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INTRODUCTION

When you took off for the annual 'Family Summer Holiday', it would be your father who would navigate: navigate *and* drive. You and your sibling(s) would fight in the back of the car and your mother took sole responsibility for 'The Map'. This meant that when you needed a detour or (whisper it) got lost, it was Mum who, unfairly, would be to blame. Not that Dad ever looked at the map; he preferred the method of learning the roads and the sequence of settlements en route. Nowadays, folks just plug in the destination location, set the satnav and off they go, hopefully avoiding low bridges and dead ends.

This vignette encapsulates the role of geography in everyday life and unfortunately demonstrates the limits of its reach into many people's lives. Avoiding all of the talk about how the world of work has changed and how we have all become more isolated from people in our own communities: just think of the maps! Be it Lewis and Clark in the USA, Flinders across Australia or Livingstone in Africa, the great explorers didn't set out to create maps for us to then downgrade them in the face of technology.

Maps are where most people first encounter geography and though satnav demonstrates the limits of people's engagement now, maps have made a pretty

spectacular comeback. Modern geographers go nuts over 'geographical information systems' (GIS) and you too may, probably unwittingly, have become a geographer at least once in your working day. The Internet is awash with maps: maps with data on them, maps that show you where your friends (or at least their mobile phones) are, maps that show you when your house will flood, maps that locate your nearest restaurant, maps in fact that can show anything and everything. So geography is here to stay, a vital part of all our lives.

To be a geographer in the opening decades of the twenty-first century is to be on the one hand excited about the endless possibilities for travel, study and fulfilment, yet on the other to be frustrated with the lack of true joined-up thinking out there. Geography has a unique and valuable role to play in bringing together the strands that surround complex issues and produce clarity of focus. Nowhere can this be seen in more sharp relief than in the debate over climate change.

Across the world we know that use of renewable resources must be a foundation for our descendants. We know too that, locally, weather patterns have changed over time as the climate has varied in the past. Also, we know that carbon dioxide levels have rocketed upwards since we have helped move carbon from its stores in the ground, up into the atmosphere. But we don't *actually* know that the climate is changing because of man. It

probably is, but it doesn't matter. The reality is that due to dwindling supplies of fossil fuels sometime in the future, we will have to change our reliance.

And it's geography that plays a part in all facets of this debate, and geographers who are perhaps uniquely placed to spot the simple coherent pathway to explanation. Be it economic concerns over the rising price of oil, environmental concerns over the impact of fossil fuel production and combustion, scarcity concerns where national supplies will be cut off or political concerns over one country's influence on others – it doesn't matter. In the end we need to become more sustainable, hence we need to adapt to renewable resources and we need geographers to bring together the disparate fields of enquiry to provide the ideas for moving to the next stage of development.

This issue is our modern 'Malthusian debate' (*see* p.117), that cornerstone of public consciousness that yields column inches of erudite copy and its fair share of mumbo-jumbo too. We now have the twenty-four-hour news network and the live blogosphere to keep the debate swirling around the world.

Who would have thought that when you were learning your US state capitals, your longest rivers in the world and your flags of the UN you were laying down the foundations for a subject that would become more and more relevant as the world has grown in complexity?

THE PHYSICAL WORLD

RIVERS

As rivers provide invaluable resources for so many people around the world – and take the lives of many too – this is probably a good place to start investigating just what we remember of our physical geography. A river – water flowing in a channel downhill – is simple to understand: the merry cascade tumbling down a mountainside; the awe-inspiring waterfall; the long, slow, meandering waterway; the huge body of water of a river in flood, bearing down on all before it . . .

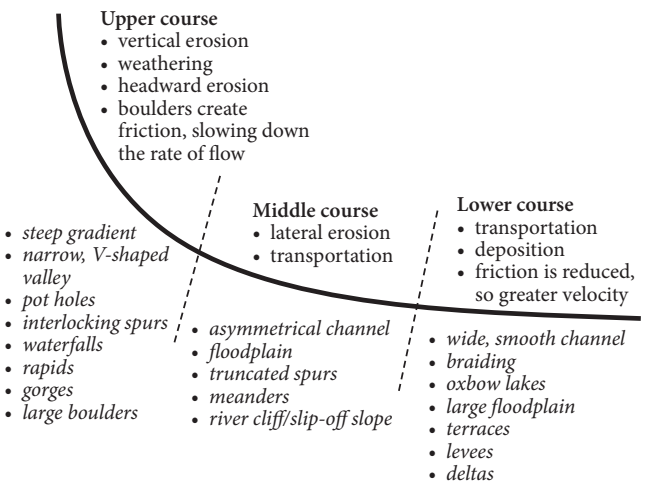
You may have learned where they were and how long they were, or you may have waded into them and measured them, pebbles and all. Disappointingly, the former tended to be those in exotic places like Egypt, while the latter were usually whatever waterway could be found locally.

THE LONG PROFILE

This refers to the 'make-up' of the river, how it changes shape from source to mouth. Rivers are usually divided into three sections: the upper course, the middle course and the lower course, and they can start from springs, bogs or run-off from the sides of steep mountains, which often get rainfall to sustain the streams. Moving from source to

mouth, the character of most rivers changes significantly as a result of the interaction of three factors:

* the rate at which the altitude of the riverbed decreases with distance (the gradient).
* the relationship between the friction surface of the bed and banks and the cross-sectional area of the channel (channel morphology).
* the small-scale features of the riverbed and their impact on the way the water flows, eddies and tumbles (bed roughness).



Obviously, the work of water on the land is only half the story: the underlying rock provides the sketch pad on which the water draws.

Where the River Runs Fastest

You might think it's logical for the river to flow fastest at the source in the upper course, with that steep gradient? Well, you'd think so and it is certainly true that most waterfalls are in the upper course and, yes, they are running rather quickly. But the answer is more complex than that. Over a significant section of river the fastest velocities will be found where the influence of the gradient is enough to defeat the dark forces of friction. In the end, it is in the lower course, where the river channel is most efficient, that the average velocity is at its highest.

HOW DO YOU MEASURE THE WATER IN A RIVER?

The volume of water flowing in a river is called its discharge, and that is calculated as cross-sectional area multiplied by average velocity.

From this derive the units for measuring discharge: cumecs – **cu**bic **m**etres per **se**cond. The universally utilized symbol for river discharge is Q.