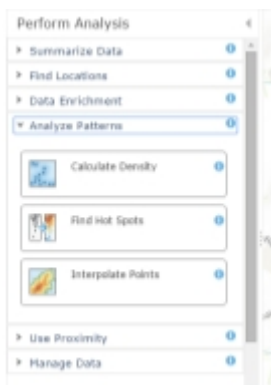




With smart mapping you also have the opportunity of a heat map

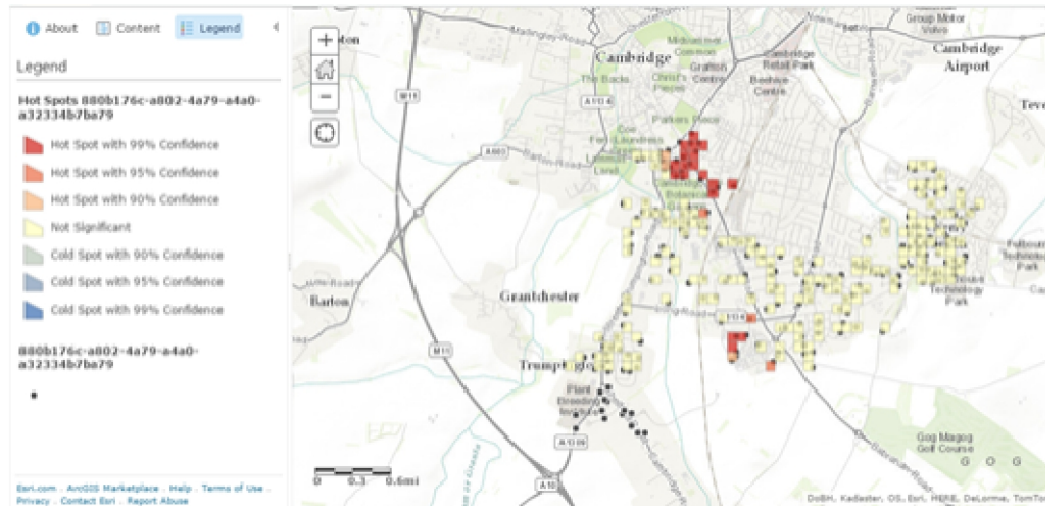


You can also carry out some spatial analysis including density mapping and finding hotspots



Hot spot analysis

In AGOL subscription you can carry out a wide range of spatial analysis including looking for crime hot spots for example by using the **perform analysis** then selecting **analyse patterns** then **find hotspot**:



Surface Density map:

In AGOL subscription you can create a surface density map by using the **perform analysis** then selecting **analyse patterns** then **calculate density**.



With this map as with any map you can add additional data sets such as different time periods or census data.

Lesson ideas

- One example of a lesson idea is to first get pupils to plot their perception of crime/safety using a site such as AGOL then to check their perception with reality using the Police crime site.
- Using crime site to look for patterns and then to decide where to put resources, where and how to improve the local environment.
- Use in local area studies
-

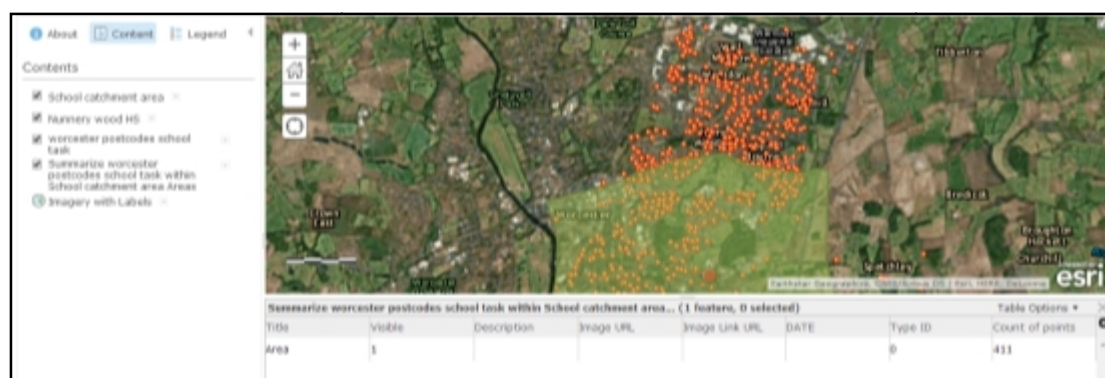
Spatial tools not already discussed in this workshop

There are many tools not discussed or shown in this workshop due to time constraints and the workshop being an introduction to ArcGIS Online rather than an advanced workshop. These can all be found when you left click a layer and go **to perform analysis**.

New Tools include watershed, viewshed tool used with for example wind turbine and river investigations

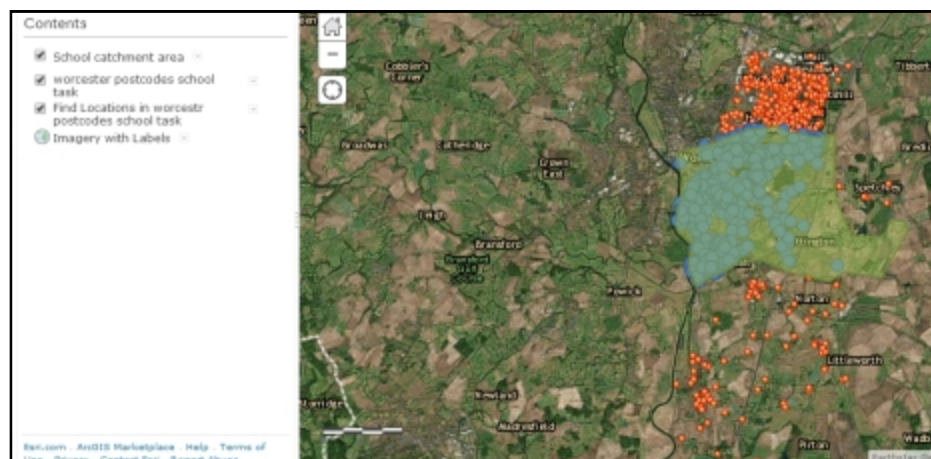
Summarise data tools

This example looks at how many points lie within a given defined area



Find locations tools:

This example shows all the points within a given area



Use proximity tools:

Buffer e.g. draw an area around a given place of a given distance, drivetimes show how far you can travel in a given time at a given time and nearest location such as showing the nearest 50 points to a given point such as with school catchment investigations.

Examples:

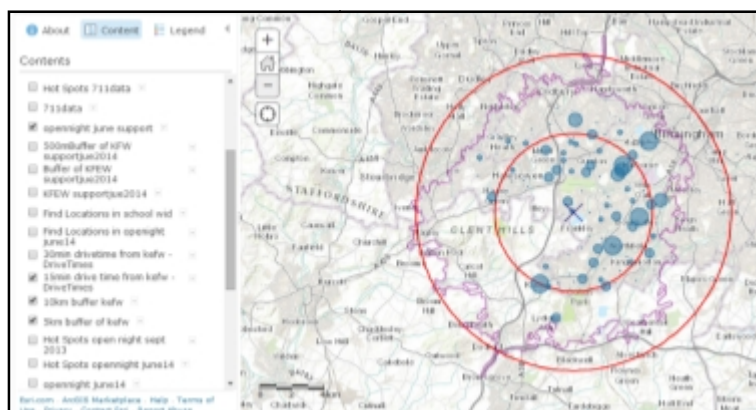
Proximity 500m buffer around given points



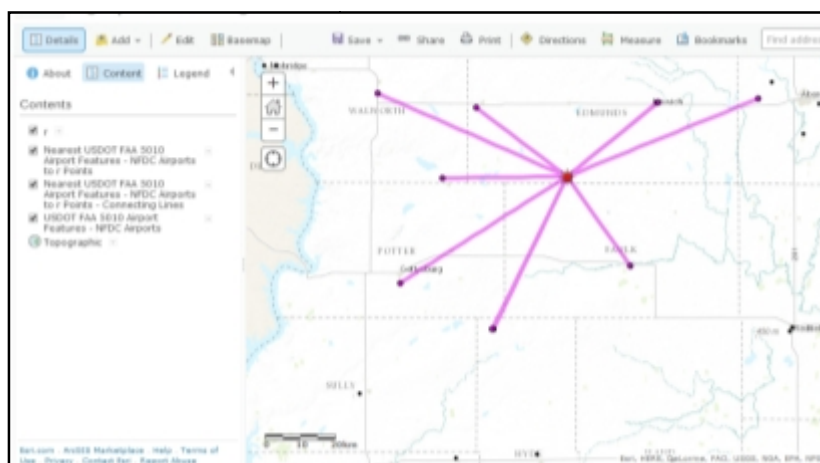
Proximity: 1km Buffer around given points dissolved



Proximity: 5 km & 10 km buffer and 15 min drivetime around a given point



Use Proximity find nearest: Closest 10 airports within 100km of given point



Tutorial and resource links by Raphael Heath, Head of Geography, Royal High School Bath

Please note that ArcGIS Online has updates very few months. This usually brings new tools and functionality as well as some workflow changes to the platform. This means that there may be some changes from when these videos were made to how things work and there will be the odd step where you might have to work out the change.

Overview course into most key GIS skills

Raphael have recently produced a series of resources for the Royal Geographical Society on using ArcGIS online for a study into the geography of crime. Even if you don't want to conduct a study into this topic the videos take you through all the key skills required to use ArcGIS online. Here is an interactive storymap with all the resources <http://arcg.is/1TZiyvj>

Below are the video tutorials which it includes:

- 1 – sources of useful data on crime patterns - <https://youtu.be/0DcyudEnPh0>
- 2 – Adding data to ArcGIS online - <https://www.youtube.com/watch?v=RiZqMKCmpSM>
- 3 – visualising data in ArcGIS online - <https://www.youtube.com/watch?v=MG9iNGRXOg8&feature=youtu.be>
- 4 – Hot spot and density map analysis - <https://youtu.be/hnVRK8ol2Zk>
- 5 – Adding secondary data from ArcGIS online into a map - <https://youtu.be/p940qzbyzTc>
- 6 – Using the data enrichment tools - <https://youtu.be/-bixghf6RB8>
- 7 – Setting up spreadsheets for primary data you want to add to ArcGIS online <https://www.youtube.com/watch?v=qE3VLgsjzus&feature=youtu.be>
- 8 – Analysing spatial links using the summarise tools - <https://youtu.be/GhyT1mv2T9Q>
- 9 – Merging and exporting data back to a spreadsheet - <https://youtu.be/f61TqBOPwvl>
- 10 – Using the Esri Collector App for offline data collection in the field <https://www.youtube.com/watch?v=pUgUkBBtol0>

Additional tutorial videos

In addition to the videos relating to the geography of crime study here are some other tutorials Raphael has made to cover other aspects of ArcGIS online including storymaps and other web apps:

Raphael's Esri insights video <https://www.youtube.com/watch?v=OPj6xME24vE>

Raphael's video explaining setting up data entry for primary data in ArcGIS online and to set up a geoform web app. <https://www.youtube.com/watch?v=zhFALQb7G38>

Raphael's video explaining building a storymap <http://youtu.be/lp8zOIGJoul>

Raphael's video explaining using the web app builder in ArcGIS Online
<http://youtu.be/6FIP1KHXYVY>

Raphael's video explaining creating the web map viewer app <http://youtu.be/IMVBHL12yQ4>

Raphael's video explaining creating the elevation web app in ArcGIS Online
<http://youtu.be/Ckt9bXacvzs>

Raphael's isoline map video https://www.youtube.com/watch?v=ir_gFdkyLmw

Raphael's video on creating and adding shapefiles
<https://www.youtube.com/watch?v=umLMN4nJhkc>

Raphael's video on flow line maps <https://www.youtube.com/watch?v=Hym5hzVUo9g>

Storymap course into GIS and using ArcGIS online

Here is Raphael's interactive storymap giving an introduction to GIS and ArcGIS Online. This is an interactive resource designed to give students an insight into what GIS is all about and some initial skills which they can use to develop some GIS capabilities:

<http://rhsb.maps.arcgis.com/apps/MapJournal/?appid=38cb13997c074c32a1fe0e7d44baa7ec>

Esri tutorial links

The following links are very useful for up to date tutorial and lesson ideas for using ArcGIS online

<http://learn.arcgis.com/en/arcgis-book/> - online GIS book and

<http://downloads.esri.com/LearnArcGIS/pdf/The-ArcGIS-Book.pdf>

<http://www.arcgis.com/home/item.html?id=841beabbbaa644fcc937d4a71cb29fb5a> Getting started with ArcGIS online guide

<http://learn.arcgis.com/en/gallery/> GIS learning site with activities

http://www.esri.com/connected/explore-materials?utm_source=mdr-WAT&utm_medium=1200x627&utm_term=Facebook&utm_campaign=ConnectED2015
detailed lesson resources using GIS

<http://edcommunity.esri.com/Resources/Collections/thinking-spatially---ago> Clearly set out and resourced lessons by Esri

Useful ESRI based map sites

Urban observatory <http://www.urbanobservatory.org/>

Esri Atlas <http://atlas.esri.com/?p=home>

- Voter atlas <http://atlas.esri.com/Atlas/VoterAtlas.html>
- Energy atlas http://atlas.esri.com/Atlas/Energy_Atlas.html
- Demographic and statistics
http://atlas.esri.com/Atlas/DS_Atlas.html?t=1&m=1&x=-97.43&y=38.72&l=5
- Save the children
<http://atlante.savethechildren.it/atlante.html#.UhSN85JBWn9>
- Global development
http://atlas.esri.com/Atlas/NGO_Atlas.html?t=1&m=1&x=0&y=20.26&l=2
- Housing
http://atlas.esri.com/Atlas/Housing_Atlas.html?t=1&m=1&x=-97.43&y=38.72&l=5
- Health in America
http://atlas.esri.com/Atlas/Health_Atlas.html?t=1&m=1&x=-97.43&y=38.72&l=5

ESRI Storymaps

Storymaps let you combine authoritative maps with narrative text, images, and multimedia content. They make it easy to harness the power of maps and geography to tell your story. They are great for supporting teaching and learning.

<http://storymaps.arcgis.com/en/>

Recent example of the 2014 Ebola outbreak in West Africa

<http://techsupportuk.maps.arcgis.com/apps/MapJournal/?appid=9711556a42804188bf8a5d895b581360>

New syllabi support storymaps

1. Alevel boundaries

<http://arcg.is/29n37QN>

2. Glaciers retreat task

<http://arcg.is/29omOrt>

3. global cities

<http://arcg.is/29omvx1>

4. Coastal landforms investigation

<http://arcg.is/29koylQ>

5. tropical storm investigation

<http://arcg.is/28Uq4tb>

6. Superstorm sandy management

<http://arcg.is/1Q1fZsD>

7. Holderness coastal erosion

<http://arcg.is/28IgBTm>

8. globalisation investigation

<http://arcg.is/1Un9fGm>

Storymaps that are excellent for teaching:

Oceans

<http://esrioceans.maps.arcgis.com/apps/Cascade/index.html?appid=70f95ebd47754b1a905459a14387e198>

ports

<http://storymaps.esri.com/stories/2013/ports/>

eu referendum

<http://arcg.is/2eOizG9>

<http://arcg.is/295vz6W>

Brazils' people

<https://www.arcgis.com/apps/MapJournal/index.html?appid=7a1db2437a674d6fa0bd63106587efa0>

biomes

<http://arcg.is/2eOeQIM>

Tropical Rainforest deforestation

<http://arcg.is/2eOdUUp>

USA energy

<http://arcg.is/2eObGEQ>

Population

<http://arcg.is/2eGezUP>

biodiversity

<http://arcg.is/2eGjtkS>

Mining minerals

<http://arcg.is/2eOhVbE>

Coastal processes

<http://arcg.is/28R3eUY>

World War 1

<http://arcg.is/2eOlSx9>

<http://s1.support.eaglelegis.co.nz/Javascript/Gallipoli/>

<http://carto.maps.arcgis.com/apps/MapJournal/index.html?appid=d36f6f26b831456d9401e33875d6def2&webmap=d4972ca401df462fa666f04771efb061>

troubled borders

<http://arcg.is/1YDFB0N>

thematic mapping

<http://arcg.is/29JIECI>

Olympics

http://coolmaps.esri.com/Olympics/2016/?utm_source=Story+Map&utm_medium=Social&utm_term=8.9.16&utm_content=Olympics+Medal+Count&utm_campaign=PR

Tropical storms

<http://arcg.is/2ca1BQo>

Pearl harbour

<http://storymaps.esri.com/stories/2016/pearl-harbor/>

Contours

<http://arcg.is/1Qr1CdY>

pop living atlas

<http://arcg.is/1Tv9RsB>

gender equality

<http://arcg.is/2bYVvyvQ>

<https://theworldslesson.maps.arcgis.com/apps/Cascade/index.html?appid=9c47dee341a14292b1f5470b9140a3ef>

US 2016 presidential campaign travel log

<http://storymaps.esri.com/stories/2016/campaign-travel-log/>

sporting uses

<http://www.esri.com/products/maps-we-love/pitch-perfect>

10 most damaging hurricanes

<http://arcg.is/2dP9n6l>

Hurricane Matthews who is at risk

<https://directrelief.maps.arcgis.com/apps/Cascade/index.html?appid=290b420a59a34a80a12ffc13e56f4389>

<http://nga.maps.arcgis.com/apps/MapSeries/index.html?appid=8a22b48330094b23b2e7937a56e8c42f>

uk info

<http://arcg.is/2dwae8t>

impact map Haiti hurricane matthew

<http://arcg.is/2eOhQVI>

bruised borders

<http://storymaps.esri.com/stories/2016/bruised-borders/index.html>

atlas of us electricity

<http://storymaps.esri.com/stories/2016/electricity/index.html>

us climate change scenarios

<https://epa.maps.arcgis.com/apps/MapSeries/index.html?appid=3805293158d54846a29f750d63c6890e>

Some useful ready made maps and map apps

UK Census storymap

<http://bureau.maps.arcgis.com/apps/MapJournal/?appid=04d147352f634d64baa4ced4c262807a>

Quality of life web app with some UK scale economic data layers

<http://rhsb.maps.arcgis.com/apps/webappviewer/index.html?id=04b91b11c6e047e4af5f07cd8b8b54f1>

Live earthquakes and tectonics map

<http://www.arcgis.com/apps/Viewer/index.html?appid=26588e40bee64bbb90871e418933e156>

Elevation web app

<http://www.arcgis.com/apps/Elevations/index.html?appid=6920379354214d37be9145d7cdbf1c2c>

World volcanoes and eruptions map

<http://www.arcgis.com/apps/webappviewer/index.html?id=77be67c0bc0e4a668c37df6aa67b03a7>

UK Incomes map

<http://rhsb.maps.arcgis.com/apps/webappviewer/index.html?id=3da31a8a867a4aa0aa833642831fad99>

Live hurricanes map

<http://www.arcgis.com/home/webmap/viewer.html?webmap=a87f34dc175c4c1e80f35319e00f8b43>

World climate zones and biomes

<http://www.arcgis.com/home/webmap/viewer.html?webmap=1ccf0cf779ed4fc8b7783d534f0b883a>

Climate change effect on zones

<http://www.arcgis.com/home/webmap/viewer.html?webmap=17216c3f7c844ffdac9b141e79681e2e>

World sustainability Index

<http://www.arcgis.com/home/webmap/viewer.html?layers=8386aa92e4ff4fc6b98bc1b47f932eb1&useExisting=1>

Land cover Europe

<http://www.arcgis.com/home/webmap/viewer.html?webmap=52ab869d72004d2e8dfd c29c12f95ec4>

Environment Agency UK data layers –e.g. floodplains

<http://www.arcgis.com/home/webmap/viewer.html?webmap=0b8fd1f5cbd74a7b8c2e6a53b632ef8d>

The Ashcloud Apocalypse hazard risk mapping resource

This is a GIS Day activity which Raphael set up and promoted. The idea was for students to use maps to calculate their risk from a mega volcanic eruption event. In November 2015 over 9,000 students took part in this event and added data to the online map. The resources are still accessible and classes can complete the activity at any time. <http://gisevent.wix.com/gisday2015>

The Map Off – November 2016 collaborative mapping event for schools

This website explains the GIS event that Raphael have planned for November 2016. This year the theme is about climate change. There will be various web based resources for teaching this theme. The collaborative activity will get students to comment on their views about climate change issues. They will then be able to analyse all the data inputted into the map from respondent around the world. <http://themapoff.wix.com/mapoff>

Data sites

There are many types and sources of data as you have seen from the activities included in this workbook. When looking for data you need to take into account accessibility, who has produced it?, When? For what purpose? Is it complete? Is it in a format that useable?

Below are some good sources of data that you may want to use especially focussing on the UK:

<http://data.gov.uk/> The UK's Government data site. You can download data such as 2010 English indices of deprivation

<https://www.ordnancesurvey.co.uk/opendatadownload/products.html> Ordnance Survey opendata site including:

- Codepoint open(CSV file of every postcode in UK),
- Meridian 2 data(Shapefile format that includes data on roads, hydrology,etc)

Office of National Statistics UK Census: <http://www.ons.gov.uk/ons/datasets-and-tables/index.html>

Many nature and UK agencies such as the National parks authority

- <http://www.naturalengland.org.uk/publications/data/> or for example IUCN <http://www.iucnredlist.org/technical-documents/spatial-data#mammals>

<http://earthquake.usgs.gov/earthquakes/feed/v1.0/csv.php>

USGS Earthquake data base.

www.Gapminder.org there is a wide range of data sets that can be used. All can be downloaded as an excel file. What is important with these data sets that they tell you all the meta data, the information about the data, which is very important. You may have to tidy up and delete some of the countries in the data set before saving then as a csv when downloaded as an excel file

<http://hdr.undp.org/opendata/> UN human development report data. This data can be downloaded as an excel file. Like with the gapminder data a little tidying up will be needed to be done including changing it to a CSV file.

<http://www.theguardian.com/data>

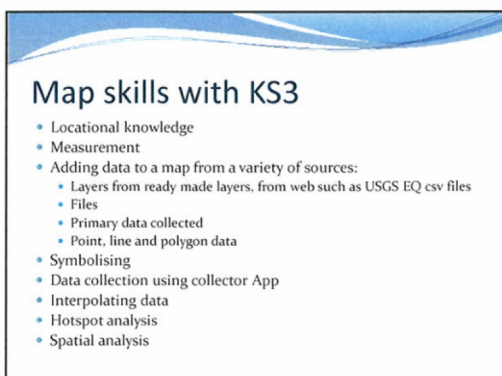
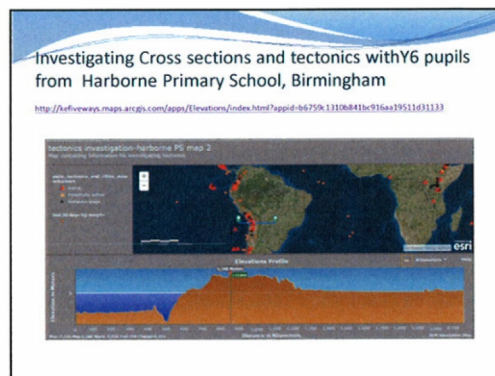
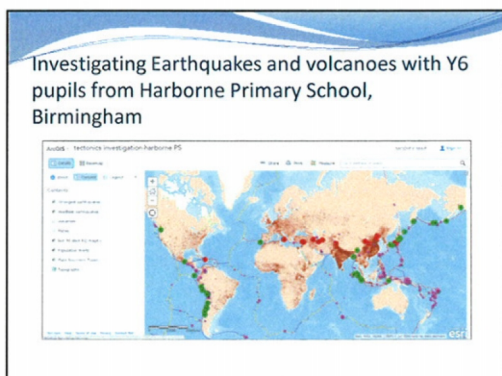
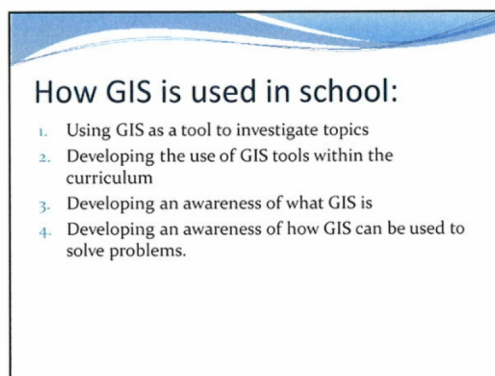
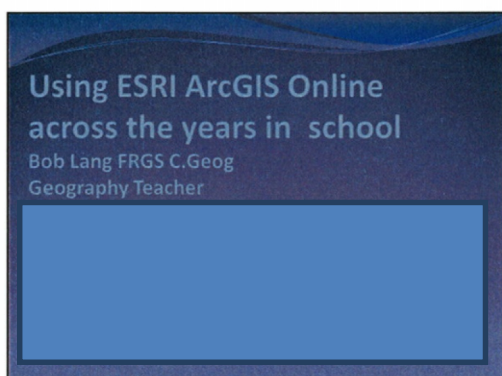
<http://www.theguardian.com/news/datablog/interactive/2013/jan/14/all-our-datasets-index> The Guardian Data store is an excellent source of data on a wide range of topics. Some of the data may need to be changed or tweaked before using.

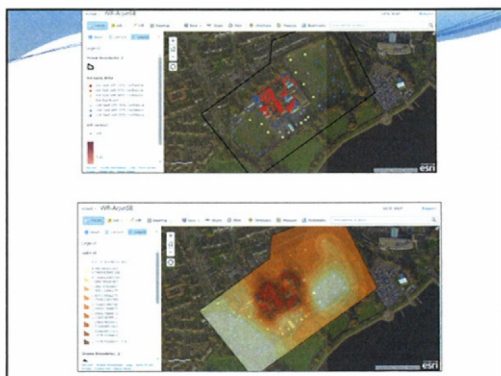
British Geological Survey <http://www.bgs.ac.uk/data/services/wms.html>

<http://www.bgs.ac.uk/opengeoscience/home.html>

has a range of data sets that are available and accessible either as a WMS, Kml layer or as a dataset.

Examples of using ArcGIS Online





Y9 Airplane task

Airplane incident investigation
This task looks at deciding where to divert a plane following an incident. It uses simple GIS tools of plotting data, doing a buffer search then a filter search. Time is of the essence in this type of event so shows the ability to handle large sets of data quickly. This idea came from pupils asking to do something about an event in the news.

Storymap of Y9 German exchange visit

<http://arcg.is/1pwJzEP>

Y10 Polio Challenge Task

GIS was used within this Y10 enrichment day activity along with other tools to find the best way to transport Polio vaccines to remote areas under controlled conditions. It used buffering, filtering, searching by attributes and measuring.

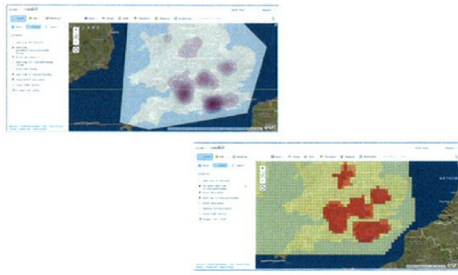
Y12 flood risk mapping in Worcester:

Collecting data, mapping data and carrying out spatial analysis including interpolation and hotspot analysis

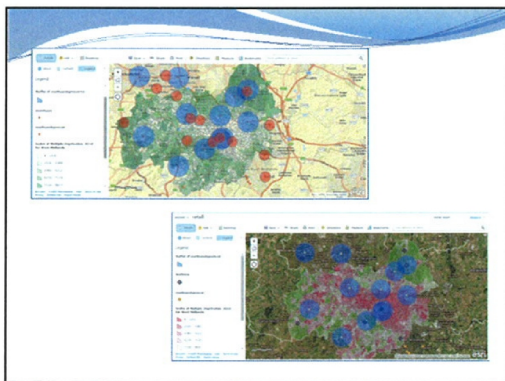
Sixth Form GISDAY Activities

- Part of the Global GISDAY www.gisday.com
- Speakers on the use of GIS:
 - Crime Management, Hazard management, Ecology, Big Data, Retail, Civil engineering, Mapping football tweets
- Practical workshops using GIS based upon the themes of the talk
- Local schools & teachers invited to attend
- If you are interested in attending or presenting please get in touch.

GIS DAY : Roadkill mapping



GIS DAY : Supermarket investigation



GISDAY : Crime mapping



Teacher training & resources

- Teacher training has been provided to Initial Teacher Training institutions
- Resources have been produced and made available to teachers by ESRI's ArcLessons, Geographical Association & Royal Geographical Society on a range of topics including microclimate/wifi investigations, school catchment investigations, routing school buses, locating offshore windfarms, splitting California into 6 new states

GIS Activity planning sheet

Topic	
Ideas	

How will you use the GIS in the learning experience?

Visualising the process: What do you want to do achieve	Actual process: How you are going to get there? What data do I need and from where? Further info and tools, problems & solution	Outcomes: What do you want at the finish? A map? A solution to an issue? A case study?

With using GIS in your geography classes there are a number of key issues to take on board:

- What is the end goal of using GIS?
 - Controlled assessment?
 - Development of skills?
 - Understanding of a topic?
- What are the outcome in 6 months, 12months, 2years? For You? For your students?

	6 Months	12 Months	2 Years
Teacher			
Student			

- State the map isn't the final part but a starting point
- Vulnerability of new ideas and changing technology
- How can GIS and tools be used to make decisions?

Deal with it activity

Deal with it task: You will be given a situation that can happen in the classroom. Come up with a solution to deal with the problem

1. You have a new student in your class who has not used the software that you are planning to use in your lesson.	2. You were planning to use an online GIS site but the internet is down
3. You were planning to use PC in your lesson but there has been a power cut on the classroom you are using/booked	4. You are planning to use a software package but you find that the school's license has expired
5. Your ICT room that has been booked has been acquired by another member of staff	6. You are doing the data analysis stage and a number of pupils have forgotten their data
7. You are using large data sets and when saving your work you find that there isn't enough space on your school area	8. You have a new member of staff joining your dept in September who has not used GIS before
9. The internet site that you were planning to use has changed how it looks	10. The internet site you were planning to use no longer exists

Solution