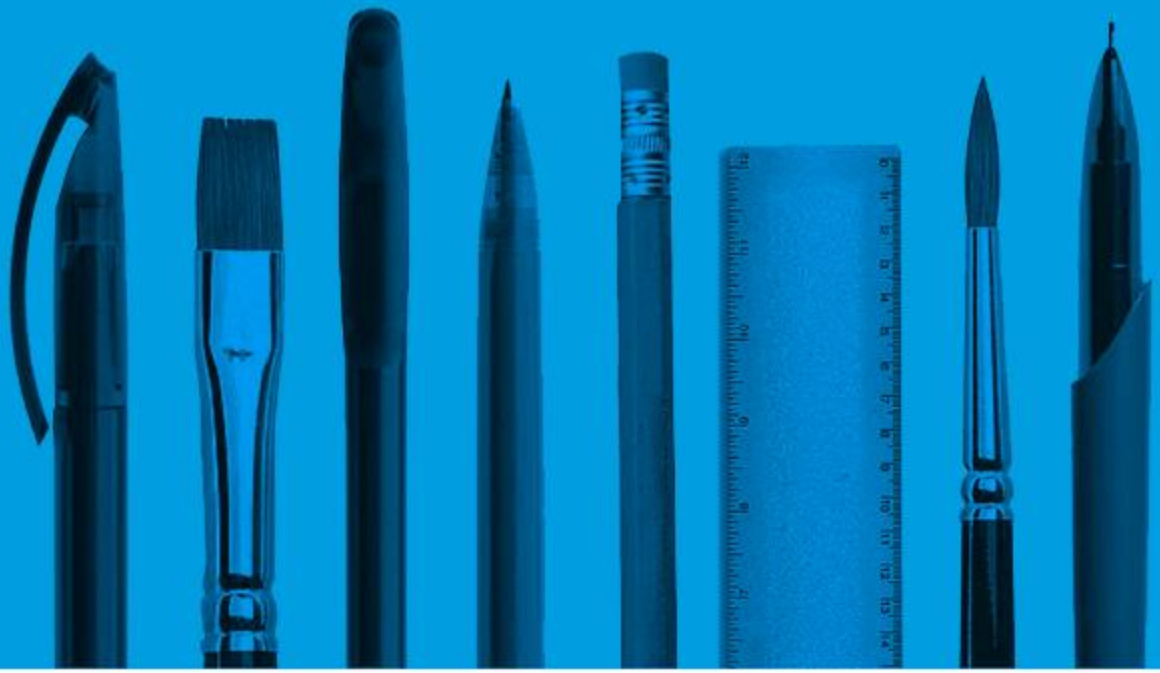
Data and statistical skills for GCSE

Bob Digby

Spring 2017



wjec cbac

Core Themes covered today

1. Landscapes & physical processes
   - Using geographical skills – the Welsh landscape
2. Rural-urban links
   - Urban issues in constrasting global cities
   - Rural-urban migration
3. Weather, Climate and Ecosystems
   - Climatic hazards
   - Global circulation model
4. Development and Resource Issues

1 Numeracy

Types of skills that must be developed	Specific techniques required
Numerical and statistical skills	
1 Numerical skills 1.1 Demonstrate an understanding of number, area and scale and the quantitative relationships between units.	*Calculate distance from maps using the scale line and estimate area. Use quantitative statements when describing relationships revealed by tables of data or graphs.*
1.2 Design fieldwork data collection sheets and collect data with an understanding of accuracy, sample size and procedures, control groups and reliability.	Sample using random, systematic, opportunistic and/or stratified techniques. Use fieldwork equipment to obtain accurate and reliable results *(for example, the use of clinometer or quadrats)*. Make sketch maps and field sketches to present and interpret data.
1.3 Understand and correctly use proportion and ratio, magnitude and frequency.	*For example, 1:200 flood; and logarithmic scales such as the Richter scale, in orders of magnitude.*
1.4 Draw informed conclusions from numerical data.	*Use tables of data to draw evidenced conclusions about spatial or temporal patterns (for example, from Office of National Statistics).*

2 Statistics

2 Statistical skills 2.1 Use appropriate measures of central tendency, spread and cumulative frequency.	Median, mean, range, quartiles and inter-quartile range, mode and modal class.
2.2 Calculate percentage increase or decrease and understand the use of percentiles.	*For example, calculate percentage increase/decrease in population from a line graph or table of data. Draw a histogram of a normal/skewed distribution and use it to calculate percentiles.*
2.3 Describe relationships in bivariate data.	Sketch trend lines through scatter plots; draw estimated lines of best fit. Interpret evidence to make predictions. Interpolate and extrapolate trends on a line graph.
2.4 Identify weaknesses in selective statistical presentation of data.	Identify limitations *(for example, in the interpretation of a scatter graph).*

3 Cartographic

Presentation and processing skills	
3.1 Cartographic skills 3.1 Use and understand gradient, contour and spot height on OS maps and other isoline maps.	Interpret and analyse atlas maps at different scales, topological maps, OS maps at 1:50,000 and 1:25,000 scales, isoline maps (*for example, weather charts, ocean bathymetric charts*), maps with proportional symbols, weather (synoptic) charts.
3.2 Interpret cross sections and transects.	Interpret cross sections *(for example, that show relief)* and transects *(for example, through the zones of a sand dune or across an eroded footpath)*.
3.3 Use and understand coordinates, scale and distance.	Give 4 and 6 figure grid references. Measure distance accurately and estimate area from maps (including from O.S maps at a scale of 1:50,000 and 1:25,000).
3.4 Describe and interpret geo-spatial data presented in a GIS framework.	Describe location, distribution and other spatial patterns as shown on a screen shot from a GIS *(for example, Office of National Statistics or analysis of flood hazard using the interactive maps on the Environment Agency website)*.

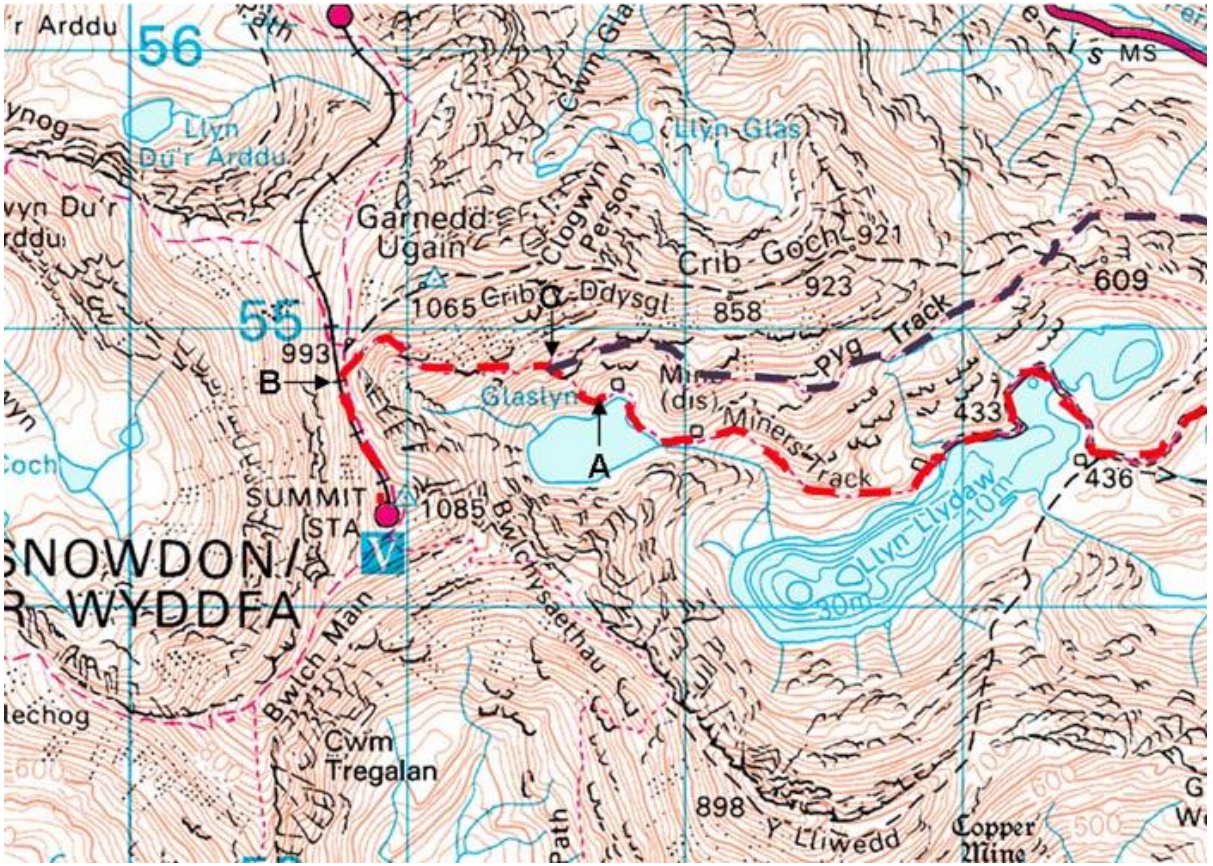
4 Graphical

4 Graphical skills 4.1 Select and construct appropriate graphs and charts to present data, using appropriate scales.	Bar and line charts (to include climate charts and hydrographs), pie charts, pictograms, histograms with equal class intervals, star and radial graphs, kite diagrams, triangular graphs, dispersion graphs and scatter graphs.
4.2 Interpret and extract information from different types of graphs. Interpret different graphs to identify patterns and trends.	*See the techniques listed above for 4.1.*
4.3 Interpret population pyramids, choropleth maps and flow-line maps.	Interpret population pyramids *(for example, displaying both absolute and percentage figures)* Choropleth maps *(for example, those showing variations in economic development)* Flow-line maps with proportional arrows *(for example, showing migration, tourism or traffic flows).*

Distinctive landscapes in Wales – skills opportunities 1

Field sketching of upland glaciated landscape features

Distinctive landscapes in Wales: skills opportunities 2

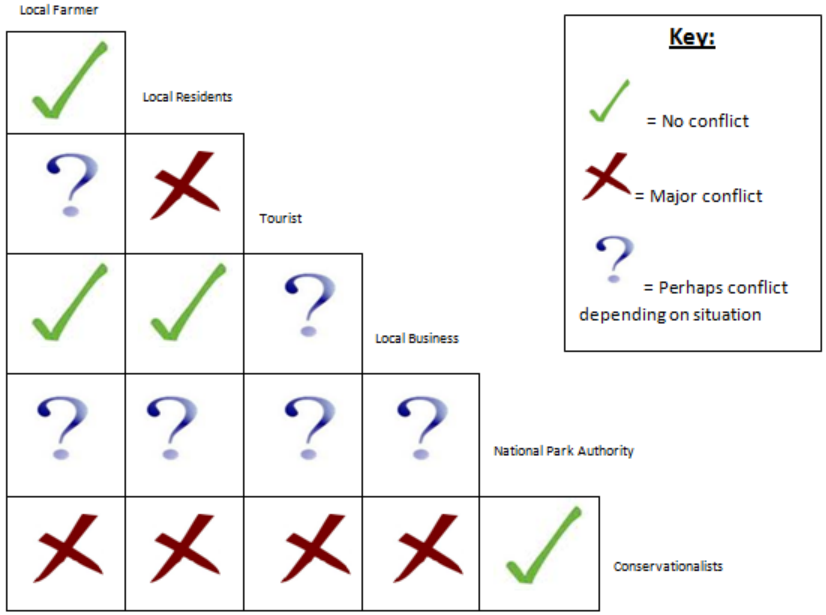


- Using directions
- Measuring scale and distance
- Identifying suitable areas for: Hill walking or Rock climbing
- Identifying where tourists might be at risk, and why
- Calculating height gained /lost by following a particular footpath

Distinctive landscapes in Wales: skills opportunities 3

		Development/ exploitation						Conservation/ recreation				
		Sheep and deer farming	Forestry	Quarrying	Reservoirs	Military training	Wind turbines	Riding	Walking and climbing	Hunting and shooting	Photography and filming	Wildlife conservation
Conservation/recreation	Wildlife conservation											
	Photography and filming											
	Hunting and shooting											
	Walking and climbing											
	Riding											
Development/exploitation	Wind turbines											
	Military training											
	Reservoirs											
	Quarrying											
	Forestry											
	Sheep and deer farming											

Key
- No conflict
- Some conflict
- Strong conflict



The environmental challenges created by human activity in one distinctive landscape

Urban issues in contrasting global cities:
Integrating geographical skills

Urban issues in contrasting global cities:
Integrating geographical skills

E.g. Focus on Mumbai

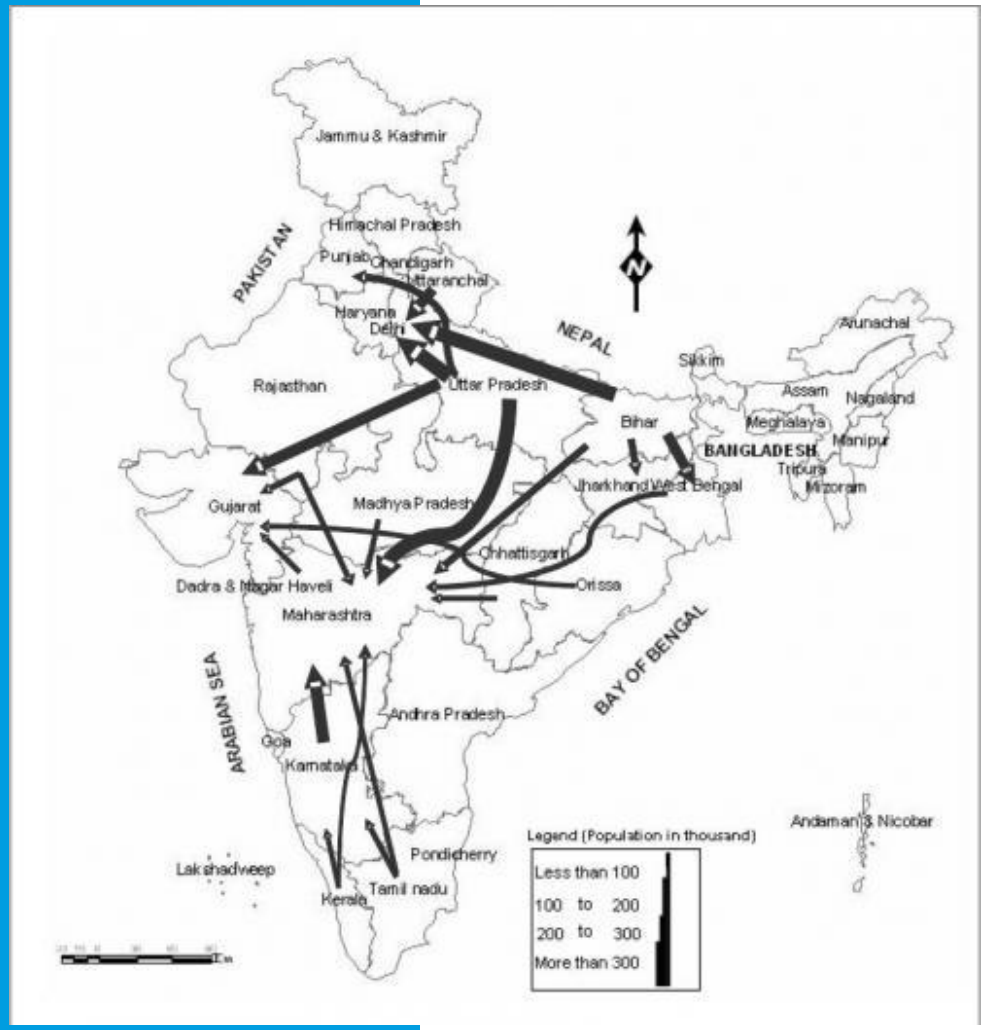
- Use and interpretation of line graphs/bar charts showing population change.
- Use and interpretation of flow maps showing migration patterns.
- Using images and data to describe variations in quality of life

Geographical skills – Mumbai 1

Year	Millions population
1951	2.97
1961	4.15
1971	5.97
1981	8.23
1991	12.5
2001	16.37
2015	25 (est)

Source of photo: http://www.bordermovement.com/wp-upload/2012/08/dharavi-e1343887950403.jpeg

Geographical skills – Mumbai 2



Select and construct appropriate graphs and charts to present data, using appropriate scales:

- line charts, bar charts, pie charts, pictograms, histograms with equal class intervals, divided bar, scatter graphs, and population pyramids
- suggest an appropriate form of graphical representation for the data provided
- complete a variety of graphs and maps – choropleth, isoline, dot maps, desire lines, proportional symbols and flow lines

Source of map: http://www.migrationpolicy.org/article/internal-labor-migration-india-raises-integration-challenges-migrants

Mumbai 3: using data to identify urban challenges

A walk in Dharavi, by Jim Yardley, New York Times, Dec 28 2011

"*A walk through Dharavi is a journey through a dank maze of ever-narrowing passages until the shanties press together so tightly that daylight barely reaches the footpaths below, as if the slum were a great urban rain forest*

People	
Population of Dharavi	estimated 800,000-1 million
Area	2.39 km^2 (size of London's Hyde Park)
Population density	at least 330 000 people per km^2
No of homes in Dharavi	60 000
People per home	Between 13 and 17
Average size of home	10 m^2 (size of a medium bedroom)
Hygiene and health	
No of toilets in Dharavi	1440
People per individual toilet	625
% women suffering anaemia	75%
% of women with malnutrition	50%
% of women with recurrent gastro-enteritis	50%.
Most common causes of death	Malnutrition, diarrhoea, dehydration, typhoid
Education	
Literacy rate in Dharavi	69% (Mumbai averages 91%)

Source of article: http://www.nytimes.com/2011/12/29/world/asia/in-indian-slum-misery-work-politics-and-hope.html?_r=0

Weather, climate and ecosystems: skills opportunities

- Use and understand coordinates (latitude and longitude) and recognise distributions and patterns
- Select and construct appropriate graphs and charts to present data, using appropriate scales
- Demonstrate understanding of numbers and scales in relation to changing climate and weather trends and patterns
- Use appropriate measures of central tendency, spread and cumulative frequency (median, mean, range, quartiles and inter-quartile range, mode and modal class)
- Calculate percentage increase or decrease and understand the use of percentiles
- Draw informed conclusions from climate data

Geographical skills – the global circulation model 1

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Tresco, Isles of Scilly, 49.5°N

Geographical skills – the global circulation model 1

Tresco, Isles of Scilly, 49.5°N

Averages in January:

- 0 days of snow,
- Night-time temperatures 4°C
- Daytime average 10°C

Geographical skills – the global circulation model 1

Av

-
-
-

Geographical skills – the global circulation 2

http://www.theglobeandmail.com/news/national/in-pictures-st-johns-hit-by-storm/article16196905/

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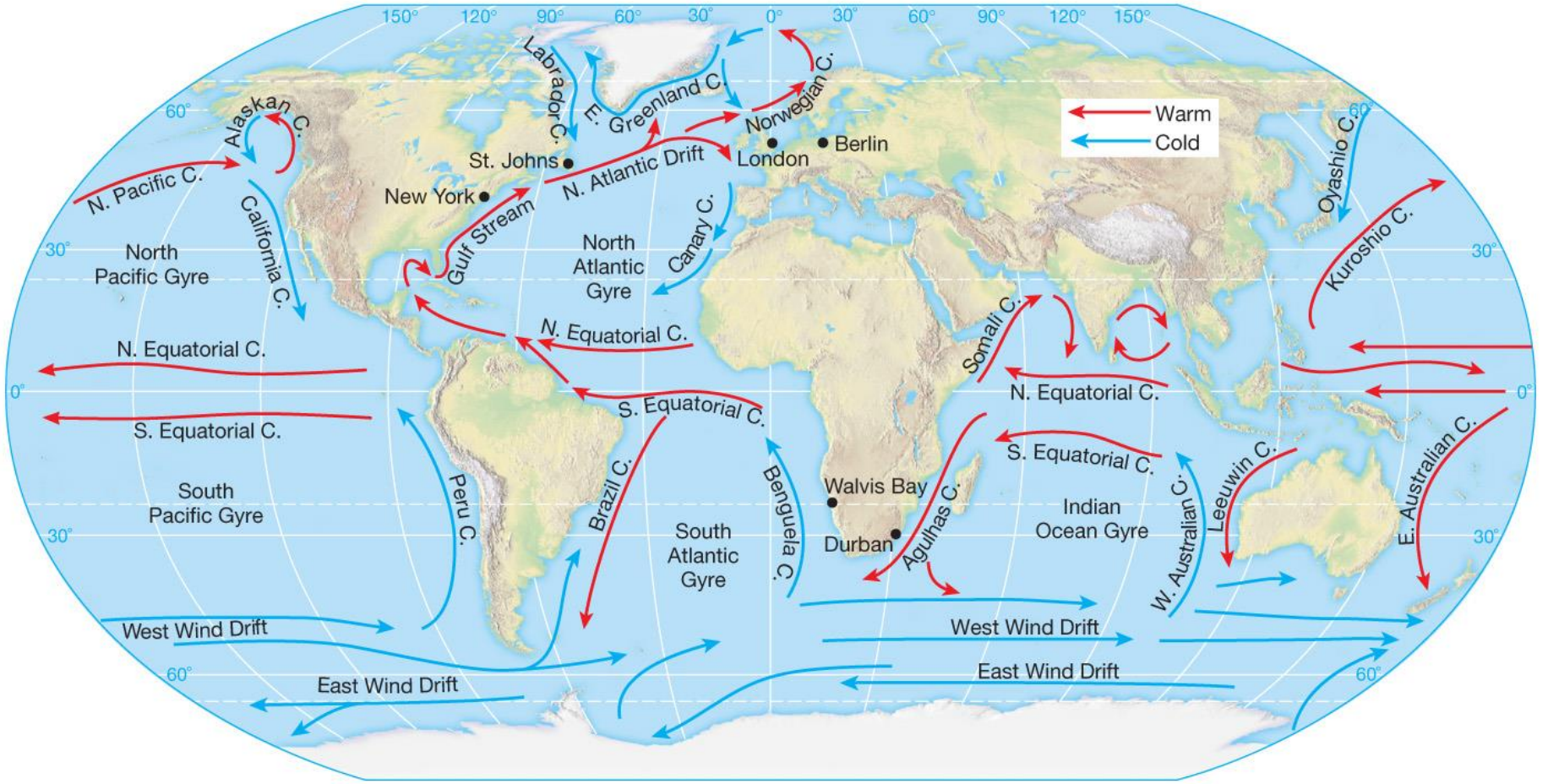
Interpreting ocean currents



Source: http://www.geography.hunter.cuny.edu/tbw/wc.notes/3.temperature/ocean_currents.htm

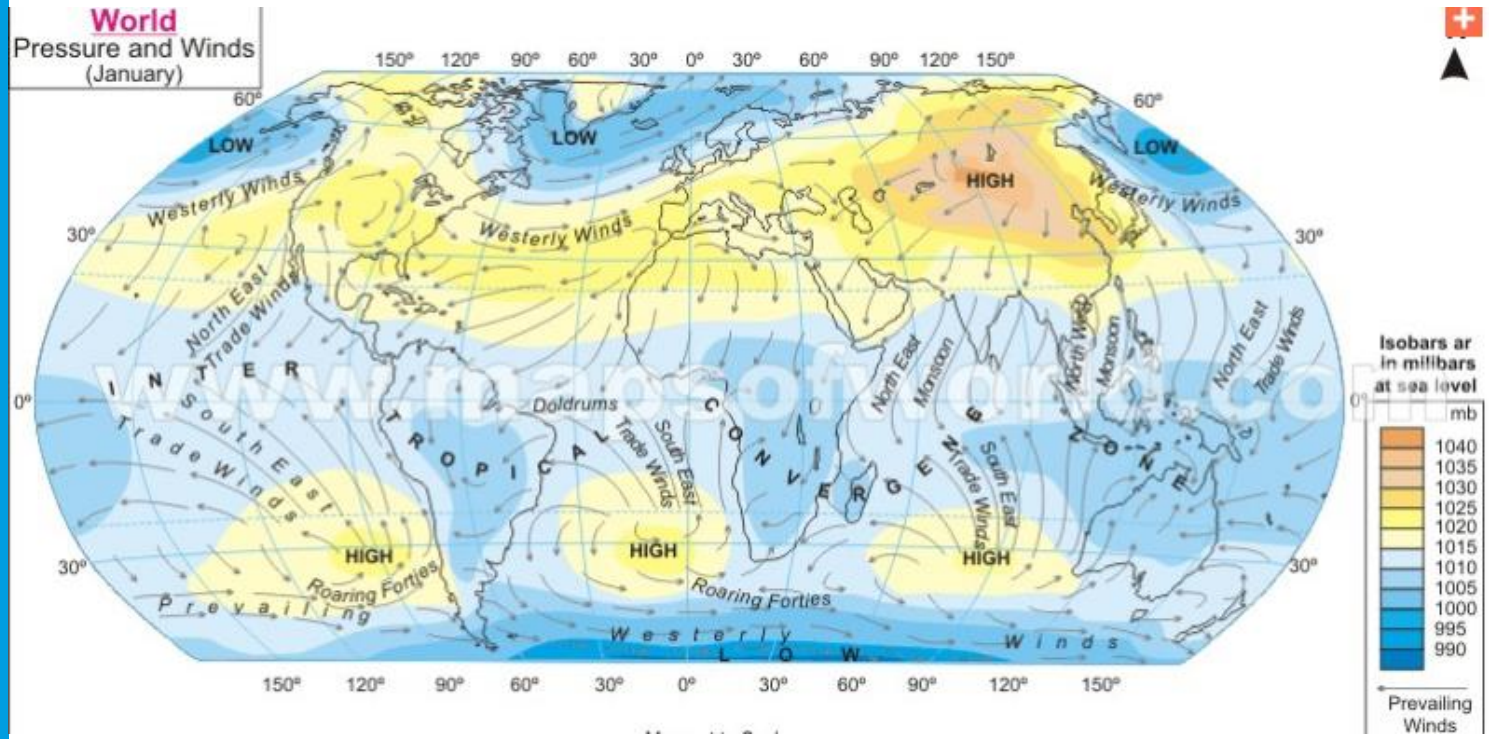
Atmospheric circulation

- Worth watching https://www.youtube.com/watch?v=qh011eAYjAA
- The global circulation redistributes heat from the **Equator** (which would otherwise become unbearably hot) and the **Poles** (otherwise intensely cold).

Heat is redistributed globally in two ways:

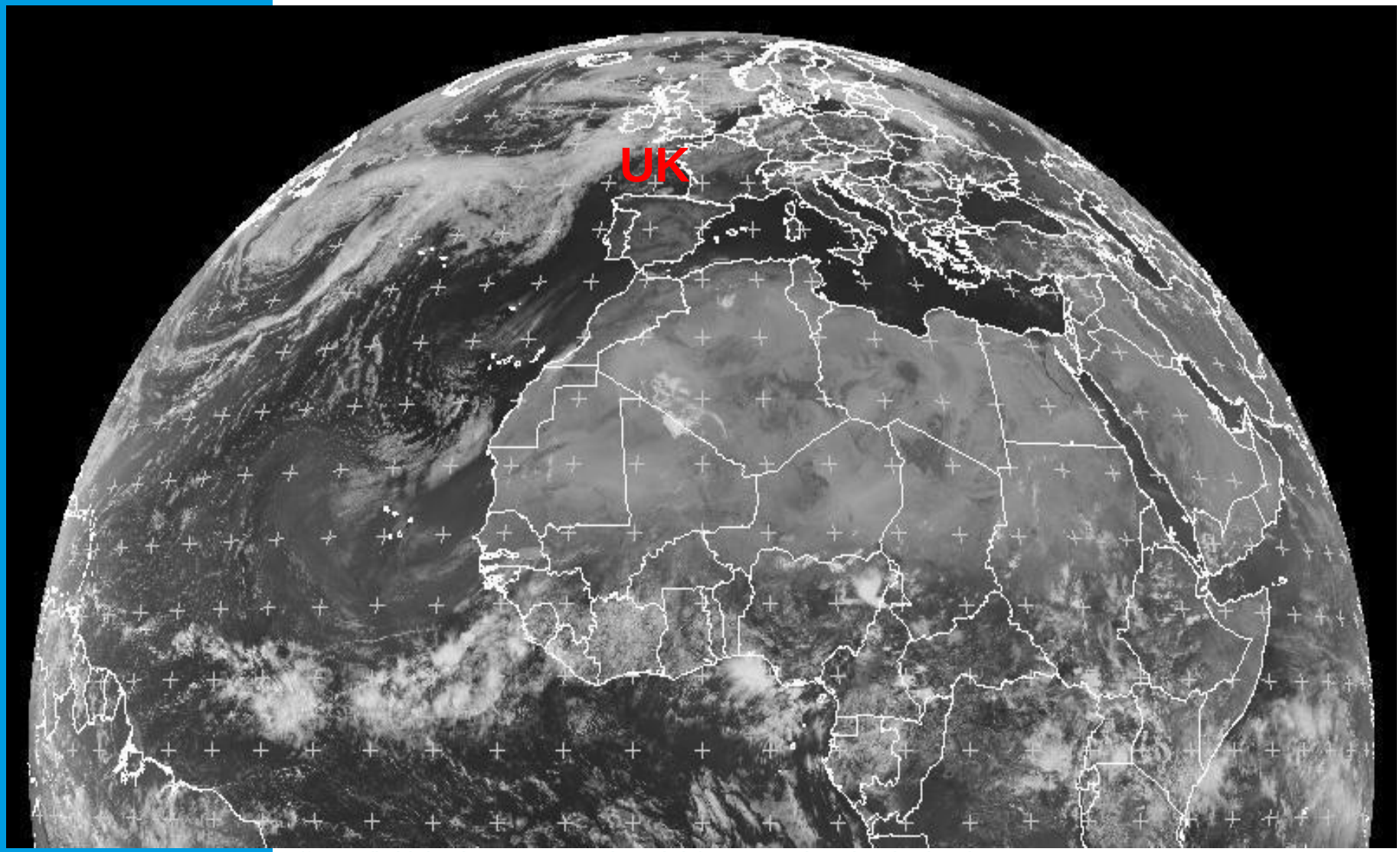
- air movements caused by pressure differences
- ocean currents.

Winds and ocean currents: using atlas maps



Source – http://www.mapsofworld.com/world-maps/wind-and-pressure-jan-enlarge-map1.html

West Africa June 2012



Source: http://www.flyertalk.com/forum/british-airways-executive-club/1349294-ba-cloud-9.html

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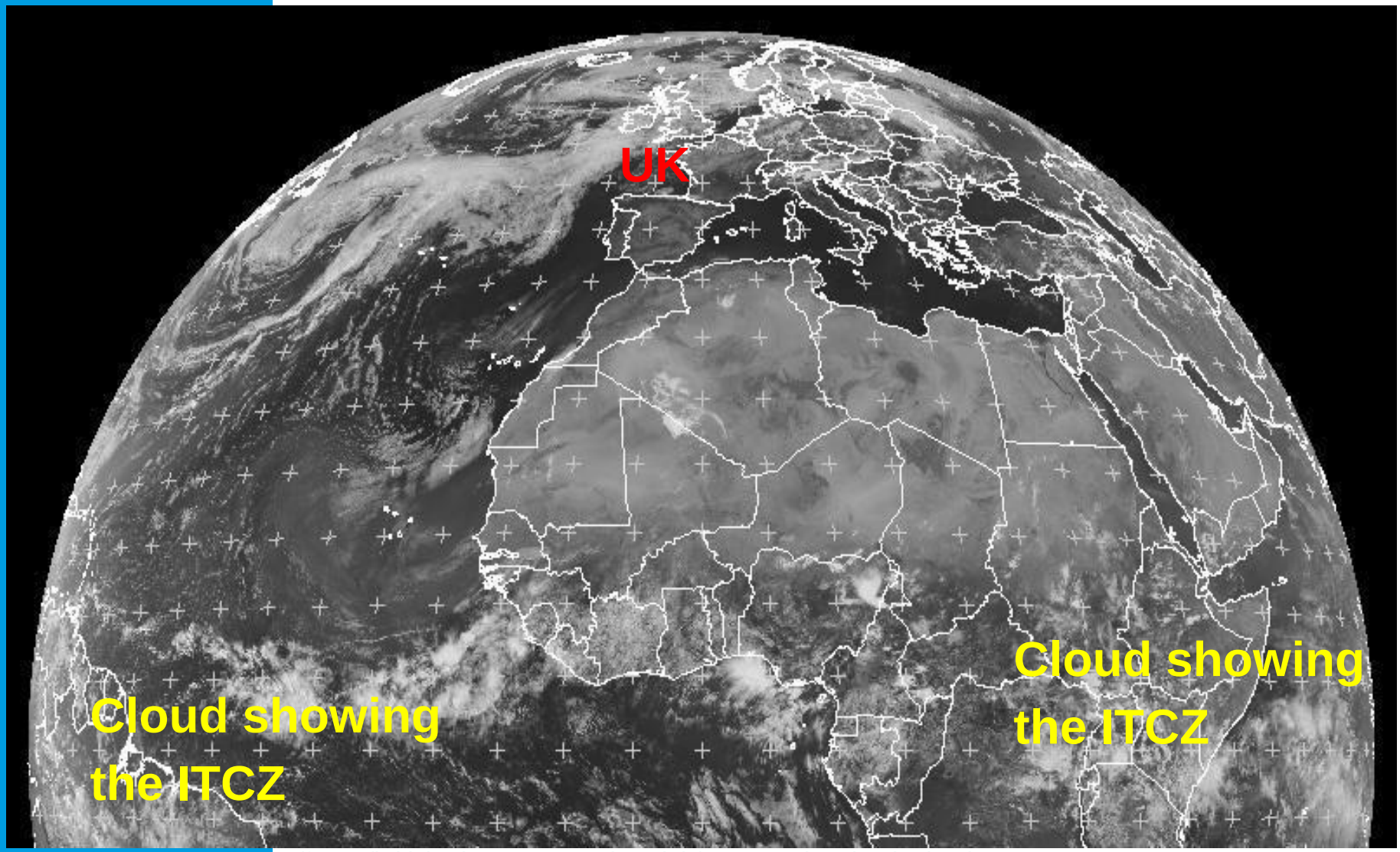

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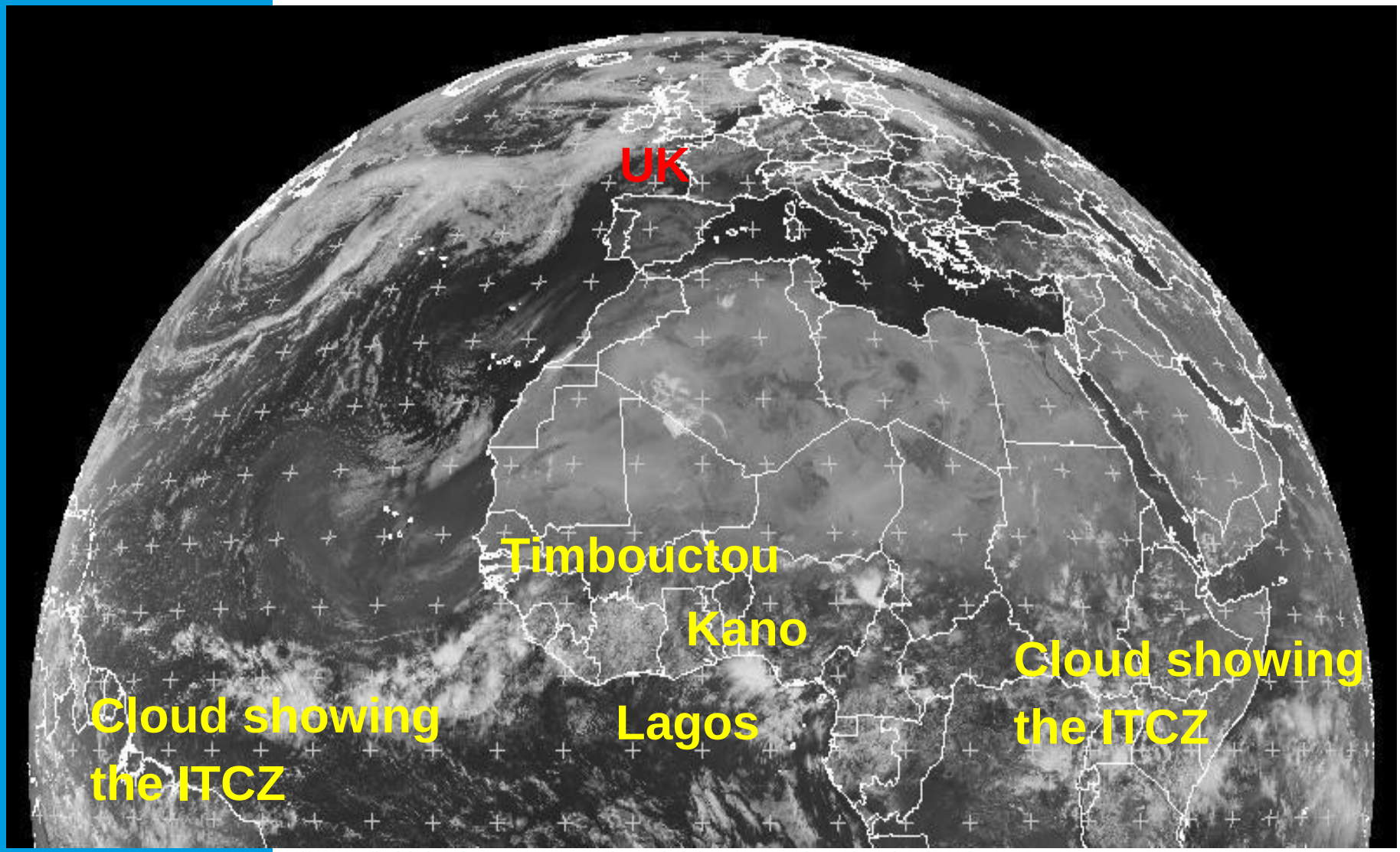

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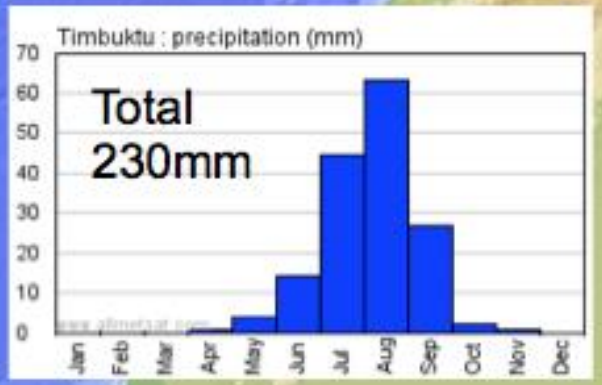
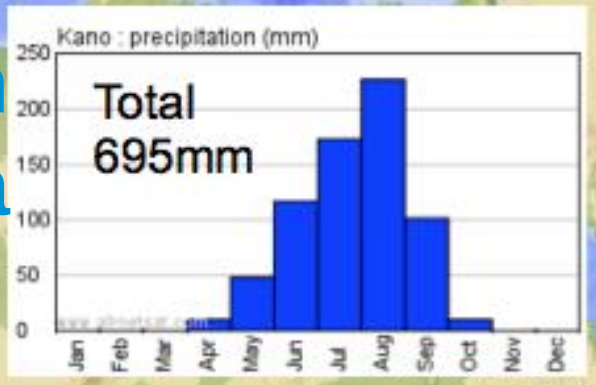
The ITCZ in West Africa





20°N
15°N
10°N

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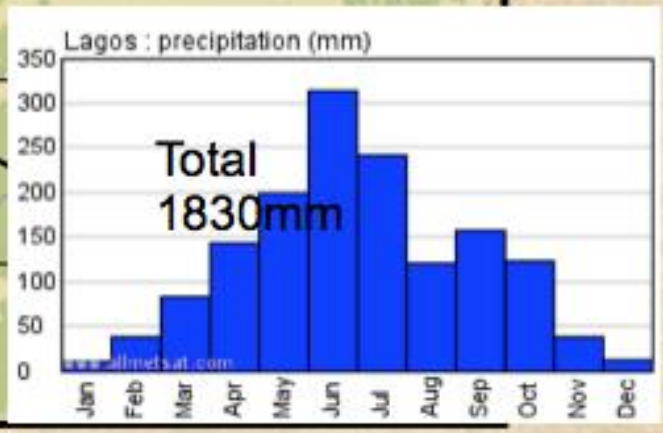
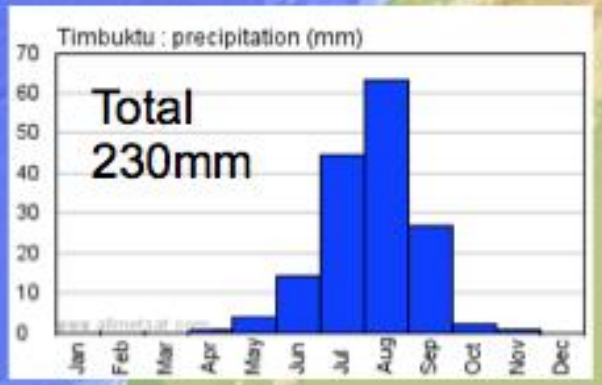
Timbouctou
Late May
Late April
Kano
Early March
1000 Lagos

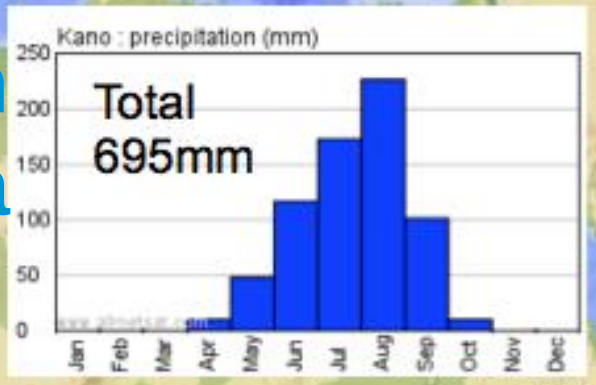


May
250
75

Text in blue shows start of rainy season
Isohyets showing rainfall in mm
Average number of rainy days per year
Towns / cities

The ITCZ in West Africa





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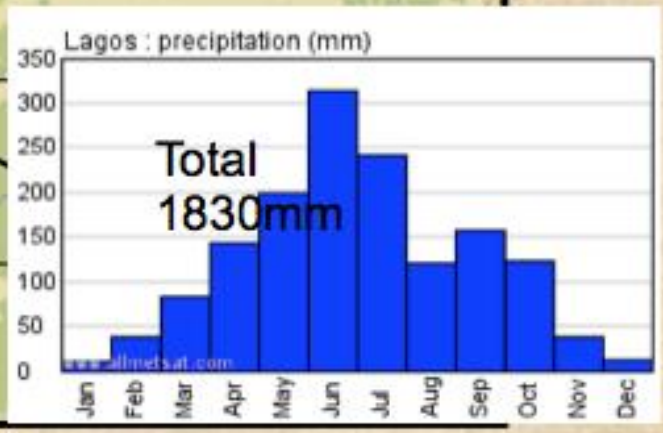
250 — Isohyets showing rainfall in mm

75 — Average number of rainy days per year

Towns / cities



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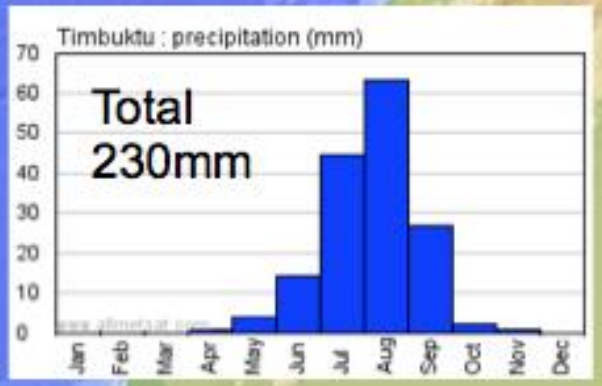

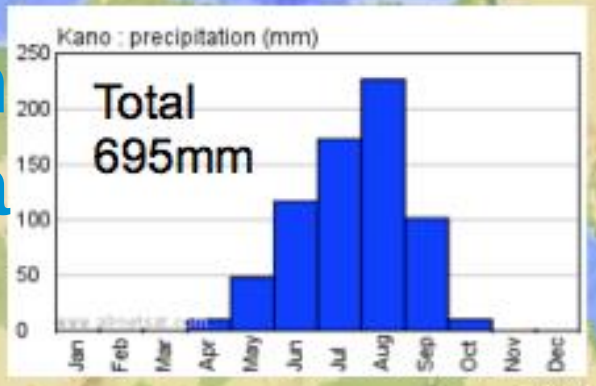

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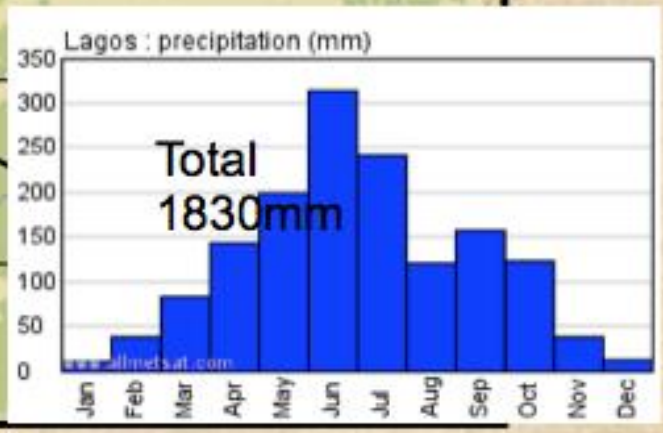

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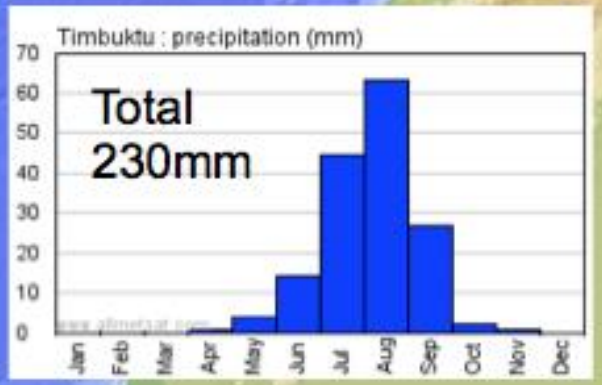

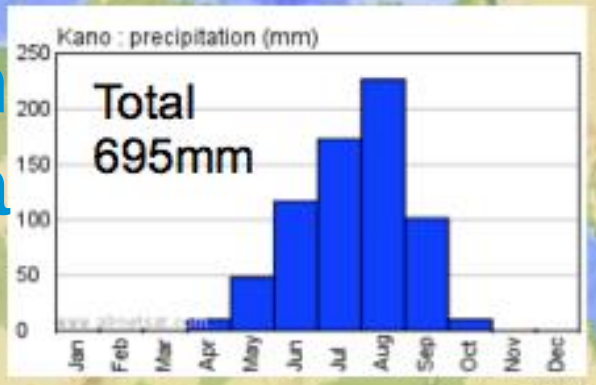

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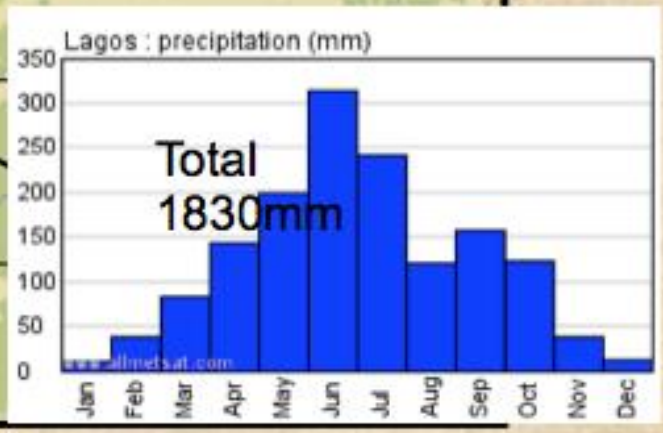

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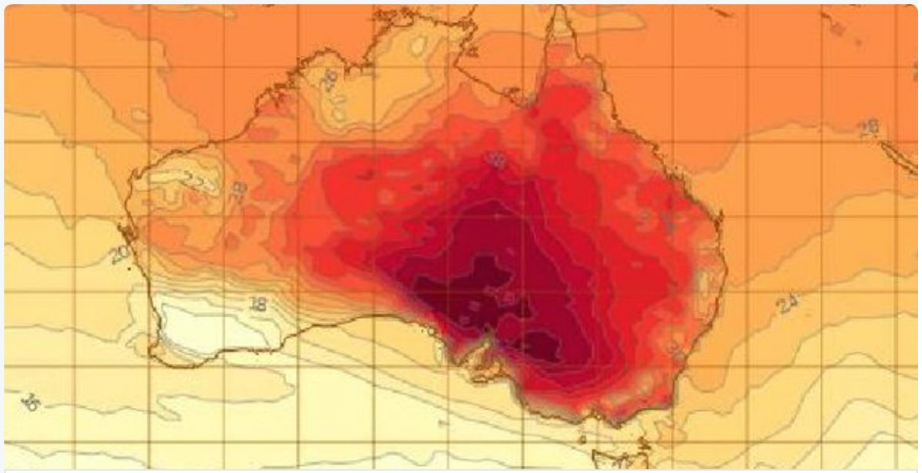
Towns / cities

Changing patterns of drought in Australia



States braced for severe heat, 45C

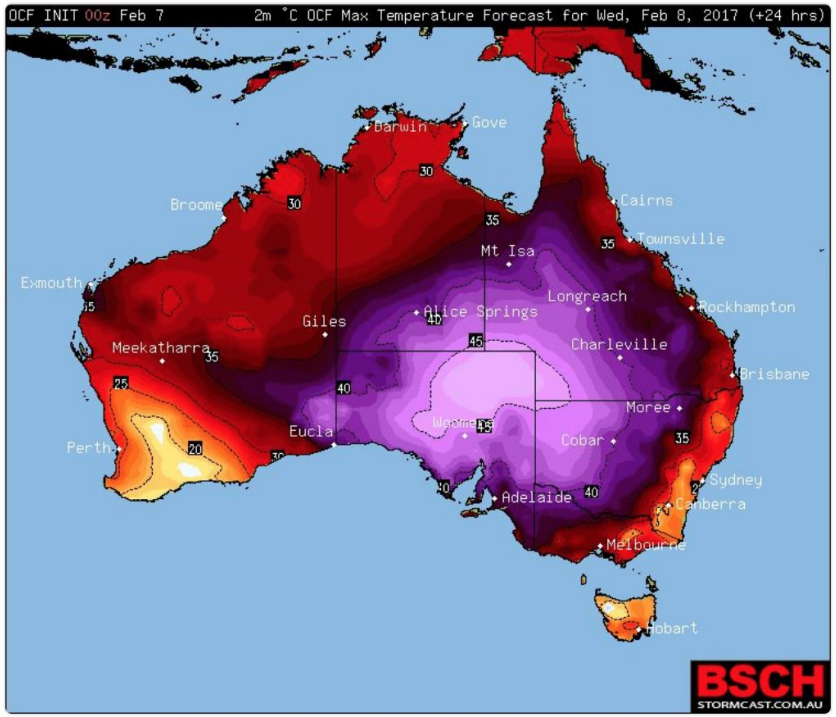
A band of hot air more than 2,000 kilometres wide is expected to sweep across South Australia, Victoria, New South Wales and Queensland, bringing heatwave temperatures…

The Australian Feb 08, 2017

Use social media (especially Twitter) to keep up to date with latest drought events

BossLogic @Bosslogic · 16h

I have seen red being the highest when it comes to **heat** but now we go full serious with purple O_O stay safe **Australia** during this wave



19 29 89

BOM South Australia @BOM_SA · 17h

Today's **heat** broke records; Moomba 46.4°C and Coles Point 43.6°C hottest Feb day on record. Check recent extremes at bom.gov.au/cgi-bin/climat…

2 33 14

Key teaching points

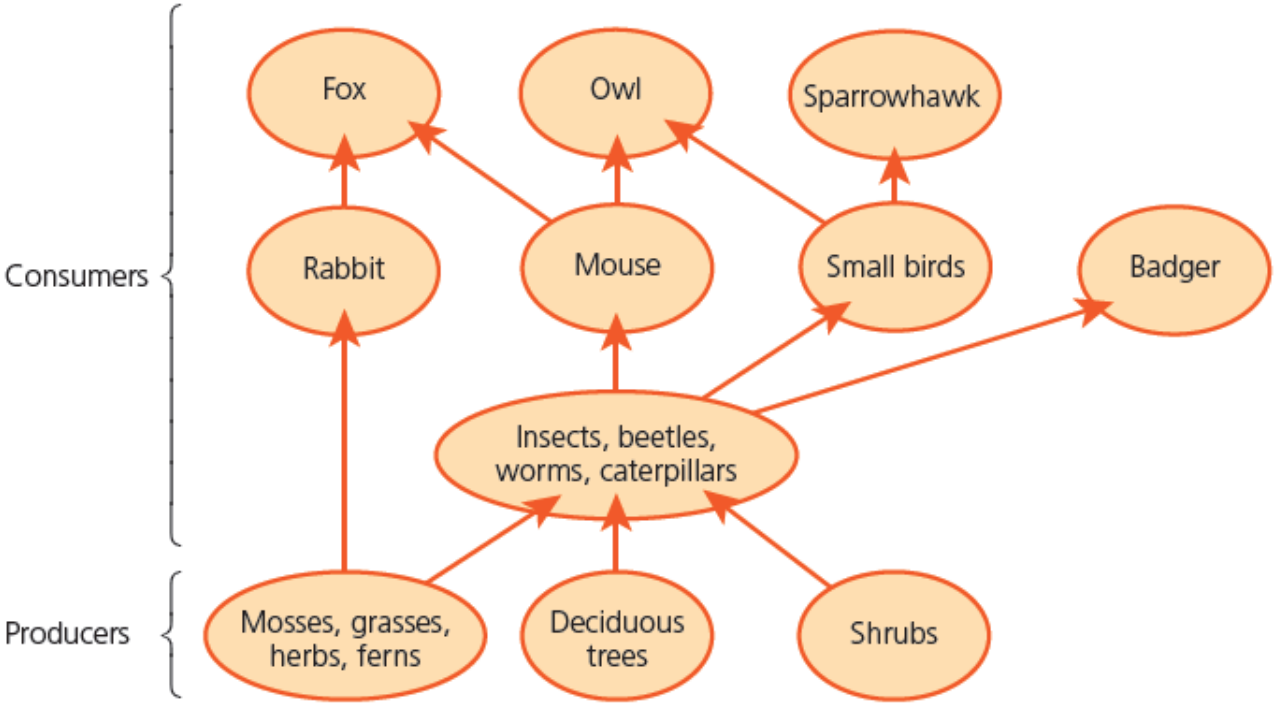
Using data skills to

- Identify the ITCZ drives and seasonal rain in the Tropics
- Use temperature data and graphs to compare places in order to identify the impacts of the **global circulation model (GCM)** (e.g. comparing the UK with Canadian locations at the same latitude)
- The GCM consists of three ‘cells’ of air, the largest of which is the **Hadley Cell.**
- The circulation model also helps to explain the pattern of tropical cyclones
- Between them, these create the world’s high and low pressure systems.

Processes and interactions within ecosystems: skills opportunities

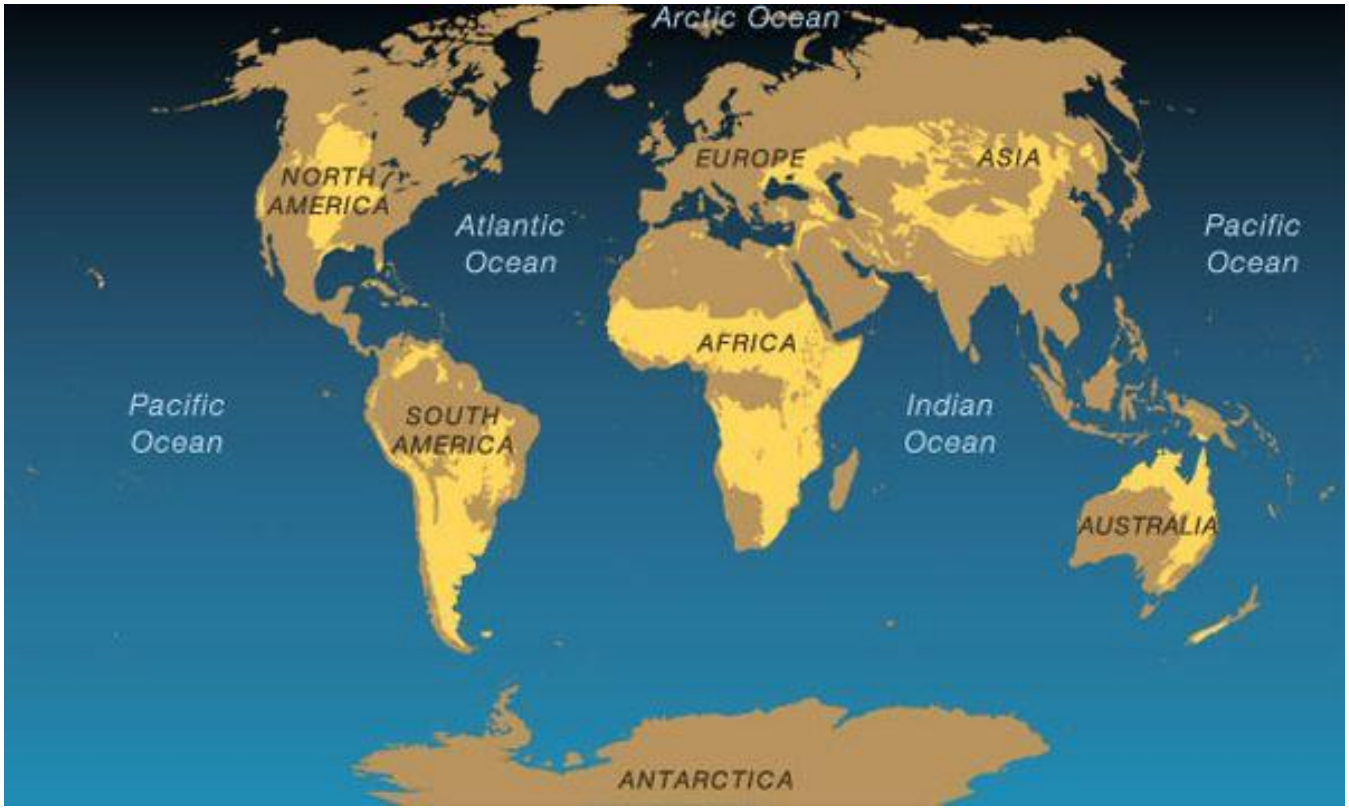
- Calculate percentage increase or decrease and understand the use of percentiles (e.g. for species data)
- Recognise and describe distributions and patterns of both human and physical features maps based on global and other scales
- Analyse the inter-relationship between physical and human factors in diagrams (e.g. food web analysis)
- Use and interpret ground, aerial and satellite photographs
- Draw informed conclusions from numerical data and make predictions

Processes & interactions within ecosystems – skills opportunities



- Interrelationship between system components
- Predicting trends for other elements when one element is modified (foundations for the concept of feedback)
- Develop an extended written argument based on data analysis skills

Processes and interactions within ecosystems: skills opportunities



- Recognise and describe distributions and patterns
- Use and understand coordinates – latitude and longitude
- Be able to identify weaknesses in selective presentation of data

Processes and interactions within ecosystems: skills opportunities

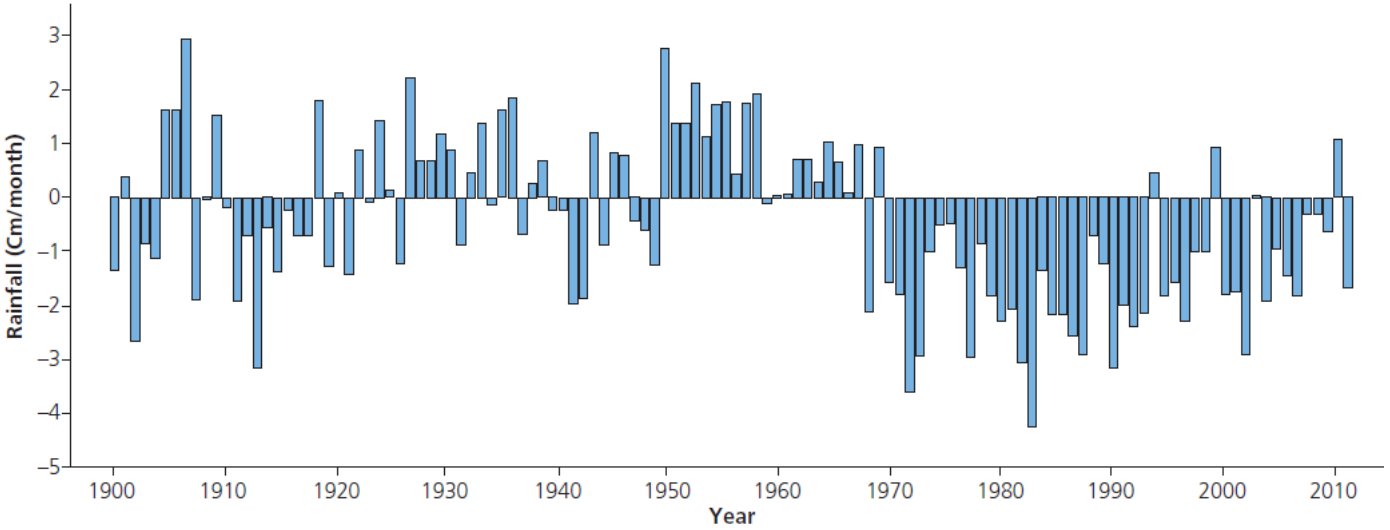


Figure 7.24 Annual rainfall in Sahel countries, 1900–2011. Each bar shows how much the year's rainfall was above or below the long-term average

- Drawing informed conclusions about desertification from data
- Suggest other types of qualitative and quantitative data to help study this phenomenon of desertification

The changing economic world – skills opportunities

- Analysis of distributions, patterns and trends, including the use of choropleth maps and scatter graphs
- Analyse inter-relationship between different places using proportional flow lines
- Demonstrate understanding of proportions, ratios and rates in the context of economic and development geography
- Draw informed conclusions from numerical data

Development and resource issues - using development data

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- Beware the mass of data and terminology – GDP, PPP, GDP per capita, GNI, etc

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- Beware the mass of data and terminology – GDP, PPP, GDP per capita, GNI, etc
- Different units – percentages (e.g. employment by sector), average units (e.g. GDP), or rates (e.g. per 1000, per 100 000 etc.)

Development and resource issues - using development data

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- Understanding data – what do they actually mean and how were they collected?

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- Different units – percentages (e.g. employment by sector), average units (e.g. GDP), or rates (e.g. per 1000, per 100 000 etc.)
- Understanding data – what do they actually mean and how were they collected?
- Interpreting data as part of a sense of what the term ‘development’ means, and what particular data mean in terms of day-to-day life

Using development data

HDI	0.69	0.94	0.55	0.63	0.73
GDP per capita US$ PPP	9,200	49,900	3,900	4,900	11,900
Internet users (% pop)	40	78	11	22	46
GDP from agriculture (%)	10	1	17	38	6
Population growth rate (%)	0.5	0.9	1.3	1.0	0.8
(2012 data)					

Use the data to guess the country

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(2012 data)	**China**	**USA**	**India**		

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GDP from agriculture (%)	10	1	17	38	6
Population growth rate (%)	0.5	0.9	1.3	1.0	0.8
(2012 data)	**China**	**USA**	**India**	**Indonesia**	

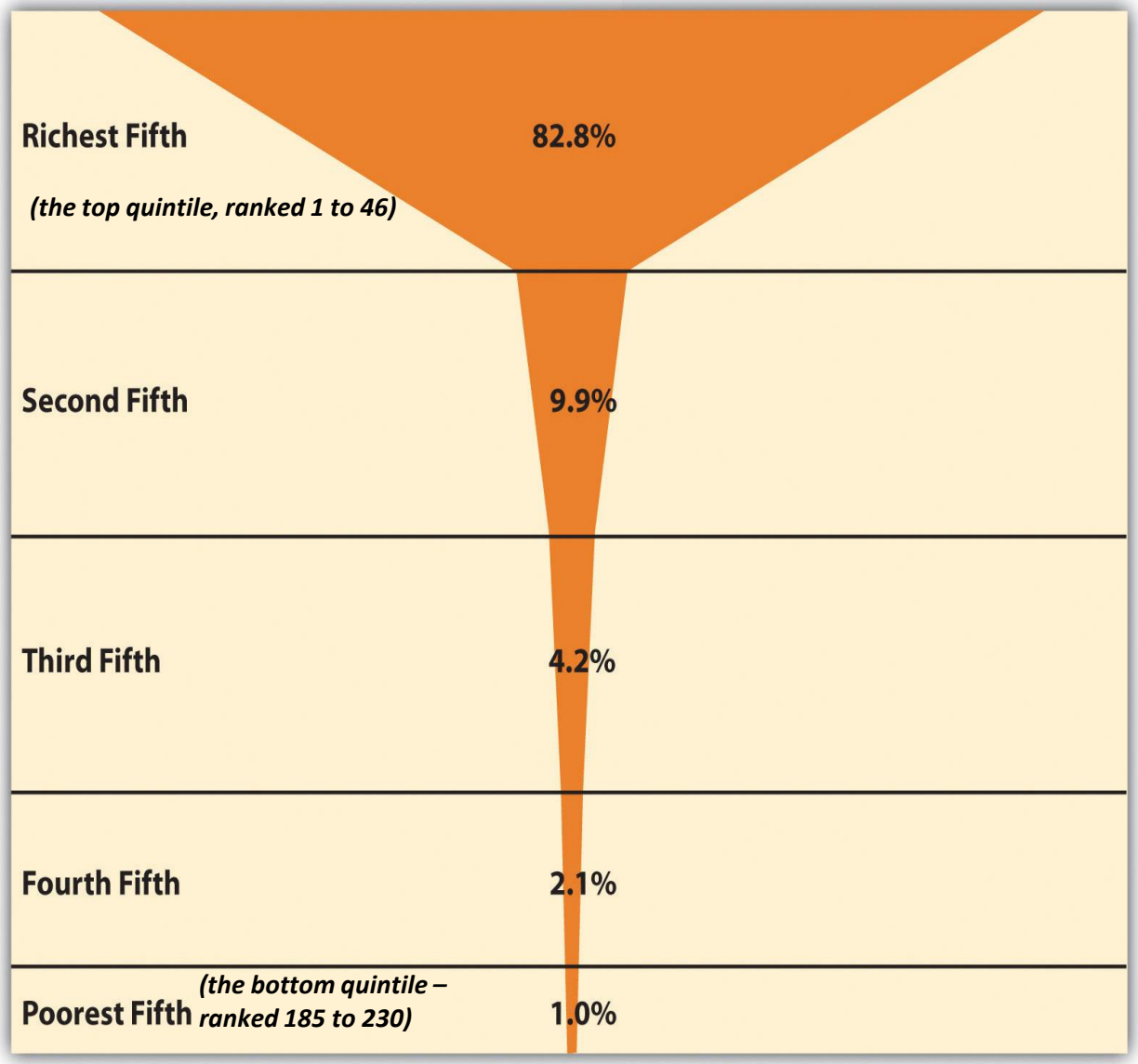
Use the data to guess the country

Using development data

HDI	0.69	0.94	0.55	0.63	0.73
GDP per capita US$ PPP	9,200	49,900	3,900	4,900	11,900
Internet users (% pop)	40	78	11	22	46
GDP from agriculture (%)	10	1	17	38	6
Population growth rate (%)	0.5	0.9	1.3	1.0	0.8
(2012 data)	**China**	**USA**	**India**	**Indonesia**	**Brazil**

Use the data to guess the country

Development & resource issues: using & understanding quintiles



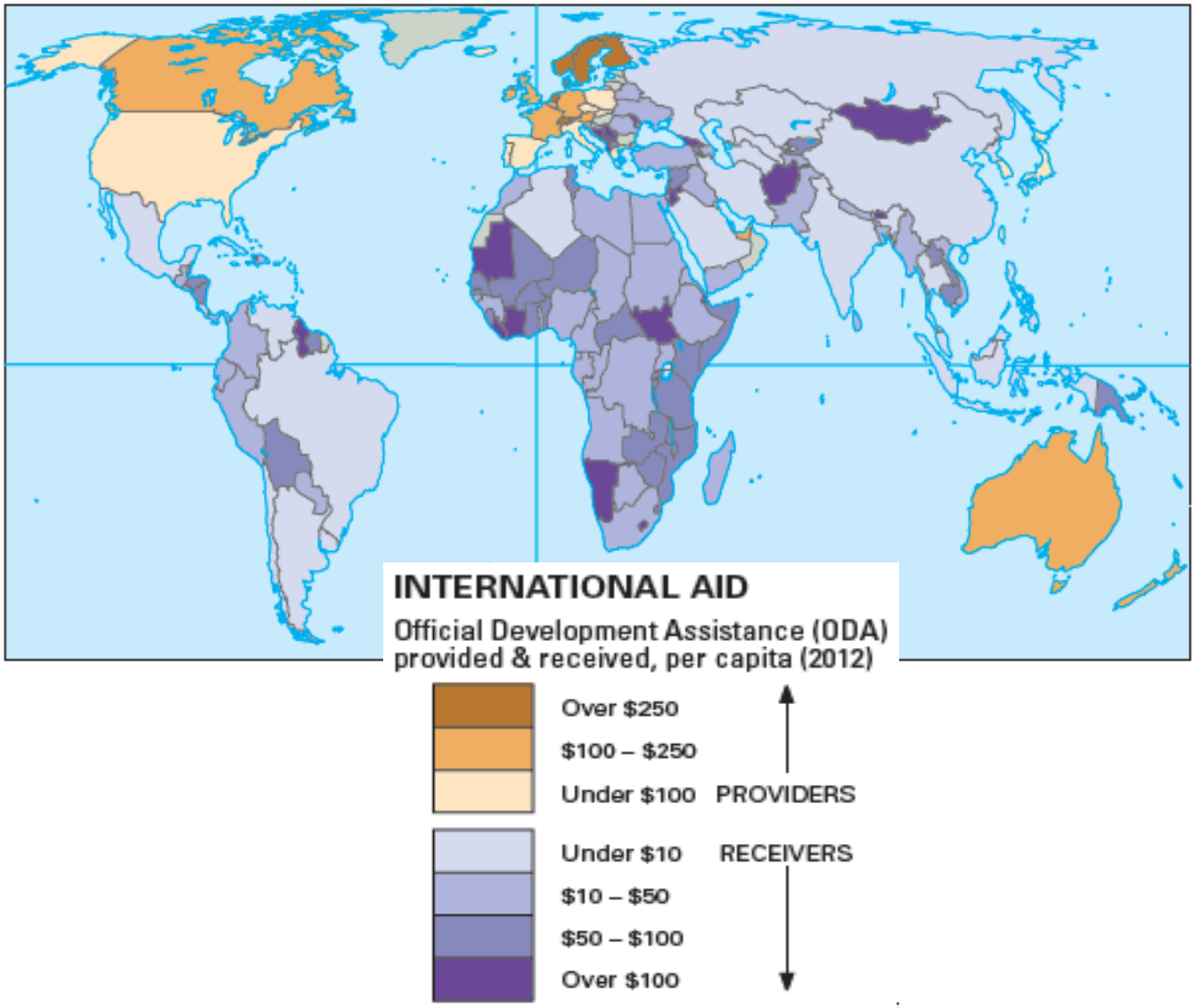
Source: http://catalog.flatworldknowledge.com/bookhub/reader/16891?e=barkan-ch09_s01

Development and resource issues: skills opportunities

Complete, use and understand choropleth maps at the national scale

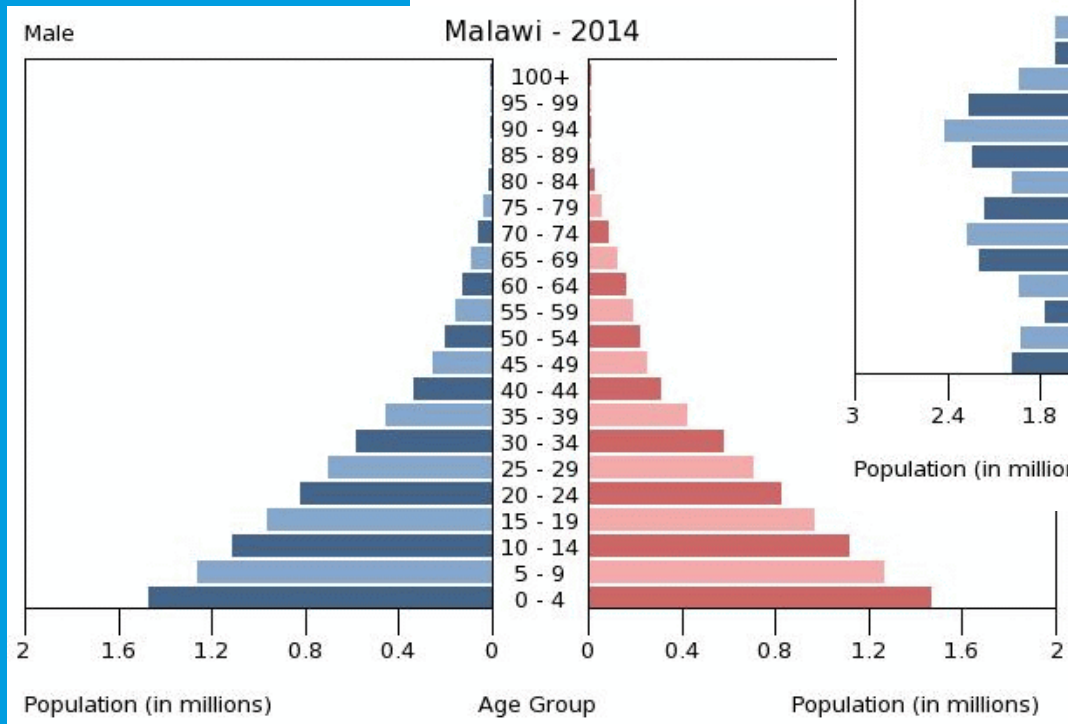
Interpret and extract information

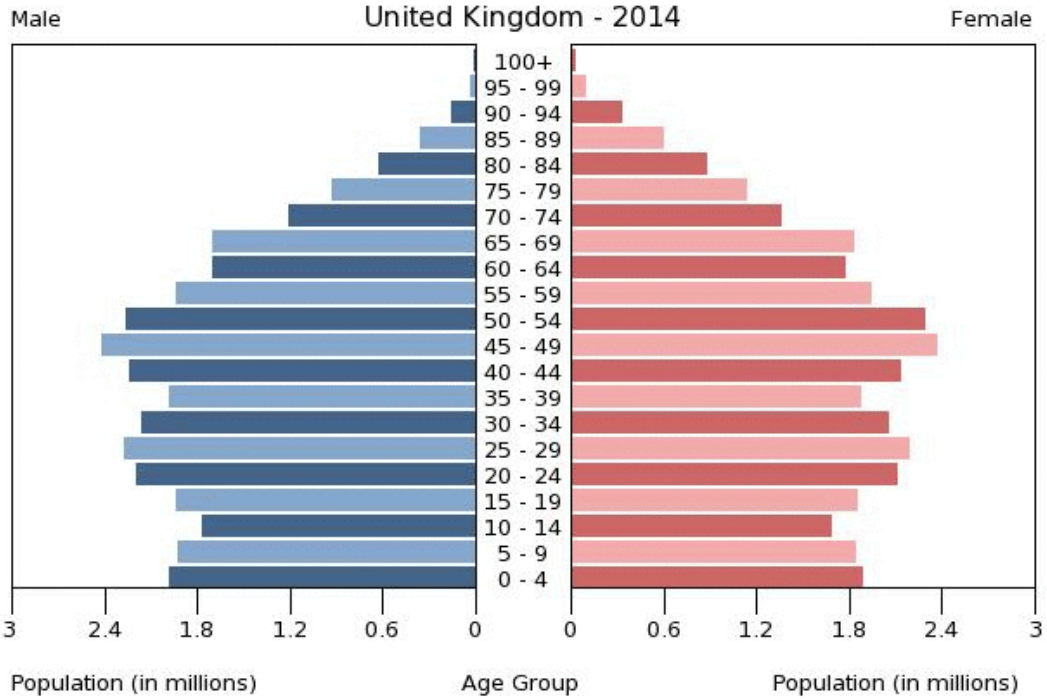
Evaluate geographical information and identify possible weaknesses



Assessing structure of populations (Theme 7 Social development)

Interpreting population pyramid graphs for countries at different levels of development





Option Theme 7 Social Development: skills opportunities

Accurate plotting of scatter graphs

Consider the appropriateness of a linear best-fit line

Draw an informed conclusion about a relationship based on the data and the strength and type of correlation shown

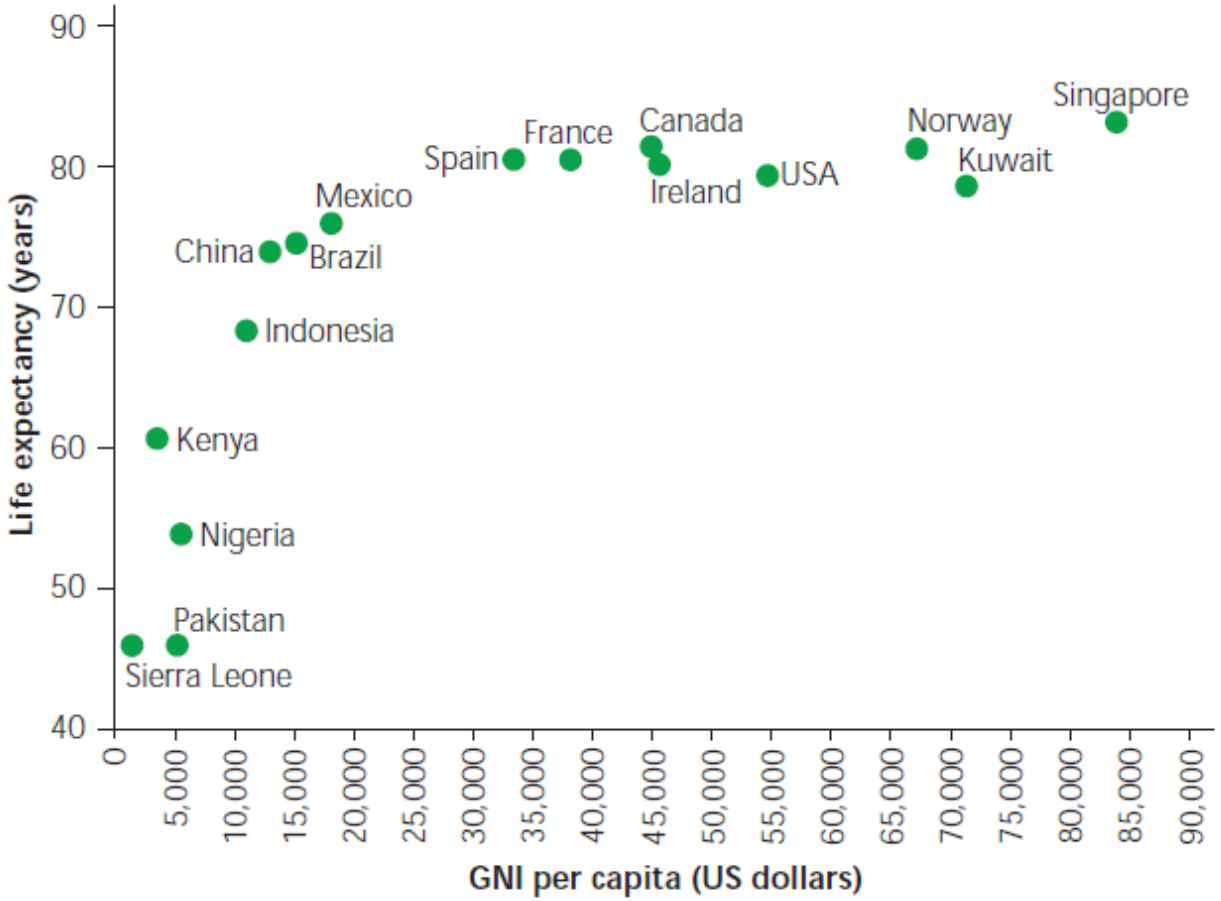


Figure 17.7 Investigating the relationship between economic and social development

Using photos to identify an issue

Have they always lived here?

Could people change this place if they wanted to?

Isn't it dangerous here near the railway?


24
MS


Essex is now the home of the East End as all the original East End people have moved out – Romford Market is where you will find true East End people. Not Newham or Tower Hamlets!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Born and bred in the East End (Poplar and the Isle of Dogs). Moved away but like a magnet it keeps drawing me back. Unfortunately I just can't afford to move back here.

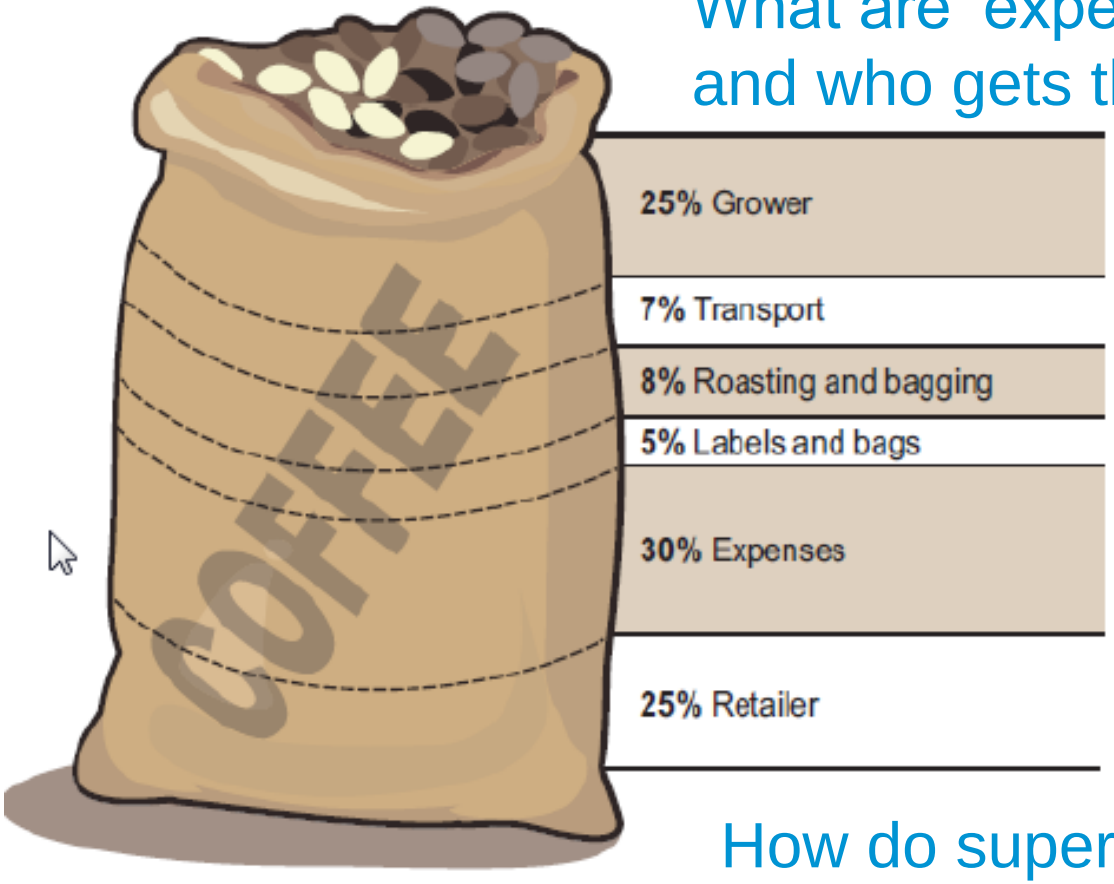

Essex is now the home of the East End as all the original East End people have moved out – Romford Market is where you will find true East End people. Not Newham or Tower Hamlets!
Born and bred in the East End (Poplar and the Isle of Dogs). Moved away but like a magnet it keeps drawing me back. Unfortunately I just can't afford to move back here.
My great-grandmother came from Bethnal Green, and moved from working in London to Tilbury Docks. I think it's a good thing their East End has gone – it was unremitting poverty

Using data to pose questions

Who gets what?

How do coffee growers feel about this?

Should shares be allocated in this way?



What are 'expenses' and who gets them?

How fair is this?

Is this a good business to be in?

How do supermarket workers feel about this?

Do workers on coffee estates share in the 25% for growers?

Some foundations for decision-making …

Less focus on learning facts related to case studies.
More emphasis on
- Interpretation
- Analysis
- Appraisal
- Making decisions
- Justification

Suitable ways to target decision-making skills with students could include the following activities in teaching topics across the specification:

1. Analyse the impacts on …
2. Weigh up the advantages / disadvantages of ..
3. Discuss the points of view of …
4. What are the limitations of?
5. To what extent do you agree?
6. Which is the best option?
7. Justify your decision / choice.
8. What are the costs and benefits?
9. How might things change in the future?
10. What might be the consequence?
11. What ought to happen …?
12. Who should…?

Any questions?

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