CAIE Geography Pre-U

4: Research Project

Detailed Notes

Example of a research project- Microclimates

This research project is an investigation into the changes in temperature and wind speed in upland areas. Use this as a guide for your research project.

Hypothesis

As altitude increases, temperature decreases and wind speed increases.

The area of investigation

The field study centre in which this investigation was carried out at had **specialist equipment** which allowed accurate measurements to be taken. It was carried out in the Lake District and the upland area had an elevation of 415m and was of **public access**. The land was mainly used for grazing pasture with areas of woodland. This meant there were few roads or buildings which would have influenced the readings.

Risks

There was a **falling or slipping** risk which meant that suitable footwear such as walking boots were needed. There was a risk of getting **lost**, although the path was relatively simple and keeping regular check on the map and GPS would reduce the risk. The **weather conditions** could have deteriorated and so having appropriate clothes such as waterproofs were needed and the weather forecast was checked before the investigation.

Sampling

Systematic sampling was carried out which is where measurements are taken at a set interval along a transect. For this investigation, measurements were taken every 20m from 200m to 400m in altitude.

Data collection

A **pilot study** was carried out beforehand which allowed various pieces of equipment to be tested. This allowed certain instruments to be discarded as they were not as accurate or were not appropriate. For example, the whirling psychrometer was not accurate for measuring temperature and its other function was to measure humidity which was not needed as humidity was not a factor being measured.

An **anemometer** was used to measure wind speed and a **probe thermometer** for temperature. Both instruments should be held high in the air by the same person and should be held for 30s before taking a reading to ensure they are **calibrated** and all the readings are consistent. 3 readings at each site were taken and an **average** taken. Limitations of these readings would be if different people were taking these readings, any obstructions, the time limit which meant only one sample at one time could be taken, changing weather conditions throughout the experiment and having to follow a path rather than walking in a straight line. Having multiple people standing at the intervals and then taking the readings at the same time or taking readings on the way up and the way down would have been more accurate and reliable.

A **GPS** was also used to measure the altitude to ensure the readings were taken at 20m intervals and to measure the latitude and longitude so that the data could be plotted using ArcGIS.

Secondary data was also collected to prepare for the investigation. Using **Google Earth** and **Digimaps** allowed a transect to be selected which was of a manageable size, showed a significant change in height and was accessible. The annual temperature for the area and the weather forecast were also looked at before the investigation. For this investigation there was no secondary data on the variables tested as the scale was so small.

Presentation of results

As the data was collected, **photos** of the area were also taken. This provided a context to the investigation and also allowed reasons for any anomalies to be seen such as trees or rocks. The data was plotted on a **scatter graph** and a **line of best fit** drawn. This allowed a representation of the whole data set, could be used to identify **outliers** and identify the **correlation**. However, the accuracy of the line of best fit is prone to **human error** and it is hard to identify the location of individual data points.

The data was also plotted using a software programme known as **ArcGIS**. This plots the data onto a map. It can allow the accurate location of the temperature and wind data to be plotted using bar charts along the transect. However, due to cloudy conditions on the day of the investigation, the GPS was not accurate for latitude and longitude so the plotting on ArcGIS was not accurate.

The **Spearman's Rank** test was also used to show a quantitative value to how strong the correlation is and how likely the correlation is due to chance. For this experiment the Rs value for wind was 0.65 which shows a strong positive correlation with a 95% significance level which means that the correlation is only 5% due to chance. The Rs value for temperature was -0.9965 which shows a very strong negative correlation with a 99% significance level which means that the correlation is only 1% due to chance. The issue with Spearman's rank is that is includes anomalies and so should be used with other data presentation methods.

Conclusion

A strong positive correlation between wind speed and altitude was shown. A strong negative correlation between temperature and altitude was shown.

These results supported the hypothesis and shows that temperature decreases with altitude and wind speed increases with altitude. There were anomalies at 378m due to it being completely sheltered which led to the wind speed only being 0.4m/s compared with 8.1m/s 20m below. The weather conditions, time of the year and any human factors such as woodland clearance could affect the results.

Evaluation

Need to reflect critically on the **strengths and limitations** on all parts of the investigation from the primary and secondary data collected to the conclusions drawn.

The investigation could have been carried out at another site to enable comparison this is known as **spatial variation**. It could have been carried out at a different time of the year which is known

as **temporal variation**. Other variables such as land use and wind direction could also be taken into account.