



Embedding GIS in Enquiry

David Morgan

Getting started

You'll need a notepad on which to make notes as you go along, or you could make notes, paste images, etc. on your device.

You can view these slides:

- as a slide-show for any animations and to follow links
- in 'normal' view if you want to add call-outs or extra slides to make notes, paste images, answer questions.



Getting started

Apologies in advance for any interruptions!



Aims

- Introduce GIS and Spatial Data and its application to geographical enquiry and the Individual Investigation.
- Consider how GIS and Spatial Data can be used to support the development of an investigation question.
- Share ideas for incorporating GIS in your methodology to enable 'GIS-Ready' data collection.
- Introduce framework for ensuring appropriate use of GIS in your data presentation and analysis.



'80% of all data is geographic'

An enthusiastic geographer might translate this as '80% of all data is geography'.

What geographic data do you create and use on a daily basis?

Information about places is the bread and butter of a geographer, we use it to build a picture of the people and processes within a landscape, be that rural or urban, coastal or mountain, densely populated or wild and remote, and understand the intricacies and complexities of these interactions.



A bus stop-based example

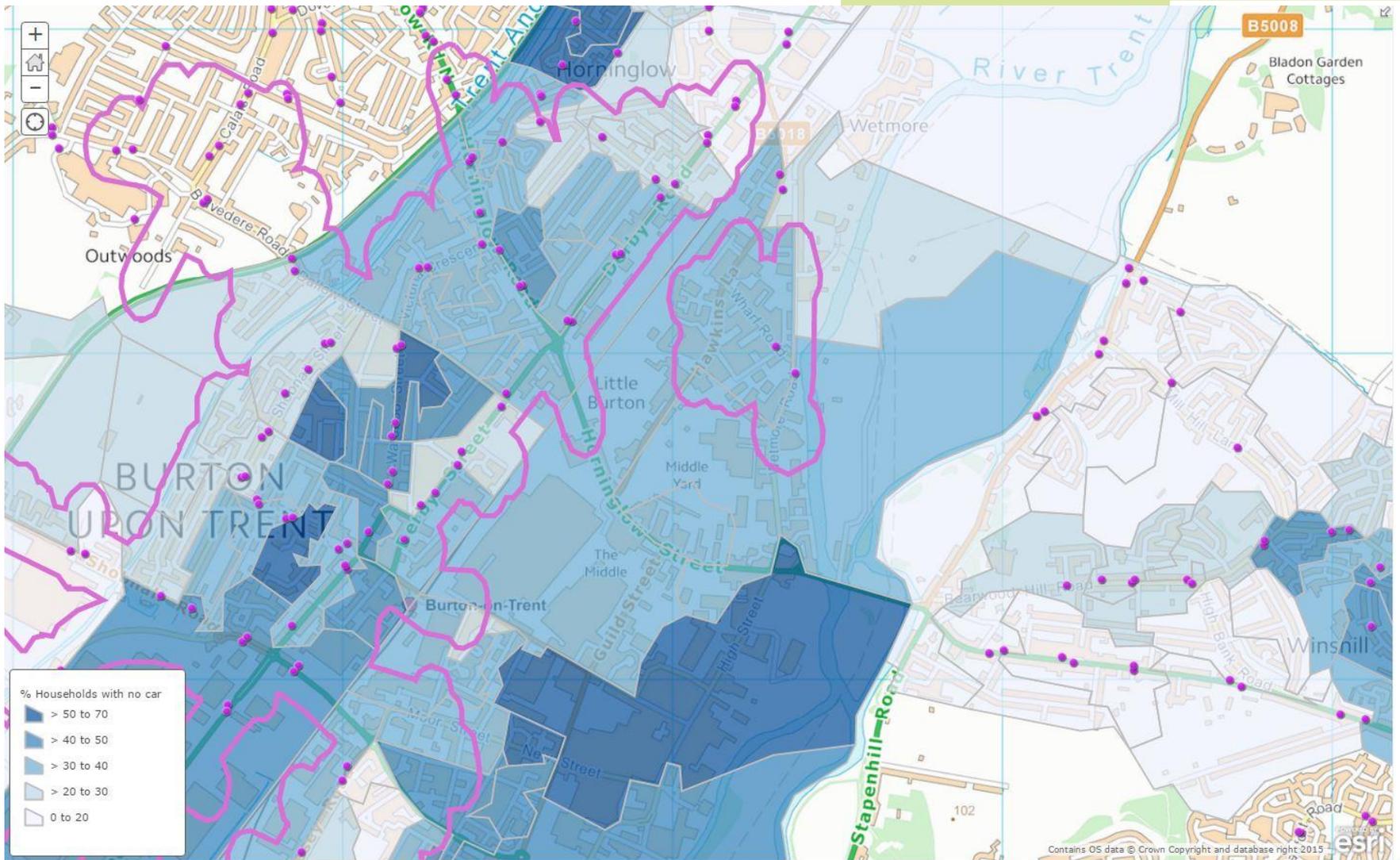
National Public Transport Access Nodes (NaPTAN)

	A	B	E	K	S	T	AD	AE	AF	AG	AH	AI
1	ATCOCode	NaptanCode	CommonName	Street	LocalityName	ParentLocalit	Longitude	Latitude	StopType	BusStopTy	TimingSta	Default
2	100053338	bstdpgj	Bedminster Road	Bedminster Road	Bristol City Centre	Bristol	-2.58766	51.45579	BCT	MKD	OTH	
3	100053342	bstjdam	Henry St Green Street	Henry Street	Bristol City Centre	Bristol	-2.58767	51.45578	BCT	CUS	OTH	
4	100053328	bstdjaj	Ilchester Crescent	Ilchester Crescent	Bristol City Centre	Bristol	-2.58779	51.45587	BCT	MKD	OTH	
5	100053329	bstdjdp	Ilchester Crescent	Ilchester Crescent	Bristol City Centre	Bristol	-2.58776	51.45581	BCT	MKD	OTH	
6	100053324	bstatmd	Swiss Road	South Liberty Lane	Bristol City Centre	Bristol	-2.5876	51.45572	BCT	CUS	OTH	
7	100053325	bstatjw	Swiss Road	South Liberty Lane	Bristol City Centre	Bristol	-2.58759	51.45574	BCT	CUS	OTH	
8	100053344	bstamwp	Ashton Park School		Bristol City Centre	Bristol	-2.58765	51.45577	BCT	MKD	OTH	
9	100053262	bstjpwd	Ikea Car Park	Eastgate Road	Bristol City Centre	Bristol	-2.58767	51.45572	BCT	MKD	OTH	
10	100053316	bstjpdm	Broad Walk Shops		Bristol City Centre	Bristol	-2.58762	51.45584	BCT	MKD	OTH	
11	100053264	bstmjdp	Alberton Road	Alberton Road	Bristol City Centre	Bristol	-2.5407	51.48899	BCT	CUS	OTH	
12	100053308	bstgtgj	Counterslip	Counterslip	Bristol City Centre	Bristol	-2.58767	51.4557	BCT	MKD	OTH	
13	100053306	bstapjm	Risdale Road	Risdale Road	Bristol City Centre	Bristol	-2.5878	51.45575	BCT	CUS	OTH	
14	10000015	bstpgpa	Kings Head Lane	Kings Head Lane	Bristol City Centre	Bristol	-2.5878	51.45572	BCT	MKD	OTH	
15	100053309	bstatwga	Northcote Road	Guthrie Road	Bristol City Centre	Bristol	-2.58757	51.45579	BCT	MKD	OTH	
16	100053330	bstdjtd	Ilchester Crescent	Ilchester Crescent	Bristol City Centre	Bristol	-2.58763	51.45584	BCT	MKD	OTH	
17	100053331	bstdjmg	Ilchester Crescent	Ilchester Crescent	Bristol City Centre	Bristol	-2.58769	51.45582	BCT	MKD	OTH	
18	100053332	bstdjmw	Brooklyn Road	Brooklyn Road	Bristol City Centre	Bristol	-2.58749	51.45582	BCT	MKD	OTH	
19	100053333	bstjdjm	Brooklyn Road	Brooklyn Road	Bristol City Centre	Bristol	-2.58742	51.45583	BCT	MKD	OTH	
20	100053334	bstdgjm	Lewis Road	Lewis Road	Bristol City Centre	Bristol	-2.58767	51.45577	BCT	MKD	OTH	
21	100053335	bstdgt	Lewis Road	Lewis Road	Bristol City Centre	Bristol	-2.58762	51.4557	BCT	MKD	OTH	
22	0100BRP91028	bstdatj	Durdham Park	Westbury Road	The Downs	Bristol	-2.61623	51.47478	BCT	MKD	OTH	
23	0100BRP91032	bstdapa	Henleaze Gardens	Westbury Road	Stoke Bishop	Bristol	-2.6166	51.48361	BCT	MKD	OTH	
24	0100BRP91033	bstdapt	Henleaze Gardens	Westbury Road	Stoke Bishop	Bristol	-2.61653	51.48326	BCT	MKD	OTH	
25	0100BRZ00704	bstatam	Reedley Road	Reedley Road	Stoke Bishop	Bristol	-2.62611	51.48499	BCT	CUS	OTH	
26	0100BRZ00705	bstatdg	Reedley Road	Reedley Road	Stoke Bishop	Bristol	-2.62571	51.48519	BCT	CUS	OTH	
27	0100BRZ01652	bstajmt	Sea Mills Station		Sea Mills	Bristol	-2.64993	51.47953	BCT	MKD	OTH	
28	0100BRZ01655	bstgdjw	Windmill Hill	Windmill Hill	Windmill Hill	Bristol	-2.59427	51.43964	BCT	CUS	OTH	
29	0100BRZ01656	bstgdjm	Windmill Hill	Windmill Hill	Windmill Hill	Bristol	-2.59436	51.43959	BCT	CUS	OTH	



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What is GIS?

A **Geographical Information System** (GIS) is a tool to help ask and answer geographical questions.

A GIS can be used to capture, store, manipulate, analyse, manage and display spatial data.

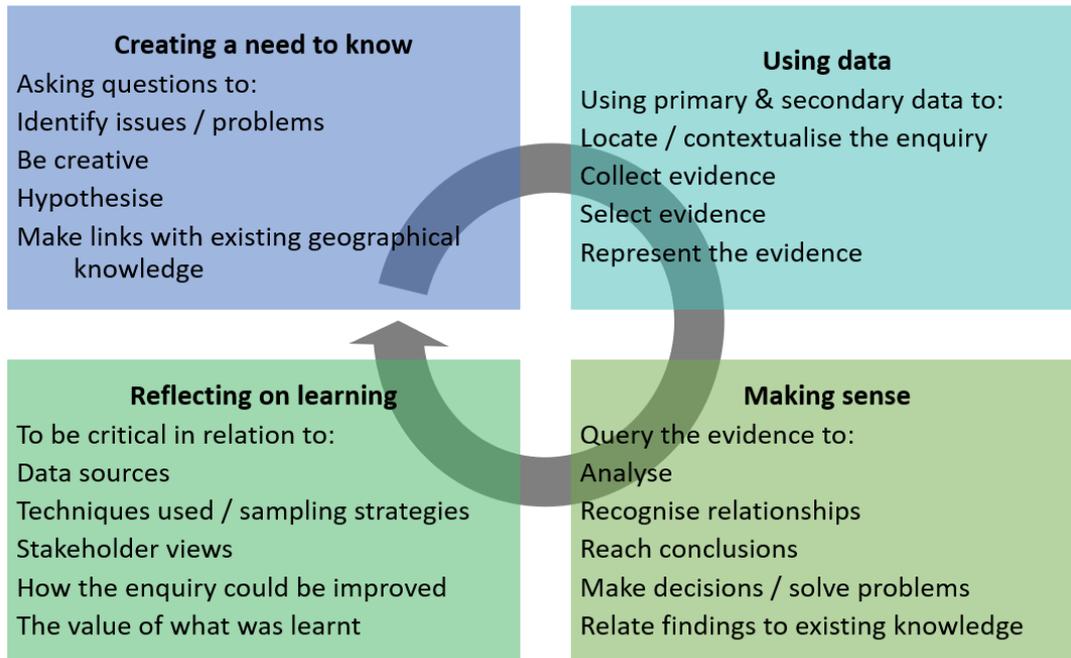
As a student carrying out an enquiry you are part of a '**Geographical Information System**' – asking questions, collecting and processing information and applying knowledge and understanding to the results.

All of this is possible via 'paper-based' systems, but technology can make this easier.

By using GIS, you will be able to access authoritative, secondary data sets on a range of scales, map data more quickly and explore the data behind the map with powerful analysis tools.



Embedding GIS at all stages of geographical enquiry





Locations for fieldwork known

- What geography is there here?
- What general topics or themes could I investigate here?

Choose broad theme of interest

Topic/theme for fieldwork known

- What patterns exist nationally? regionally? locally?
- Are there any particular locations that fit the topic?
Characteristics? Issues?
Development
- Are there any obvious exceptions to those patterns?
What variation can be observed within and between areas?

Identify location for fieldwork

Contextualising Research

Finding out more about the chosen topic in the chosen location
Secondary data & revisit background theory

Revisit Theme & Location

Following my contextualising research am I still interested in studying this topic in this place?

No
Wrong topic/theme

No
Wrong location

Yes

Questions and Hypotheses

What questions or hypotheses does this lead me to?





“ I know where I'm going, but don't know what to investigate ”

- Your teacher has given you a fieldwork destination, or you are doing fieldwork locally
- You know the area you are visiting (e.g. Guildford), but haven't chosen the area(s) your question will focus on (e.g. North Street)
- You need to identify a topic for your enquiry

GIS gives access to maps and aerial photos at several scales and for many different topics. Start looking at maps of the area:

- What features do you notice?
- What do these features suggest?
- Can you see any links to geographical topics you have studied?

“ I want to investigate this topic, but don't know the best place to do it ”

- Your teacher has given you a free choice of fieldwork destination
- You have an idea of a topic that your question will focus on (e.g. inequalities between places)
- You need to choose a fieldwork destination, and smaller area(s) to focus your question on

GIS gives access to data for many different topics. Start looking at secondary data sets related to your chosen topic:

- What patterns do you notice?
- Do any places show interesting characteristics?
- Are there any contrasting areas close to each other?

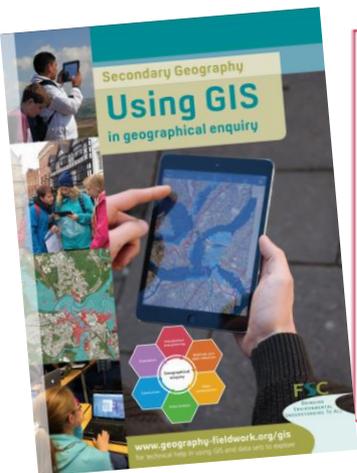
“ I know we are going here, and I want to investigate this topic ”

- Your teacher has given you a fieldwork destination, or you are doing fieldwork locally
- You know the general area you are visiting but haven't chosen the area(s) to focus on
- You have an idea of a topic that your question will focus on

You might have reached this point from one of the two other starting points.

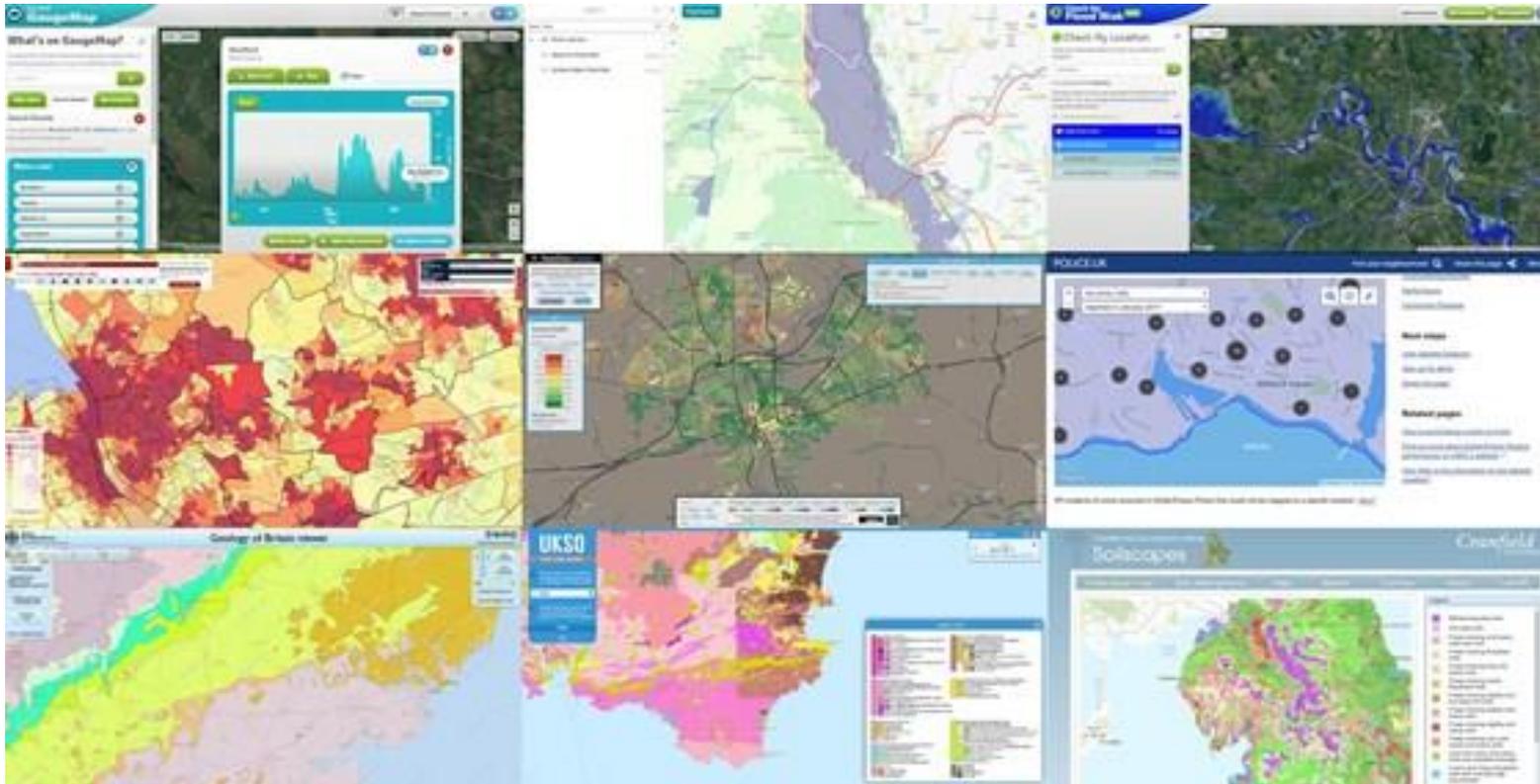
Use GIS to carry out contextualising research relating to your chosen topic and location.

Research should help you understand the location in enough detail to generate sensible questions or hypotheses, based on geographical theory AND some relevant understanding of what the location is like.



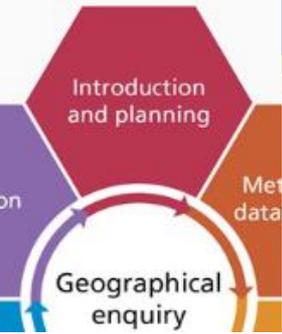


Finding and mapping secondary data sets



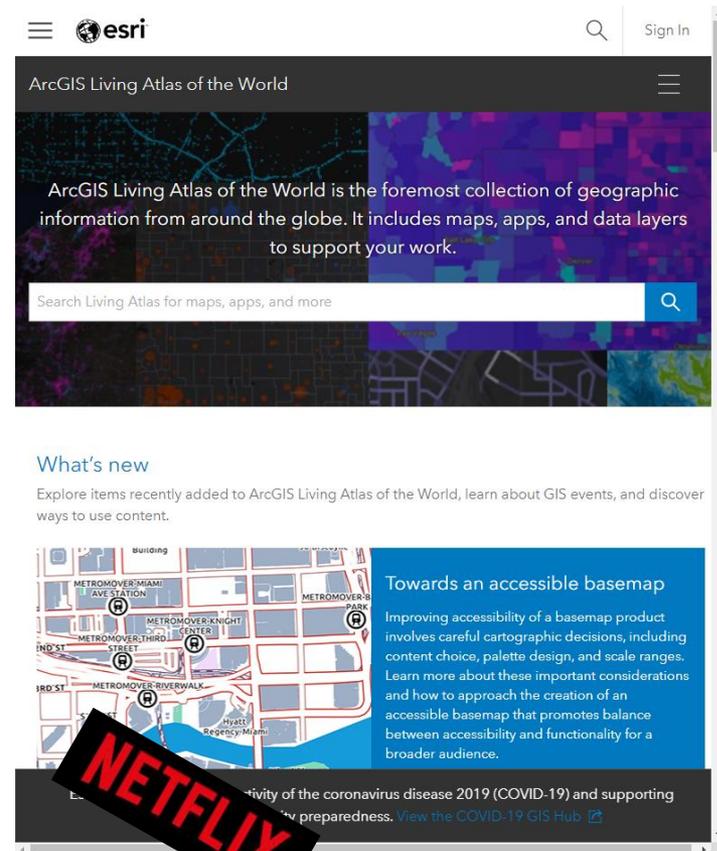
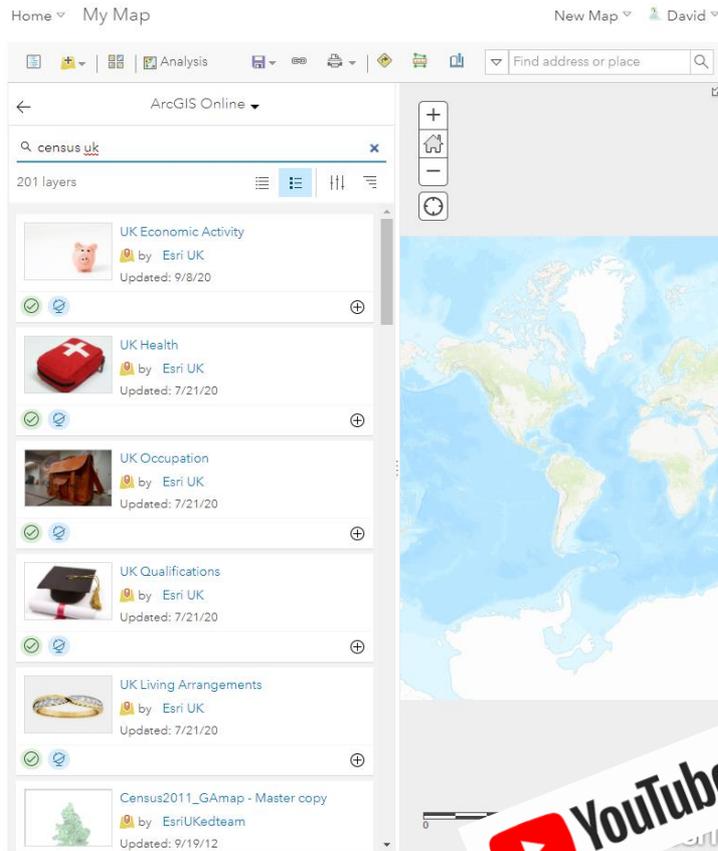
<https://www.geography-fieldwork.org/a-level/before-starting/planning/using-gis/>





Finding and mapping secondary data sets

Search ArcGIS Online & ESRI Living Atlas



Using GIS in data collection

GIS-Ready data collection



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Using GIS in data collection

GIS-Ready data collection



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AutoSave Off #FieldworkLive Weather and Climate - Saved Search

File Home Insert Page Layout Formulas Data Review View Help Ablebits Data

L33

	A	B	C	D	E	F	G	H	I
1	Date and time observations	Rainfall (mm)	Cloud Cover (Oktas)	Wind Speed (Beaufort Scale)	Wind Direction	Longitude	Latitude		
2	4/17/2020 10:40:00 AM	3	1	2	north	-2.1820298	53.4113717		
3	4/19/2020 10:52:00 AM	24	0	5	south_west	-0.056147436	51.71609473		
4	4/20/2020 8:24:00 AM	0	2	3	north_west	-3.237760315	50.69688775		
5	4/20/2020 8:55:00 AM	0	0	2	west	-0.09303	51.63519		
6	4/20/2020 9:28:00 AM	0	0	5	west	-1.843243755	52.52054932		
7	4/20/2020 11:10:00 AM	6	3		north_east	-73.98869242	40.65674686		
8	4/20/2020 12:02:00 PM	0	0	10	east	-0.046005203	51.70771272		
9	4/20/2020 12:41:00 PM	0	0	0	north	-0.424015434	51.97066111		
10	4/20/2020 1:00:00 PM	0	0	4	east	-0.1021556	51.6224882		
11	4/20/2020 1:07:00 PM	2	5	6	south_west	-0.0326015	53.7043855		
12	4/20/2020 11:00:00 AM	1	3	6		-2.294975692	53.7032325		
		0		2	east	0.43464243	51.64250986		



Using GIS in data collection

GIS-Ready data collection



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Save As

Recent

Field Studies Council

OneDrive - Field Studies Council
d.morgan@field-studies-council.org

Sites - Field Studies Council
d.morgan@field-studies-council.org

Other locations

This PC

Add a Place

Browse

Desktop

#FieldworkLive Weather and Climate

CSV (Comma delimited) (*.csv)

[More options...](#)

New Folder

Name ↑

Date modified

Data Analysis

01/08/2019 17:21

KS3 W&C

24/04/2020 12:03

New Products

22/10/2019 09:40



Using GIS in data collection

GIS-Ready data collection



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ArcGIS ▾ Overview Pricing **Map** Scene Help

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Using GIS in data collection

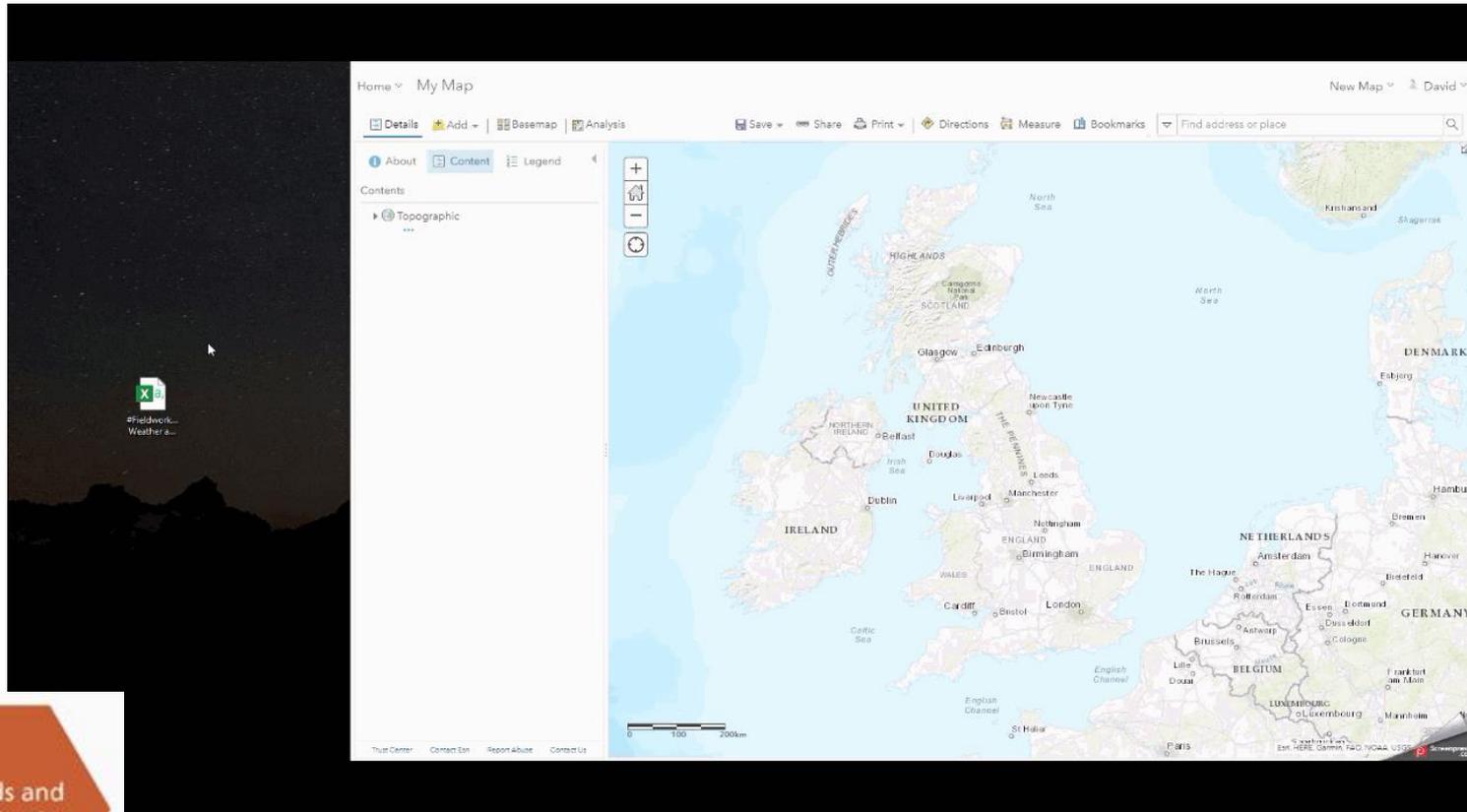
GIS-Ready data collection



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Using GIS in data collection

GIS-Ready data collection



Create a New Survey

Using the web designer

- Get started quickly
- Best for simple surveys
- Author your survey graphically



Get started

Using Survey123 Connect

- Using a desktop application
- Full smart form capabilities
- Author through XLSForm spreadsheet

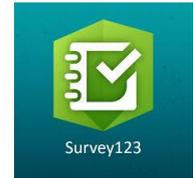


Get started



Using GIS in data collection

GIS-Ready data collection



Create a New Survey ✕

Thumbnail



Name *

FieldworkLive Webinar

Tags *

FSC FieldworkLive

Summary

Summary will display in the Overview page of the survey

Create

Cancel



[Show other options](#)



FieldworkLive Webinar

Overview **Design** Collaborate Analyze Data Settings

FieldworkLive Webinar

Description content for the survey

Please drag from or press on the right panel to add your first question.

Submit

Powered by Survey123 for ArcGIS

Add Edit Appearance Settings

- Singleline Text
- Multiline Text
- Single Choice
- Single Choice Grid
- Multiple Choice
- Dropdown
- Rating
- Likert
- Number
- Date
- Time**
- Date/Time
- Image
- File Upload
- Map
- Email
- Website
- Signature
- Note
- Group
- Page

Saved Preview Publish



FieldworkLive Webinar

- Overview
- Design**
- Collaborate
- Analyze
- Data
- Settings

FieldworkLive Webinar

Example weather survey for #FieldworkLive Webinars

1

Where are you?*

Use device location or drag the pin to your location

2

Current Precipitation*

Dry

Raining

- Add
- Edit**
- Appearance
- Settings

- Singleline Text
- Multiline Text
- Single Choice
- Single Choice Grid
- Multiple Choice
- Dropdown
- Rating
- Likert
- Number
- Date
- Time
- Date/Time
- Image
- File Upload
- Map
- Email
- Website
- Signature
- Note
- Group
- Page

- Saved
- Preview
- Publish



FieldworkLive Webinar

Overview **Design** Collaborate Analyze Data Settings

FieldworkLive Webinar

Example weather survey for #FieldworkLive Webinars

1

Where are you?*

Use device location or drag the pin to your location

Find address or place

Tip: This question will try to use your location. Press to continue.

Lat: 0 Lon: 0

2

Current Precipitation*

Dry

Raining

+ Add **✎** Edit **🎨** Appearance **⚙️** Settings

Label

Cloud Cover (Oktas)

Hint

B **A** **☰** **☰** **☰** **☰** **🔗**

0 (cloudless sky
 1 (1/8th of sky obscured by cloud) - 8 (8/8ths sky obscured)
 9 (sky not visible due to fog/mist)

Default Value

Default Value

Validation

- This is a required question
- Must be an integer
- Set min./max. value

Min.

Max.

Other

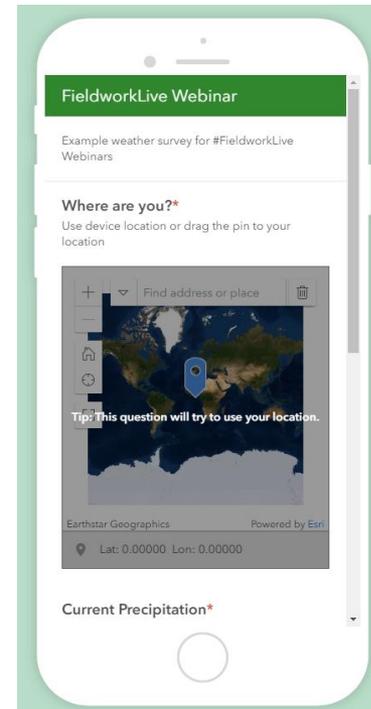
Cache answer to this question ?

Saved **▲** Preview Publish



Let's go and collect some data.....

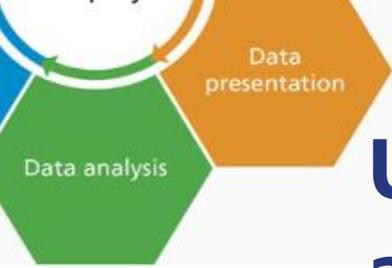
<https://arcg.is/WSOr4>



Automatically collated and presented....

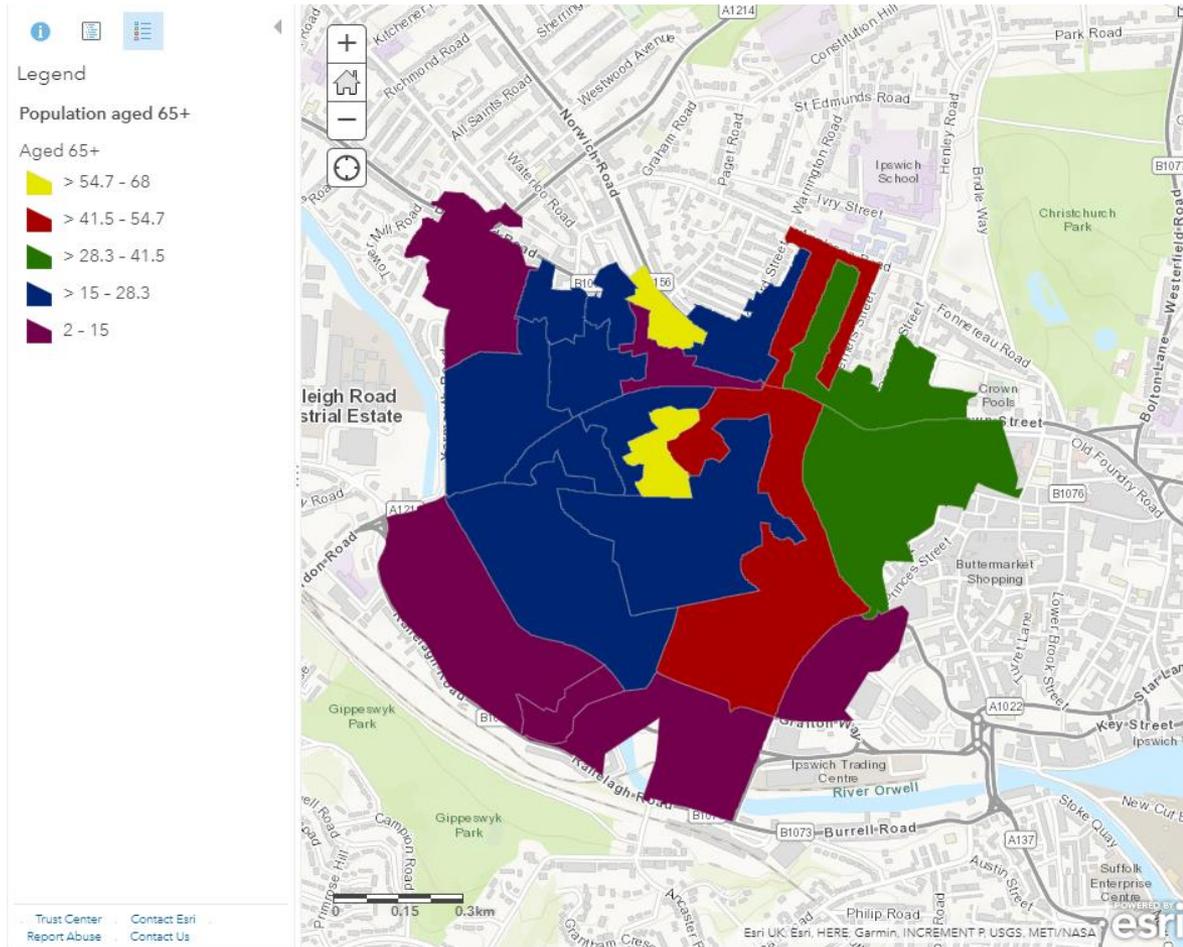
<https://arcg.is/0K8bDz0>





Using GIS for data presentation and analysis

GIS can make it really easy to do terrible data presentation!



- What is wrong with the way that this data is presented?
- What would you change?
- How would you present this data differently?





NEA feedback 2019

AQA	OCR
<p>Locational context was very often presented broadly (3 maps at different scales), but precise location of where data was collected were unclear.</p> <p>Spatial context for studies unclear, comparative details were not given.</p> <p>Students are becoming more creative with spatial ways of displaying their data, the use of computer-generated graphics should be encouraged. (<i>same could be said for hand-drawn maps</i>)</p>	<p>An increasing number of candidates used GIS packages (Digimaps or ArcGIS), while the maps produced by these packages can be very sophisticated maps where data presentation had been done on a printed base map.</p> <p>Candidates are now using GIS to produce maps, which seems to be one with located candidates give these symbols a more professional look than have become the Excel maps.</p>
<p>Eduqas/WJEC</p> <p>Only a few candidates identified study location, where they did, poorly presented and were not clearly marked. It would be pleasing to see an improvement in the present and use maps in their investigations.</p>	<p>Some candidates were using GIS techniques were</p>
<p>Some candidates making excellent use of GIS to present data, however in general, the quality of data presentation is rather disappointing with many candidates over reliant on poorly presented Excel generated maps and graphs.</p>	

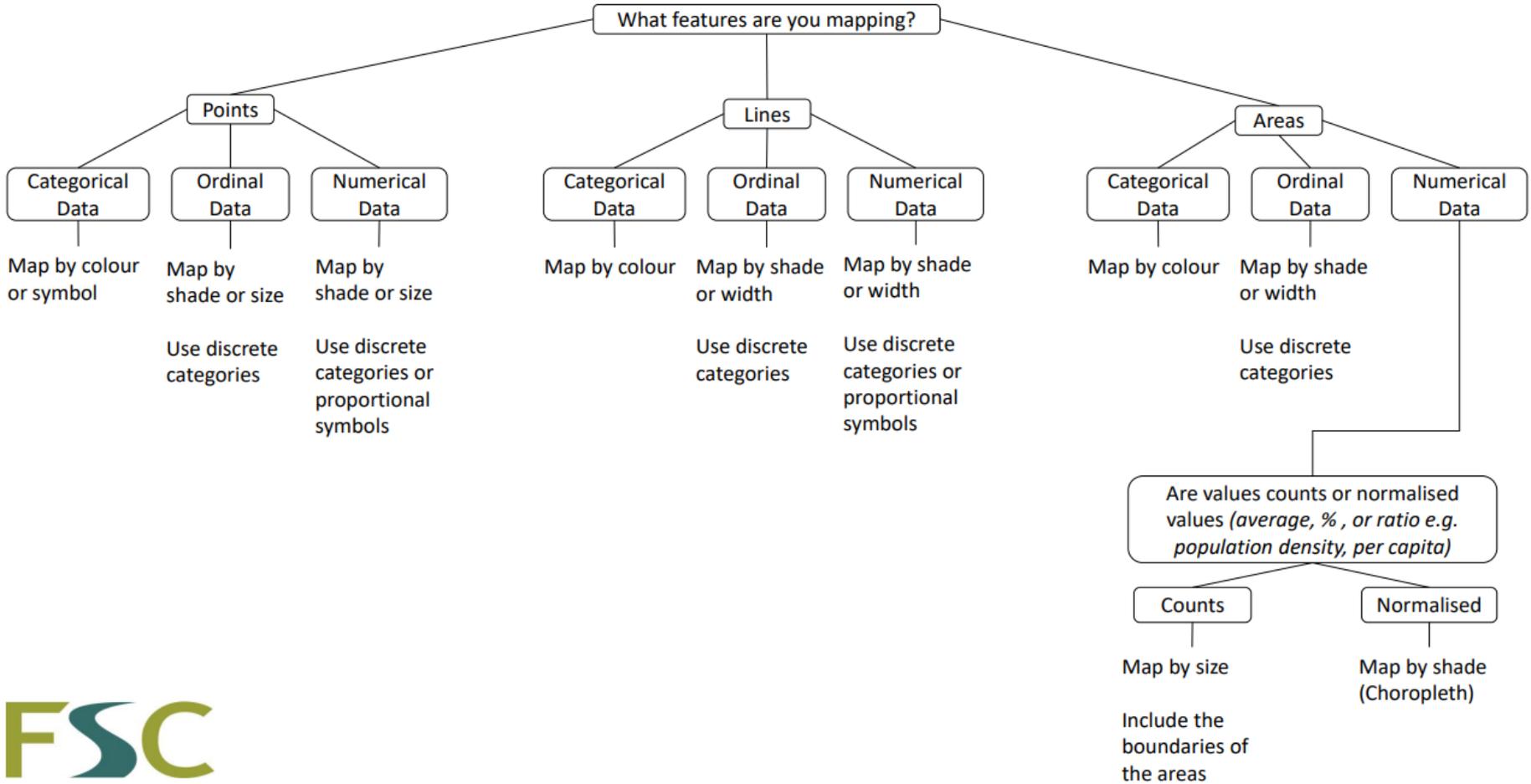
Overarching points

- Poor use of maps to introduce study area.
- Importance of using appropriate techniques.
- Hand drawn or digital equally worthy of credit.
- Locating multiple pieces of information and integrating analysis a big positive.
- Incomplete maps (missing important components such as legend, scale, north etc).
- Overreliance on automatic or default settings.



Planning data presentation

Making decisions about how to map different data





Visual variables

- Do particular choices help a reader extract meaning from your map?
- Can you use a combination of these to display more than one?

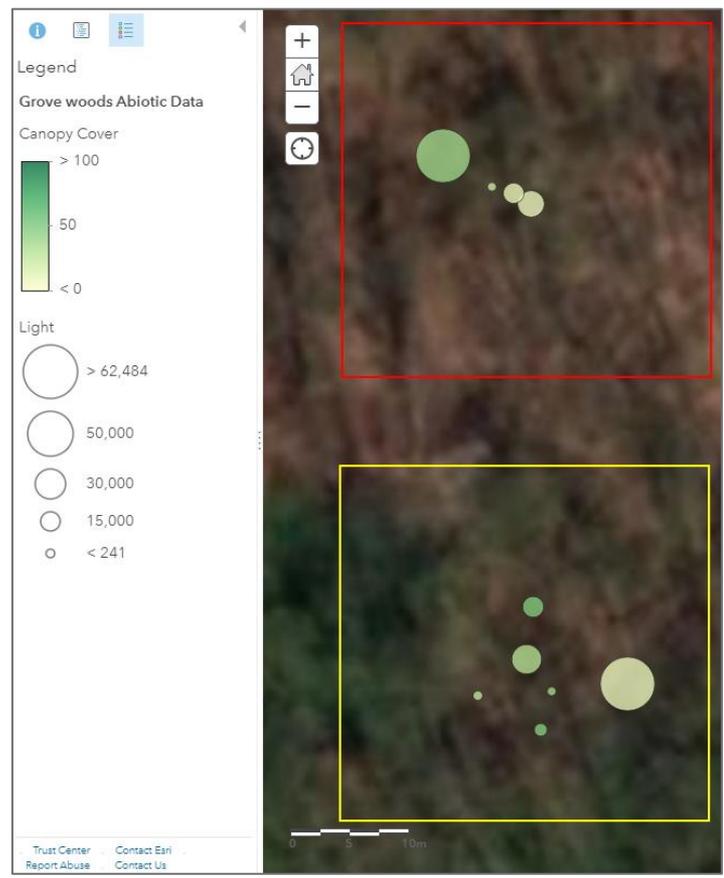
Shape or symbol

Colour

Shade

Size or width

Orientation

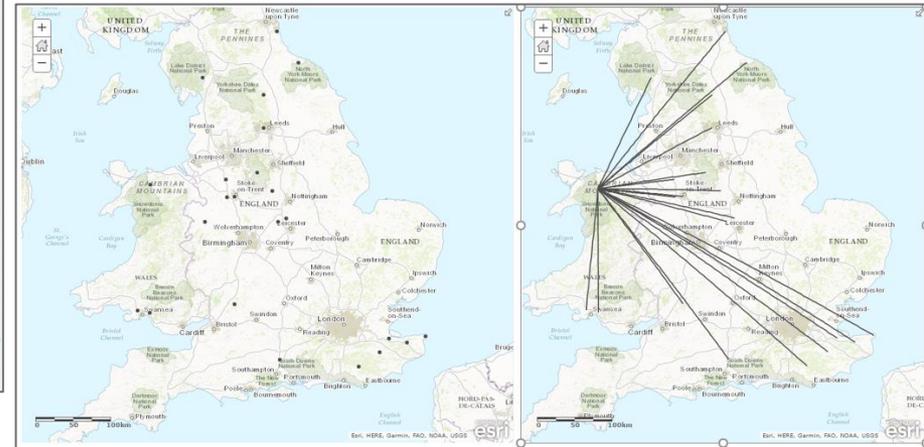
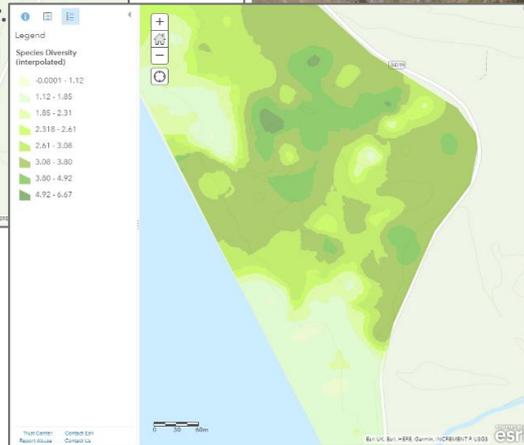
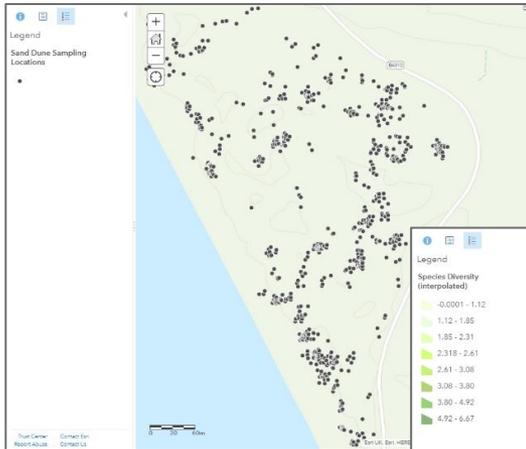
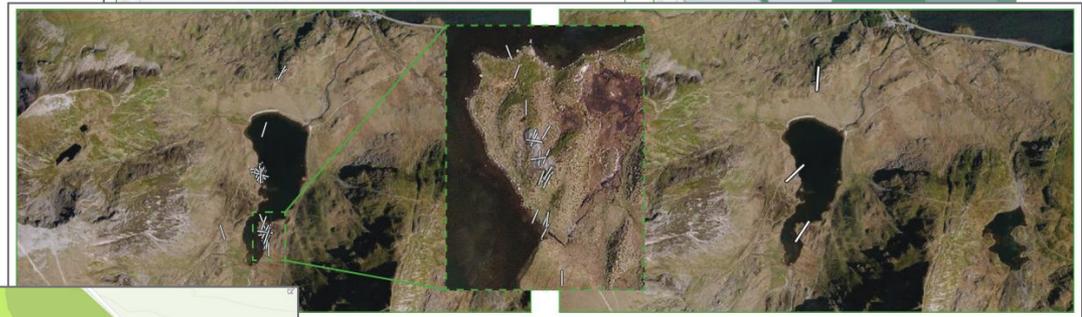
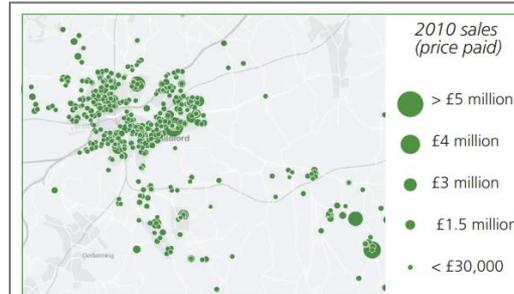




Process then present?

Are there opportunities to process data before presenting?

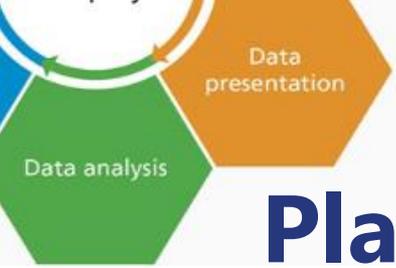
- Summarise?
- Interpolate?
- Connect?
- Normalise?





Planning data presentation

<p>Decisions <i>(Description)</i></p> <p><i>What data is being represented?</i></p> <p><i>Data represented by?</i></p> <p><i>Choice of symbols?</i></p> <p><i>Choice of colours?</i></p> <p><i>Use of transparency?</i></p> <p><i>Processing of data before mapping?</i></p>	<p><i>Data type? (Categorical, Ordinal, Numerical)</i></p> <p><i>What geography? (points, lines or areas)</i></p> <p><i>Any additional data included? What base map?</i></p>	<p>Justification <i>(or why do you think the map maker made these decisions?)</i></p> <p><i>Do the colours used make it easy to interpret the data?</i></p> <p><i>If mapping categorical data are there colours that logically represent a category?</i></p> <p><i>How do the colours use impact on perceptions. Red = Bad, Green = Good. You might want to take advantage of that or avoid it.</i></p> <p><i>Do base maps or additional data add useful context or unnecessary clutter?</i></p> <p><i>What is the "story" or message being told?</i></p> <p><i>Is the method appropriate for the data being presented?</i></p>	
<p>Strengths <i>(what works about how this data is presented?)</i></p>	<p><i>Insert GIS data presentation here</i></p>		<p>Weaknesses <i>(what doesn't work about how this data is presented?)</i></p>



Planning data presentation



Planning data presentation





Planning data presentation

Decisions
(Description)

Justification
(or why do you think the map maker made these decisions?)

Strengths
(what works about how this data is presented?)

Weaknesses
(what doesn't work about how this data is presented?)

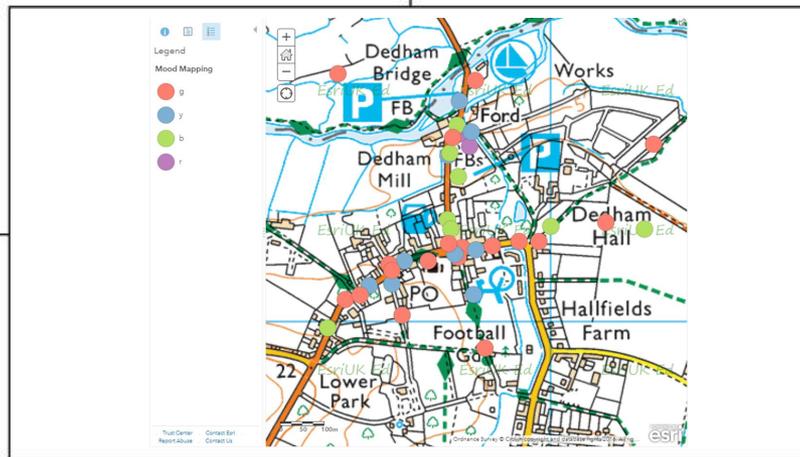




Planning data presentation

Decisions
(Description)

Justification
(or why do you think the map maker made these decisions?)



Strengths
(what works about how this data is presented?)

Weaknesses
(what doesn't work about how this data is presented?)



Links

From the awarding bodies:

- [GA specs summary](#)
- AQA [specification](#), [support](#) and [example NEA](#)
- Eduqas [specification](#), [investigative and research](#) and [data analysis skills](#)
- Edexcel [specification](#), [exemplars](#) and [maths support](#)
- OCR [specification](#) and [NEA support](#).
- WJEC [specification](#)

From the GA and the FSC:

- FSC [website for A Level students](#)
- FSC courses and [enhancement modules](#)
- GA [Methods of presenting fieldwork data](#)
- GA [Methods of statistical analysis of fieldwork data](#)
- GA [Fieldwork at A Level: your guide to the independent investigation](#)
- FSC and GA [Creative Fieldwork Guide](#)



Support With Using GIS

FSC GIS & Fieldwork Support www.geography-fieldwork.org/GIS

ESRI UK Schools <https://schools.esriuk.com/>

Getting Started with Maps and Data in ArcGIS

<https://education.microsoft.com/en-us/course/07047034/overview>

ESRI Living Atlas of the World

<https://livingatlas.arcgis.com/en/apps/>

