UK Data Service

Mapping Crime Data in R:

An Introduction to GIS and Spatial Data

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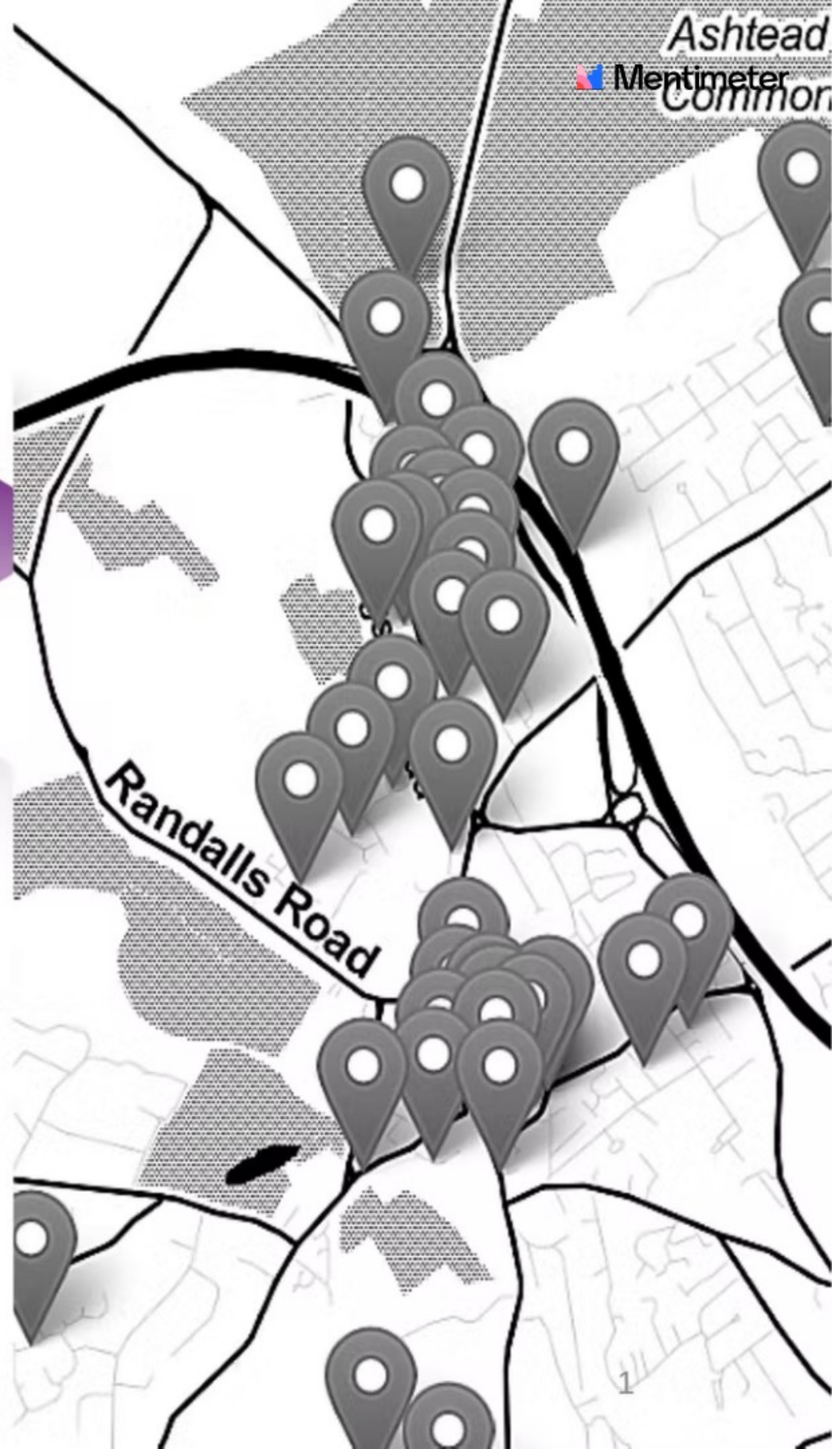

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Interaction

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- During this workshop you can use the Zoom chat for technical questions or comments (to chat with the facilitator – Gill Meadows).
- If you want to ask questions in relation to the content of this talk, then you can use the Zoom Q+A function.
- This Workshop will involve several polls, short answers and other interactions where all answers will appear anonymously on the screen. For this, you need to go to menti.com and enter the 8 digit code at the top of the screen .
- Lets test this now!

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Instructions

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Can you hear me?

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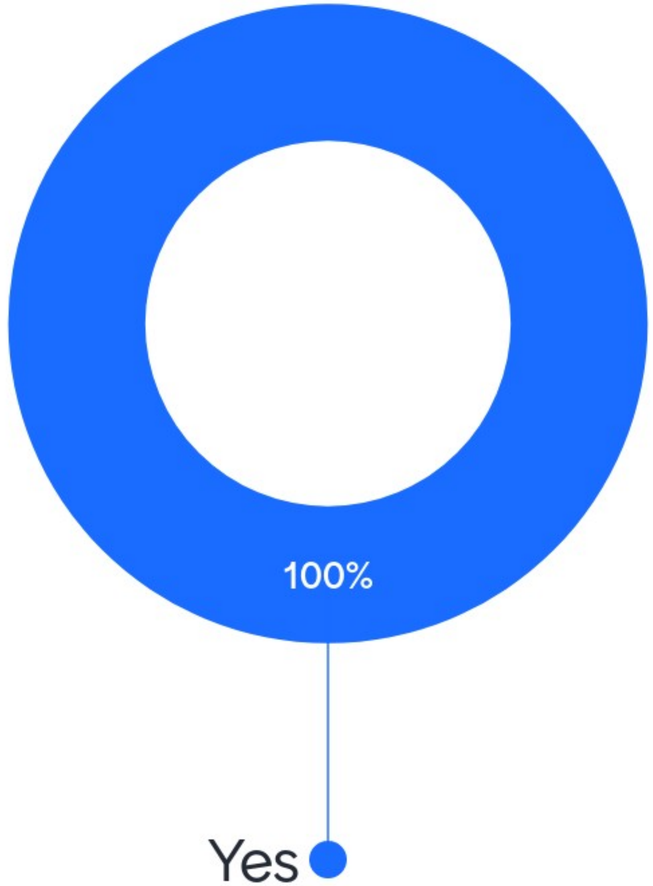

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Troubleshooting audio problems

- Check your speaker/headset is plugged in / volume is on.
- Click on audio to change to listening via phone
- This workshop is live on YouTube. We are also recording this workshop and will post it on YouTube (https://www.youtube.com/user/UKDATASERVICE)

Workshop Content – June 7th

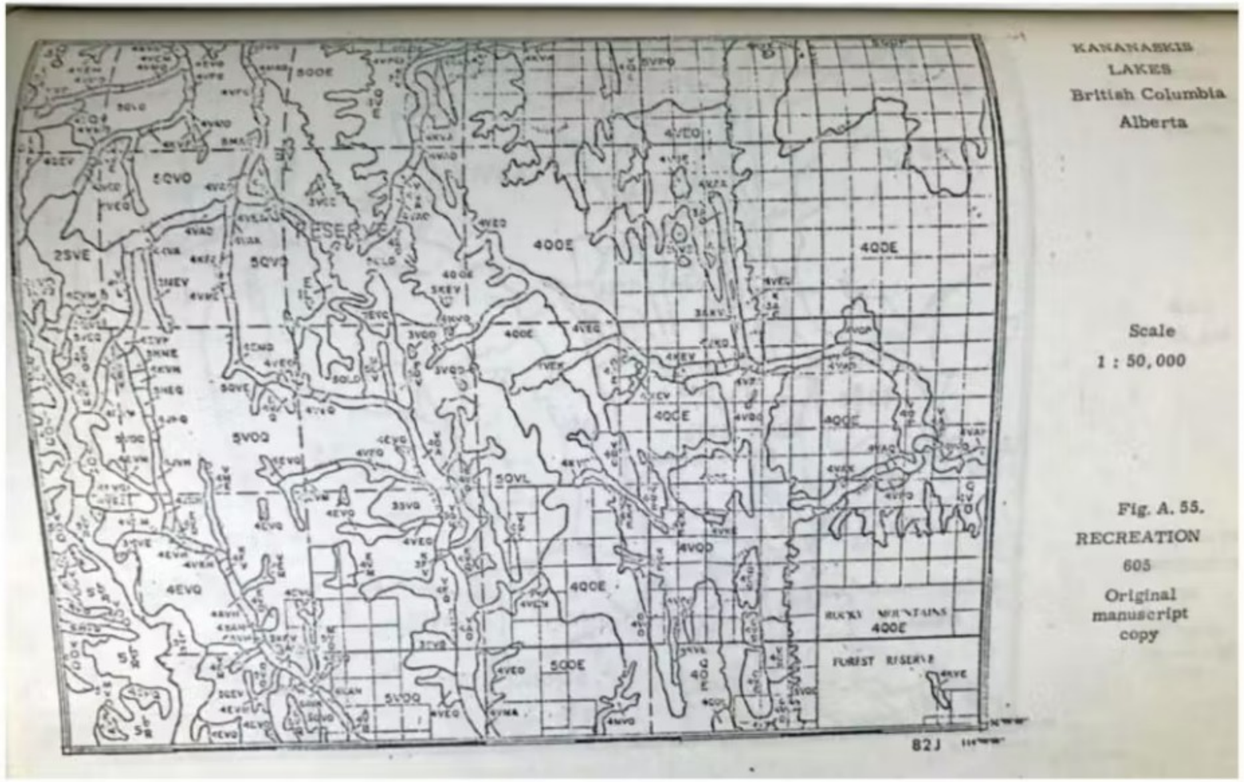
- What is GIS
- Spatial Data vs Non-Spatial Data
- Different types of maps (reference vs thematic)
- Projection Methods and Coordinate Reference Systems
- Challenges of Mapping Crime Data

Code Demo - June 8th

- Topic 1 – Exploring our crime data
- Topic 2 – Shapefiles
- Topic 3 – Combining census data (crime rate vs crime count)
- Extra Topic – Interactive maps via Leaflet Package

What is GIS?

- Graphical Information Systems:
- *“computer system for capturing, storing, checking, and displaying data related to positions on Earth’s surface”*



What software's are available?

- GeoDa,
- ArcGIS,
- FME,
- QGIS,
- R
- …

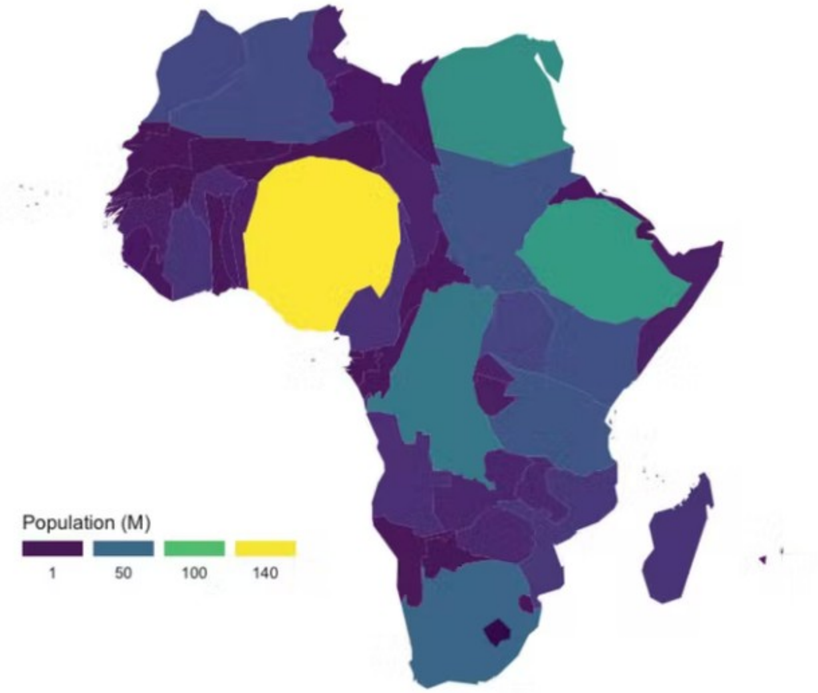
Reference vs Thematic Maps

- Reference Maps: used to communicate location on more static data points
  - To ‘pin point’ data on a map
  - Descriptive

- Thematic Maps: used to highlight a spatial relationship
  - To ‘study a theme’ within a map
  - Explanatory

Reference vs Thematic Maps Continued…

Vs



Scenario 1: The visualisation of road networks to improve road safety measures are a type of

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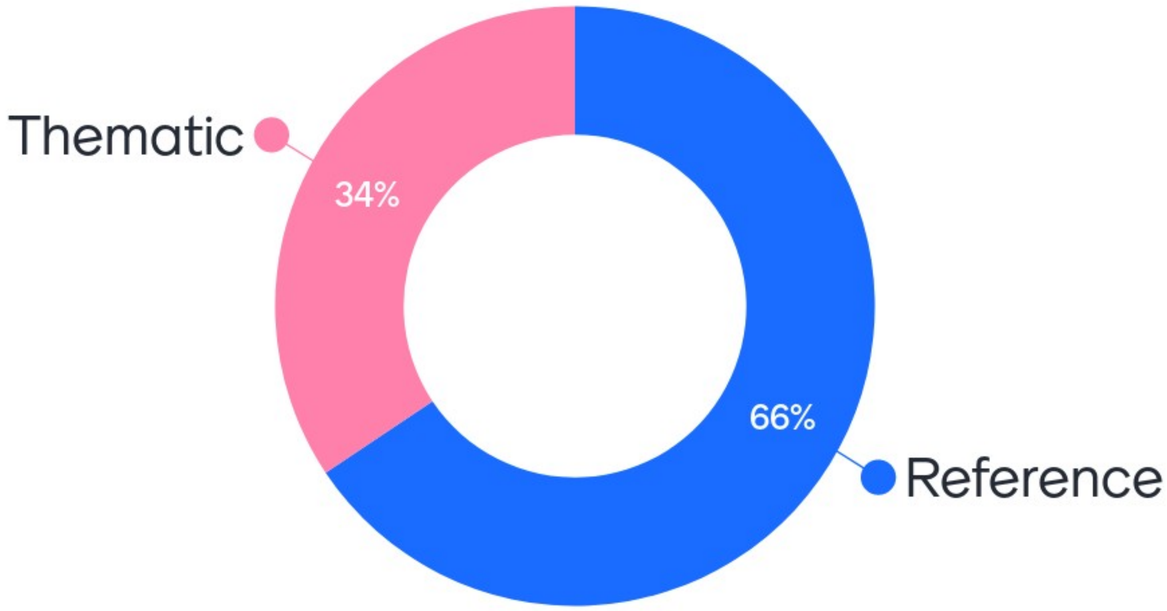

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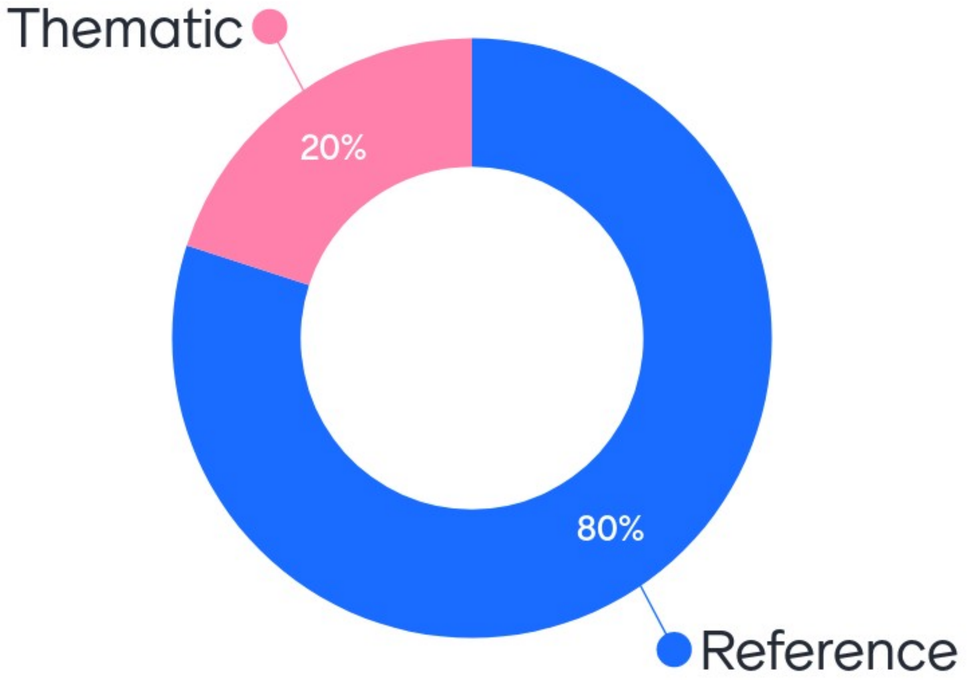
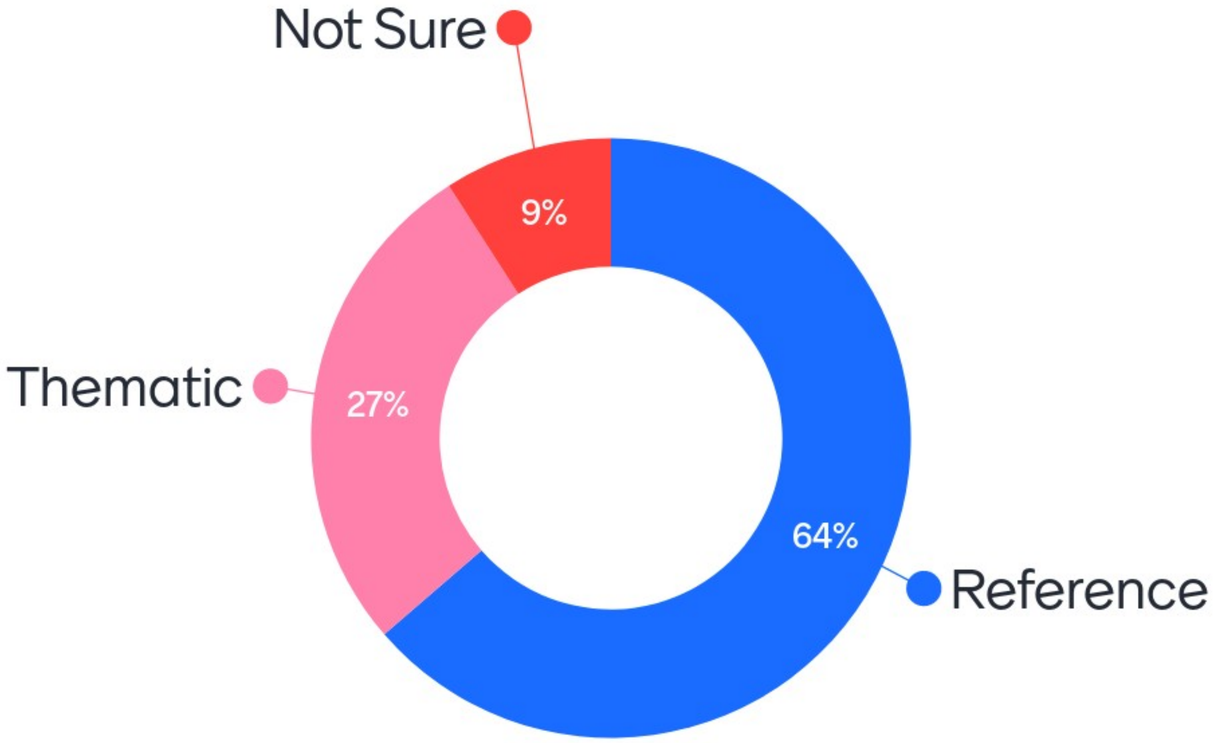
Scenario 2: The visualisation of the earths surface showing its elevation is a type of



Scenario 3: Navigation Tools such as Google Maps or City-Mapper can be classed as



Further Example; Tube Maps

- How do we class Tube Maps;

- Reference maps because…
  - They show the location of different tube stations, and the location of each tube line

- Thematic maps because...
  - They can be used to predict life expectancy, poverty and median house prices
  - https://tubecreature.com/#/livesontheline/current/same/U/*/FFTFTF/11.469326848406268/-0.1622/51.5142/

To sum up

- All though maps falls broadly into two categories, there are ways in which these types of map overlap or share similarities
- Almost every thematic maps is also a reference map, but not every reference map is a thematic map
- The decision is up to you, it is not entirely necessary to define these in your work but it is important to now what type of map you want to make as these can be affected by the data you have

Can you give examples of any other types of maps that share qualities of both reference and thematic maps?

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Air quality conditions across different boroughs in London

crime maps, maps of housing prices

deprivation maps across local authority areas

maps of soil ecosystem services

A map of the UK showing unemployment rates

Disease mpping examples in general

Burglary rates

KDE map to show high density of distribution within specific polygons

A map of all train lines in a given city

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Can you give examples of any other types of maps that share qualities of both reference and thematic maps?

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Fear of crime at Lower Super Output Areas (LSOAs)

Heat Maps on football analysis

traffic accident on a roadmap

Vaccination centers

Maps of hiking trails including difficulty

Recorded crime (which is detected by police) is only a fraction of actual crimes committed.

May be path dependence (overemphasis on notorious areas)

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Any Questions….

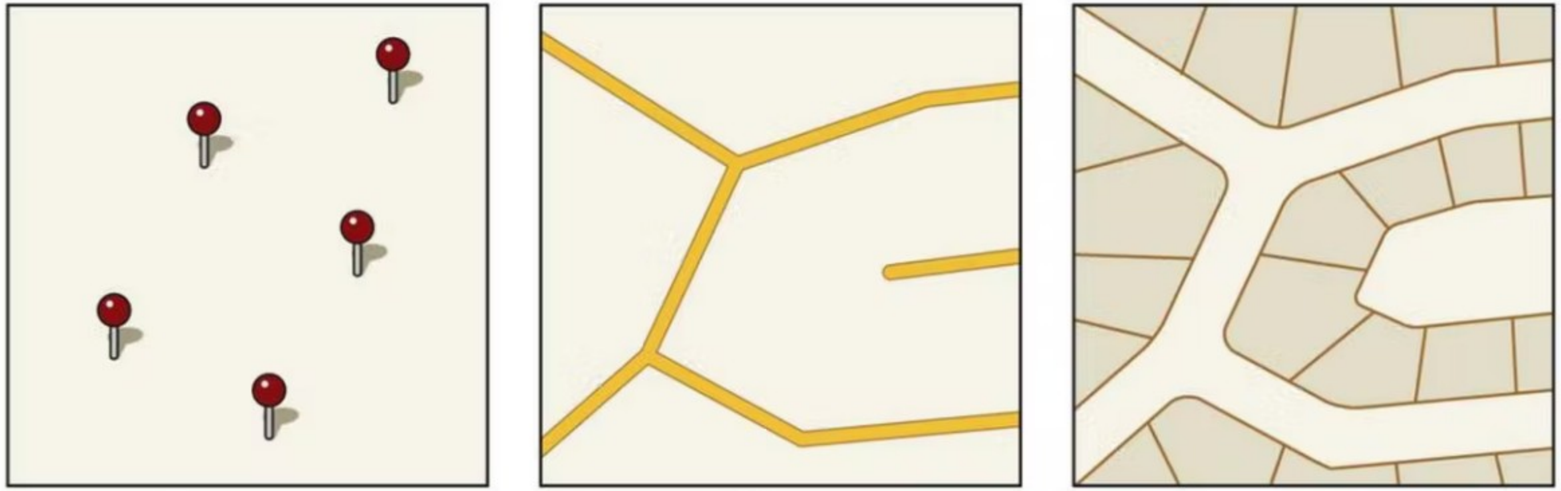
Spatial Data

What is it, and why is it important?

"Spatial data, or geospatial data, is a data frame that contains information about a specific location, which can be analysed to better understand that location"

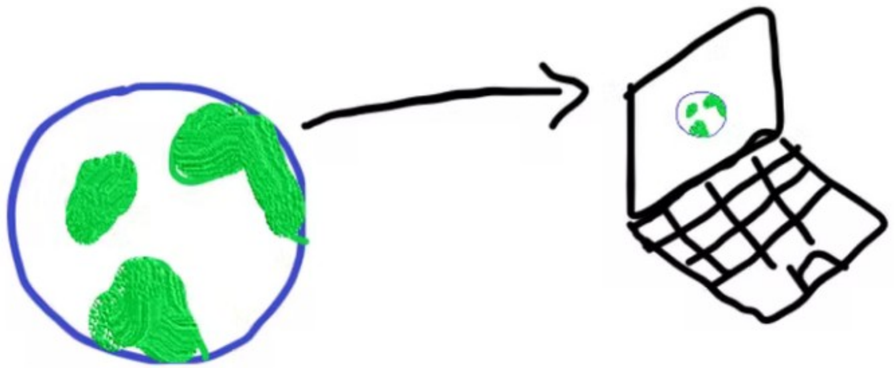
What is Spatial Data?

- Vector Data (points, lines and polygons)

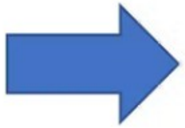


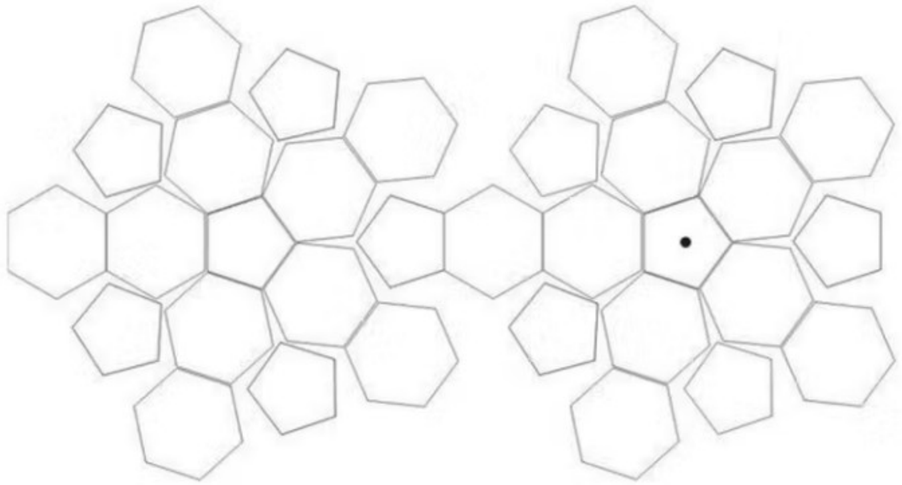
Projection Methods

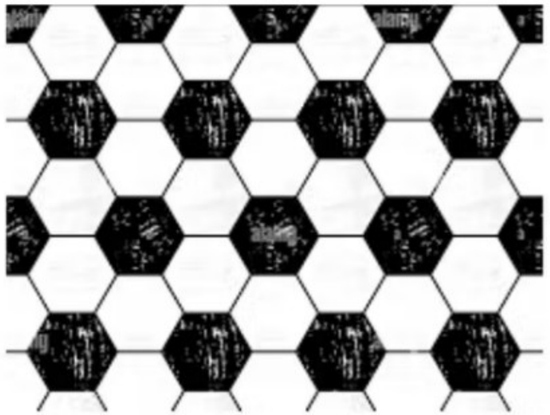
- Moving from the 3D to the 2D



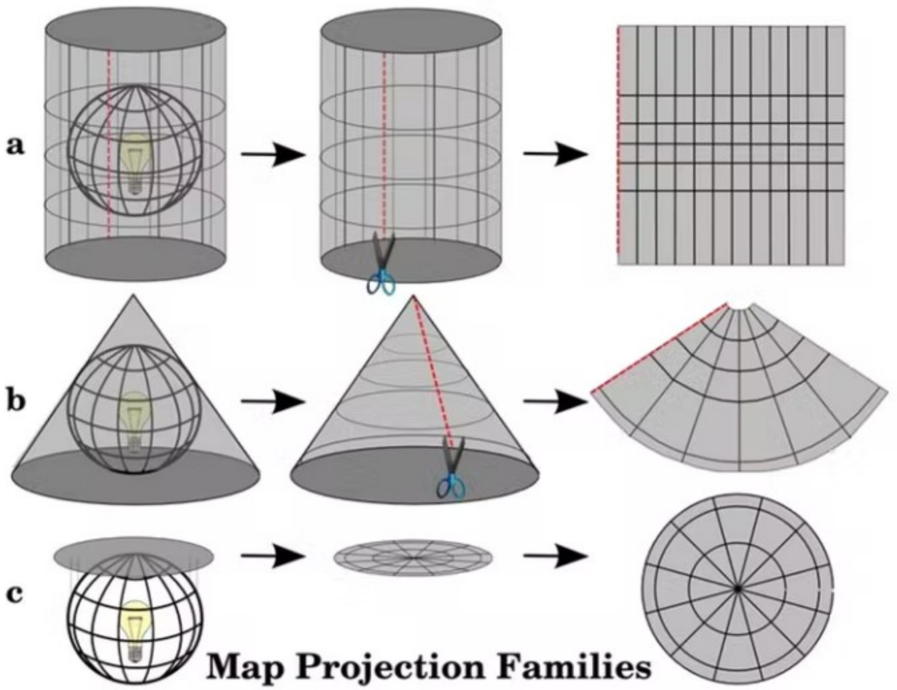
Football Example







Distortion

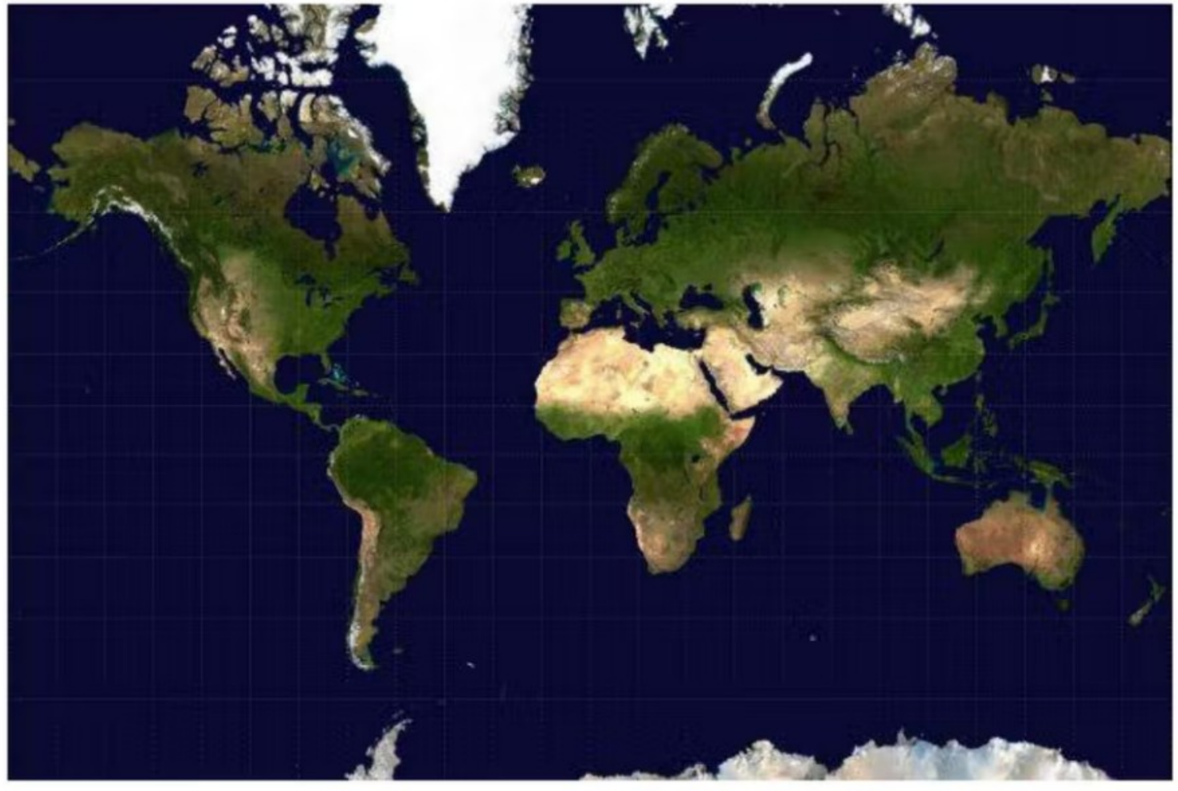


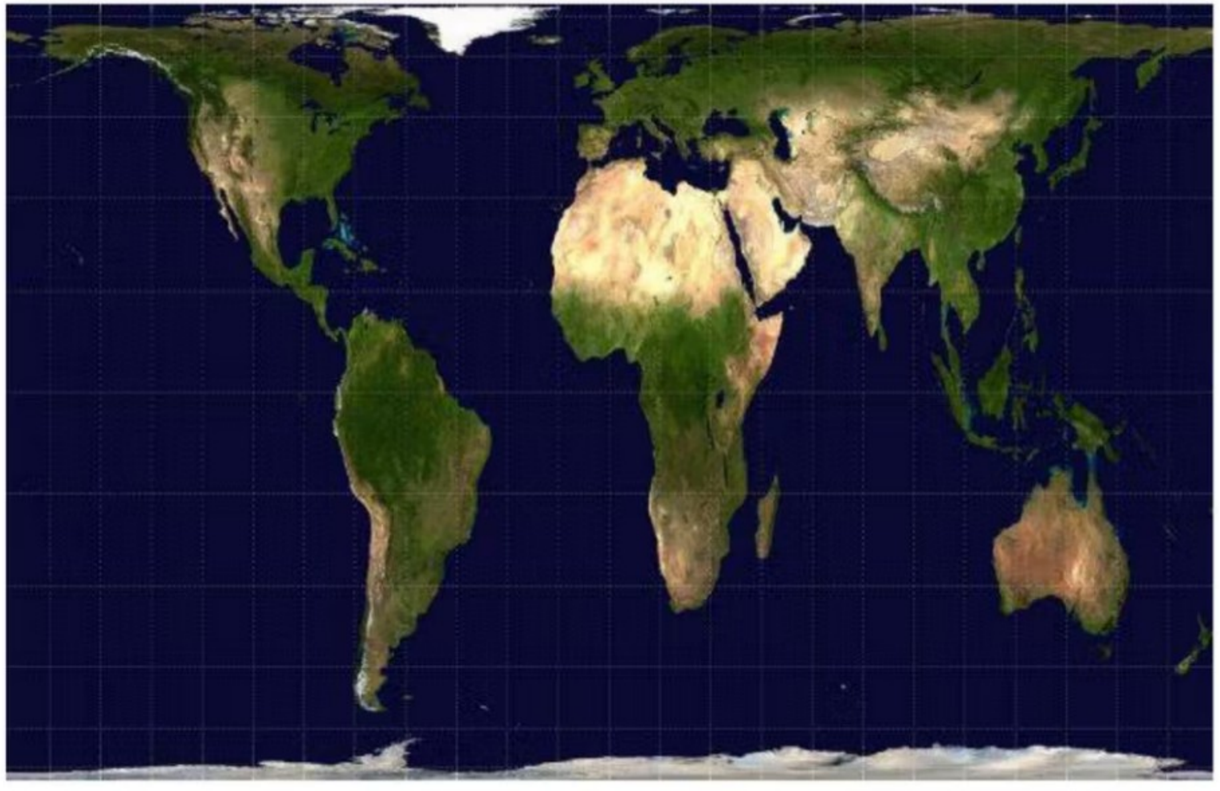
Cylindrical

Conical

Planar

Web Mercator vs Gall-Peter Projection





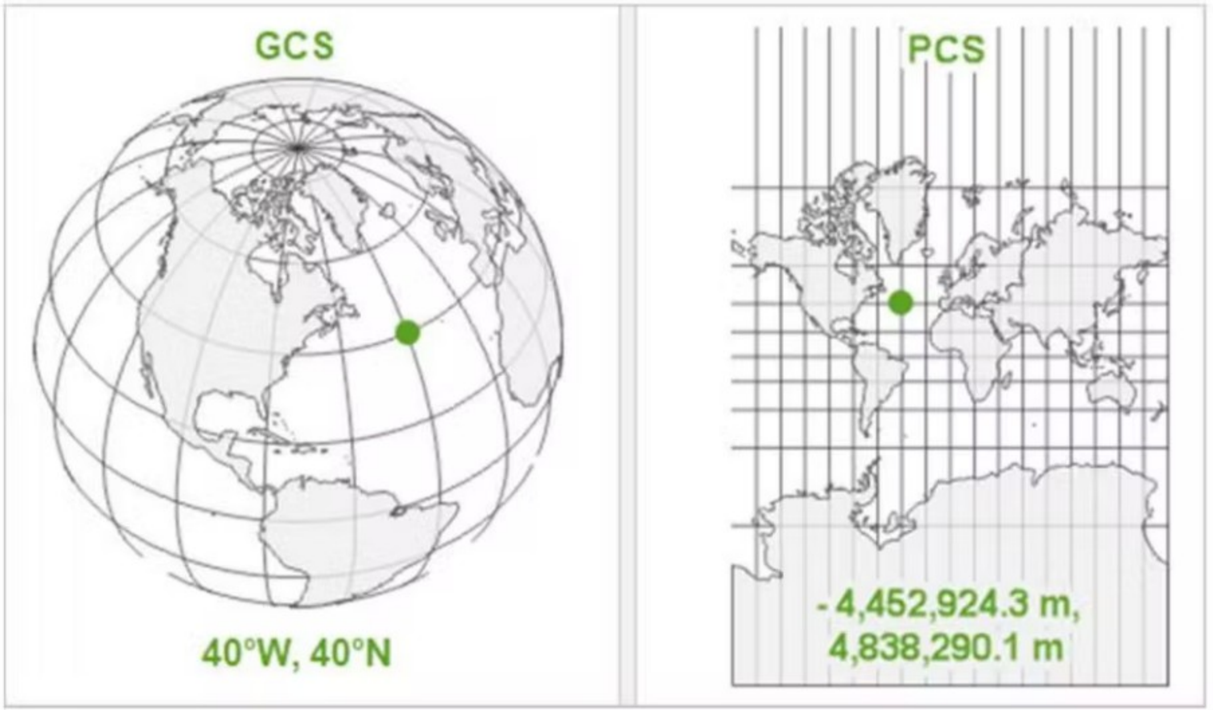
Coordinate Reference Systems (CRS)

- The move from the 3D to the 2D is done with the help of CRS
- Every place on earth is specified by three numbers (i.e. coordinates)
  - Latitude, longitude and Altitude

CRS continued…

There are two Main CRS:

Geographic Coordinate System vs **Projected Coordinate Systems**



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Any Questions….

What are the main challenges of mapping crime data?

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- Geomasking and geoprivacy
- The accuracy of police recorded statistics
  - The grey figure of crime
  - Conceptual issues surrounding its definitions of crime types
  - The impacts of seasonality; how has Covid-19 affected police recorded crime statistics

Can you think of anymore?

What are the main challenges of mapping crime data?

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Modifiable Area Unit Problem

crime reporting is not consistent

Selective reporting to the police

differential definitions/understandings of crimes between police forces

The location in which the crime occurred may not be fully accurate

lack of details - just major categories

definitions of crimes differ between different countries

event codification problems/changes

Behavioural crime is recorded in addition to the most serious other offence, so can result in multiple points being mapped from a single incident, on occasion

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What are the main challenges of mapping crime data?

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Segregating certain areas from crime mapping, creating overpoliced areas. Affecting police and community relationships?

Getting the XY coordinate where the crime is happen.

plotting information that adds value being shown on a map (e.g. plot of shoplifting shows where shops are, plots of road accidents shows where roads are)

high crime areas often have more police presence, meaning more reported crimes. people often (falsely) assume that police presence is equal across a whole city, meaning that data is misinterpreted

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Any Questions…

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References

- https://blog.ukdataservice.ac.uk/gis-spatial-data/
- Dermanis (2005) : https://www.researchgate.net/profile/Athanasios-Dermanis/publication/233387161_Coordinates_and_Reference_Systems_in_Greek/links/0912f50a149d9568b7000000/Coordinates-and-Reference-Systems-in-Greek.pdf
- Luc Anselin (2009) : https://link.springer.com/chapter/10.1007/978-3-642-03647-7_5
- Ratcliffe (2009) Spatial and Temporal Challenges: https://link.springer.com/chapter/10.1007/978-0-387-77650-7_2
- Bowers (2001) Mapping and Analysing Crime Data : https://link.springer.com/chapter/10.1007/978-0-387-77650-7_2

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Material for Tomorrow….

GitHub:

https://github.com/UKDataServiceOpen/Crime_Data_in_R

(under the June_2022 folder)

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Survey

- When you leave the webinar, please complete our short survey
- Just click on ‘continue’ to access the survey.

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Thank You.

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