Using Curated Datasets

Global Footprint Network

Royal Geographical Society with IBG

Advancing geography and geographical learning

data.footprintnetwork.org

Global Footprint Network

The Global Footprint Network is a global intergovernmental body that works to calculate ecological footprints and encourage ordinary people, industry boards and political decision makers to make changes that will reduce our overall impact on the planet. Through their reports they aim to educate everyone about sustainability issues and provide meaningful grounds on which change can be implemented.

How do I access the data?

The above link is for the data homepage of the Global Footprint Network. On entering the site the researcher is presented with a world map showing data that concerns a particular aspect of sustainability. Choosing the **Explore Data** tab takes you through to a series of five different suites of data, each with a different take on how to look at the concept of an ecological footprint (some examples of which are shown on the left). The measured data comes in two basic formats: **Ecological Footprint** (a measure of how much area of biologically productive land and water an individual, population or activity requires to produce all the resources it consumes and to absorb the waste it generates, using prevailing technology and resource management practices - usually measured in global hectares) and **Biocapacity** (a measure of nature's capacity to meet the resource demands of a person or population, usually measured in global hectares or global hectares per person). Much of the data refers to **ecological deficit** (when the ecological footprint of a population exceeds the biocapacity) and **ecological reserve** (when the biocapacity of a region exceeds its population's ecological footprint) and the data will show when different countries or regions move from the latter to the former.

Examples of suites of data available

Supply and Demand

Comparing the needs of the planet with its capacity to provide for those needs

Footprints by Land Type

Measuring the biocapacity of six different land types.

Ecological Wealth of Countries

Comparing the ecological assets and consumption patterns of countries by year.

Sustainable Development

Combining the ecological footprint with the UN Human Development Index.

Each of these suites allows the reader to select different ways of providing measurements and generates a graph and a data table reflecting these once a selection has been made. Hovering over the graph with the cursor indicates the data at that point. The graph can be downloaded in different picture formats by way of the menu icon that sits above it. There is also an option to **Download Data** which places the data in a Excel spreadsheet to download.

In all cases there is the option to **Select Country or Region** where not only are there the majority of the countries listed, but also geographical regions such as West Africa or Polynesia. In the Ecological Wealth of Countries suite, one can also **Select Year** to view how footprint sizes have changed over time.

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How can I use this in my teaching?

The study of the Earth's capacity to maintain us as a species has a strong ability to capture imagination in young geographers. One of the main draws of the topic is that it reflects a real, lived experience for students: they can go away and calculate their own ecological footprint and compare themselves with people in other parts of the world. In doing so they can link their own actions to a number of different parts of the subject: the study of climate change and resource use are as well connected to ecological footprints as the study of habitats and ecosystems.

The topic also links to a number of synoptic themes such as sustainability, inequality and thresholds. Students can use ecological footprints to develop their appreciation of global citizenship and 'one planet thinking'. There are many directions such discussions can lead students in, such as setting up active sustainability measures in their classrooms and in their schools or instigating their own behaviour changes at home.

Students can look at the data critically and discuss the extent to which the ecological footprint measure is a good way of describing our level of sustainability with regards to the Earth's resources. They can also examine the questions of the ecological footprint calculator and evaluate each, discussing why it was included and what it added to the overall index score. Students can then design their own ecological footprint calculator questions and undertake a similar analysis of each other's efforts.

Curriculum Links

This curated dataset links to a number of parts of the National Curriculum and is relevant to GCSE and A Level Specifications.

Key Stage Three: An understanding of the key processes in human geography relating to the use of natural resources.

An understanding of how human activity relies on effective functioning of natural systems.

GCSE: A study of how humans use, modify and change ecosystems and environments in order to obtain food, energy and water resources.

A recognition of issues related to the sustainable use and management of natural resources at a variety of scales.

A Level: An understanding of the distribution and size of the most important stores of carbon and water on and in the oceans and the atmosphere, and the factors driving change in the size of these stores over time and in space.

An understanding of the concepts of equilibrium, inequality, globalisation, interdependence, sustainability and thresholds.

The following specifications make particular reference to the impacts and management of unsustainable resource use:

GCSE:			**A Level:**		
AQA	Cambridge IGCSE	Edexcel A	AQA	CIE	Edexcel
Edexcel B	Eduqas A	OCR A	Eduqas	OCR	
OCR B					

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An example data walk-through

A student is wishing to investigate how the ecological footprints for different countries have changed over time. They believe that the development stage a country occupies is likely to influence whether the size of their ecological footprint has increased or decreased over time. The student feels that more developed countries are likely to have seen a slower rate of growth of their footprint than emerging economies, but that the countries with the slowest growth of all will be those in the developing stages.

First, the student goes to the **Explore Data** tab and then further selects the **Reserve / Deficit Trends** from the menu. From the types of data available they select **Ecological Footprints (Number of Earths)** to make their comparisons. The student wishes to look at two countries from different parts of the development spectrum. They choose the **UK** and **USA** as their developed countries, **India** and **China** as their emerging economies and **Burkina Faso** and **DR Congo** as their developing countries.

Each of these countries was then selected in turn from the list under **Select Country or Region**. Once selected, this gave a graph of the change in ecological footprint over time. The student could either download the appropriate data using the **Download Data** tab or read it off from the bottom of the page. Data was needed from the start of the data set (that from 1961) and from the end too (that from 2016). From this the student works out the difference in the size of the ecological footprint between those two dates (see table top left).

	Size of ecological footprint (in number of Earths)		Change between 1961 and 2016
	1961	2016	
UK	1.97	2.68	0.71
USA	2.58	4.97	2.39
India	0.2	0.72	0.52
China	0.3	2.22	1.92
Burkina Faso	0.36	0.74	0.38
DR Congo	0.31	0.43	0.12

	Biocapacity (in million global hectares)		% Change between 1961 and 2016
	1961	2016	
UK	54.2	71.6	+32.1
USA	950.8	1175.0	+23.6
India	225.7	566.1	+150.8
China	656.0	1373.6	+109.4
Burkina Faso	9.8	18.5	+88.8
DR Congo	224.4	199.5	-11.1

It is clear from the results that the student's thinking was only partly right. The two countries with the lowest increases in ecological footprints are ones deemed to be developing but it is not true that countries with the highest increases in ecological footprints are the emerging economies.

With the obvious limitations of the small number of samples, it was not possible for the student to draw any meaningful conclusions from this data. By recognising that an ecological footprint was a measure of changes in human behaviour, the student decided to also look at whether changes in biocapacity over the same time period might show different results. As these were measured in global hectares, the percentage change had to be calculated to take into account that the countries are all different sizes in terms of land mass.

This time, from the types of data available, they choose **Ecological Footprint vs Biocapacity (gha)**.The results show that all countries with the exception of the DR Congo have a capacity to renew what people demand of the Earth and meet their needs.

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Suggested delivery activities

Large footprints or small biocapacity?

Students can pick a range of countries to study and look at the year in which those countries moved from a period of having an ecological reserve to a period of having an ecological deficit (if they have made this transition). Students can then try to predict whether these transitions are due to the needs of the people increasing (the size of the ecological footprint increasing) or whether the country's ability to support those needs has reduced (the biocapacity has decreased), or a combination of both.

Armed with these predictions, students can then look at the graphed data in the reserve / deficit trends tab and see which of these are true, by seeing which of the lines drawn exhibits the greater level of change.

Correlation or Causation?

Students should download data showing China's changing size of ecological footprint over the last fifty years. Students should then, from other sources, take data such as population size, GDP, forest cover, level of urbanisation etc. and plot each against the ecological footprint on different graphs.

Students can see firstly if there is any correlation between China's ecological footprint and the other variable over the fifty years and whether any correlation is relatively strong or weak. Students can also discuss whether there is any good geographical reason for any correlation, or indeed why there may not be any correlation between them. Students can also consider whether the units they have used make the best means of making any comparison in the data.

Sustainable Development Predictors

Students can look at the Sustainable Development tab within the data set and the animated graph that shows how different countries 'moved' according to their HDI value and their biocapacity between 1990 and 2016.

Before playing the animation for particular countries, students can draw prediction lines on blank, paper templates of the axes presented on the website of the path they feel the country will take as the animation plays. They should write statements that justify their prediction which is likely to be about what they know about the nature of development and sustainability already. Playing the animation can then reveal how close they were to being correct.

Lorenz Curves

A Lorenz Curve is a graphical representation of data that shows the level of diversity in a dataset compared to that which is the norm or the expected. It works with categorical data - where the norm is thought of as being an even value of data in each category, and represented by a straight line on the graph. In the measured samples, one draws alternative lines on the graph and the greater the divergence away from the line, the more diverse it is thought to be. Students can use biocapacity data that has been split into different categories (fishing grounds; cropland; built up land; forest products; grazing land) for different countries or regions and compare these to the normal distribution of values. A guide to Lorenz Curves appears on the next page.

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A Guide to creating Lorenz Curves using ecological footprint data

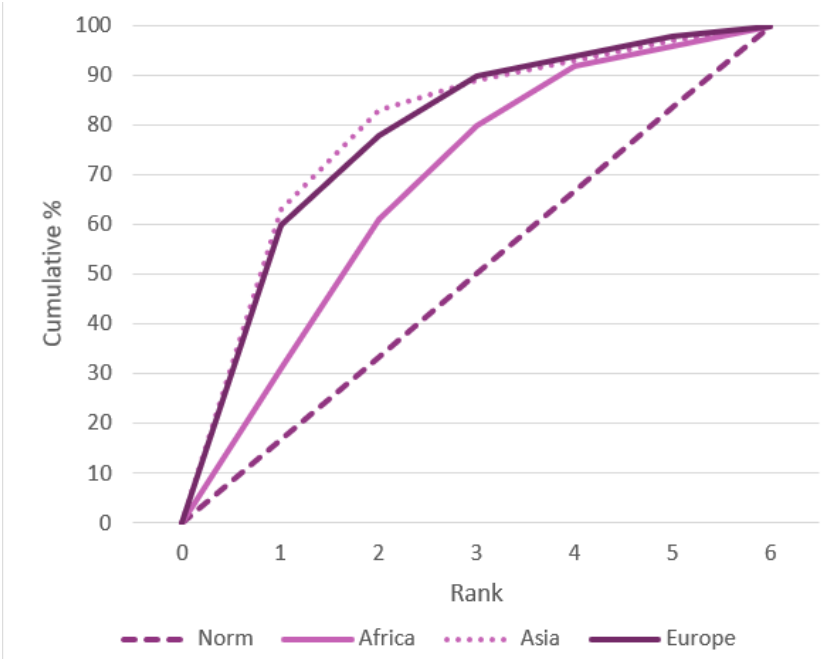
A Lorenz Curve is a graphical tool used to study how different places exhibit different levels of diversity when one studies their data in different categories. It works off the assumption of a 'norm': a prediction that if all things are equal in the data then each category will have as many values in it as any other. This is represented as a straight line on the graph. When one then plots other countries, these show divergence away from the norm - the greater the divergence the less evenly the data is represented in those categories.

Using the 2016 data from the Global Footprint Network a student can compare the biocapacity of different regions (split into different sources of biocapacity) with a norm.

Worked example:

	Built up land	Carbon	Cropland	Fishing grounds	Forest Products	Grazing land	Total
Africa	0.06	0.42	0.41	0.05	0.26	0.17	1.36
%	4	31	30	4	19	12	100
Asia	0.07	1.51	0.48	0.08	0.16	0.08	2.39
%	3	63	20	4	6	4	100
Europe	0.09	2.74	0.83	0.16	0.55	0.19	4.59
%	2	60	18	4	12	4	100

Rank	1	2	3	4	5	6
Africa	31	30	19	12	4	4
Cum. %	31	61	80	92	96	100
Asia	63	20	6	4	4	3
Cum. %	63	83	89	93	97	100
Europe	60	18	12	4	4	2
Cum. %	60	78	90	94	98	100



The relevant biocapacity data (in global hectares per person) was extracted and downloaded from the Global Footprint Network site and converted into percentages. These were then placed in rank order from largest to smallest (regardless of the actual biocapacity source). Cumulative totals for each region were then calculated.

The rankings and cumulative percentages were then used to draw the Lorenz Curves for each region.

From the graph the student could see that Africa as a region showed the least diversity in its different sources of biocapacity while Europe and Asia had far more diversity, with their lines visibly diverging away from the norm. Of the three regions it can be said that Asia had the greatest diversity in how its biocapacity was comprised.

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