Final Project Prospectus

Title: Final Project Prospectus – UK Drought Susceptibility Analysis
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Project Repository: *https://github.com/cart0588/GIS5571/tree/main/FinalProject*
Google Drive Link:
https://drive.google.com/drive/folders/1UlYr4rCIogWDVgbKYHuXL1qjsAAqICRE?usp=sharing
Time Spent: *2*

Abstract

Climate change is a global threat, but susceptibility to various natural hazards and disasters varies significantly by country and region. This project will assess historical precipitation data across the UK to evaluate regional drought susceptibility in geographic and temporal terms.

I will use UK Met Office precipitation data from 1991-2020 to construct a nationwide trend model for precipitation. Regions will be defined by hydrological standard regions from the UK Centre for Ecology and Hydrology. Data and calculated trends will be compared to the UK CEH's Standardised Precipitation Index.

This project will provide insight into changing precipitation patters across the UK, and will attempt to map drought susceptibility nationwide.

Problem Statement

As our planet's climate changes, specific nations and regions are going to face specific problems and threats. Over the summer of 2022, the United Kingdom was faced with a near-nationwide drought and heatwave of unprecedented severity (Rhoden-Paul, 2022). The reasons for this are complex and multifaceted; this project will attempt to use nationwide historical precipitation data from the UK Meteorological Office to discern trends in precipitation over time and to make assessments about regional drought susceptibility.

Table 1. Requirements for analysis

#	Requirement	Defined As	(Spatial) Data	Attribute Data	Dataset	Preparation
1	Rainfall data	Raw input dataset from UK Met Office	Rainfall data on a 2km grid across the UK	Precipitation	UK Met Office Climate Data Portal	TBD
2	Drought susceptibility	TBD; more research required		Drought susceptibility		TBD
3	Precipitation projections	TBD; more research required. Compared to Met Office Data		Projected precipitation	UK Met Office Climate Data Portal	TBD

Input Data

The raw data used for this project will be raw precipitation data across the United Kingdom at a 2km grid level. This data will be downloaded, prepared and analyzed to produce historical trends in precipitation at a national and

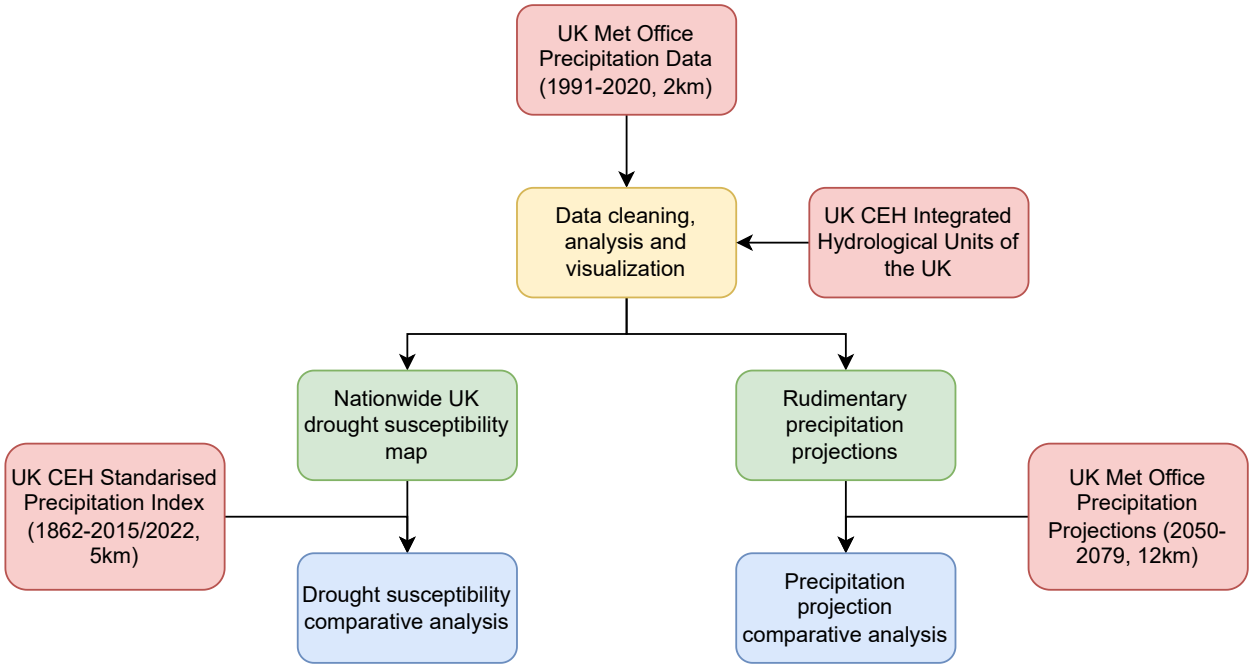
regional level. This data will also be used to create rudimentary projections on future precipitation levels, which will be compared to the Met Office's official monthly precipitation projections for 2050-2079 at a 12km grid level.

Historical data will be used to produce a drought susceptibility map of the UK, which will be compared and contrasted with the UK Centre for Ecology and Hydrology's Standardised Precipitation index 5km grid data from 1862-2015. Additional data is available for visualization up to July 2022. This data provides a qualitative assessment of 'dryness' at a 5km grid resolution across the UK.

Table 2. Expected data sources

#	Title	Purpose in Analysis	Link to Source
1	Monthly Precipitation Observations 1991-2020	Raw 2km grid input dataset for rainfall analysis from UK Met Office	UK Met Office Climate Data Portal
2	Monthly Precipitation Projections 2050-2079	Comparative analysis of future rainfall patterns at a 12km grid	UK Met Office Climate Data Portal
3	Standardised Precipitation Index 5km Grid (1862-2015)	Comparative analysis of drought and precipitation levels	UK Centre for Ecology and Hydrology Environmental Information Data Centre
4	Integrated Hydrological Units of the United Kingdom	Hydrological region maps of the UK	UK Centre for Ecology and Hydrology Environmental Information Data Centre

Methods



Results

The results will include a drought susceptibility map and a comparative analysis of precipitation projections over time. I hope to present these data in a StoryMap format to maximize audience engagement and accessibility. I will also provide all code and workflows on GitHub or Google Drive, as appropriate.

Results Verification

Data will be compared to the following data sources:

- UK Centre for Ecology and Hydrology's 5km Standard Precipitation Index data, available from December 1961 to July 2022 (Barker et al., 2016) (Svensson et al., 2017)
  - *https://eip.ceh.ac.uk/droughts*
- UK Met Office monthly 12km precipitation projections 2050-2079 (UK Met Office, 2021)
  - *https://climate-themetoffice.hub.arcgis.com/datasets/TheMetOffice::monthly-precipitation-projections-2050-2079/about*

Discussion and Conclusion

I hope that this project will provide insight into how precipitation patterns across the UK have changed over the last several decades. I hope that my drought susceptibility map

I hope that this project increases my confidence interacting with APIs and bolsters my understanding geospatial data science as a workflow or pipeline. I am also excited to get stuck back into Python across the course of the semester and the project.

I'm looking forward to making tangible progress with this project and I'm excited to see what other projects my colleagues embark on.

References

Barker, L. J., Hannaford, J., Chiverton, A., & Svensson, C. (2016). From meteorological to hydrological drought using standardised indicators. *Hydrology and Earth System Sciences*, *20*(6), 2483–2505. https://doi.org/10.5194/hess-20-2483-2016

Rhoden-Paul, A. (2022, September 1). Heatwave: England has had joint hottest summer on record, Met Office says. *BBC News*. https://www.bbc.com/news/uk-62758367

Svensson, C., Hannaford, J., & Prosdocimi, I. (2017). Statistical distributions for monthly aggregations of precipitation and streamflow in drought indicator applications. *Water Resources Research*, *53*(2), 999–1018. https://doi.org/10.1002/2016WR019276

UK Met Office. (2021, November 5). *Monthly Precipitation Projections 2050-2079*. https://climate-themetoffice.hub.arcgis.com/datasets/TheMetOffice::monthly-precipitation-projections-2050-2079/explore

Self-score

Category	Description	Points Possible	Score
Structural Elements	All elements of a lab report are included **(2 points each)**: Title, Notice: Dr. Bryan Runck, Author, Project Repository, Date, Abstract, Problem Statement, Input Data w/ tables, Methods w/ Data, Flow Diagrams, Results, Results Verification, Discussion and Conclusion, References in common format, Self-score	28	**28**
Clarity of Content	Each element above is executed at a professional level so that someone can understand the goal, data, methods, results, and their validity and implications in a 5 minute reading at a cursory-level, and in a 30 minute meeting at a deep level **(12 points)**. There is a clear connection from data to results to discussion and conclusion **(12**	24	**24**

	points).		
Reproducibility	Results are completely reproducible by someone with basic GIS training. There is no ambiguity in data flow or rationale for data operations. Every step is documented and justified.	28	**28**
Verification	Results are correct in that they have been verified in comparison to some standard. The standard is clearly stated **(10 points)**, the method of comparison is clearly stated **(5 points)**, and the result of verification is clearly stated **(5 points)**.	20	**20**
		100	**100**