4 Services provided by nature

4.1 This section provides evidence about the different services provided by nature. Specific services may be of interest to different policy makers and practitioners, so you may choose to focus just on those. Alternatively, you may be interested in overarching themes such as economic competitiveness, so **Chapter 2** and **Chapter 3** may be useful in identifying how the environment contributes to those themes.

4.2 It is important to note that not all services provided by nature are included here. The ones chosen are the ones which on the basis of current evidence are most important in the context of environmental projects. The ones selected are also those for which we have available scientific and economic evidence.

4c Food, water and other provisions

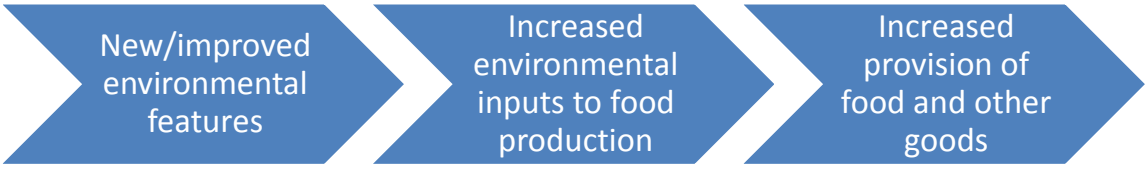
The natural environment provides essential food and water, as well as a wide range of other goods.

Introduction

4.13 This section provides some examples of goods provided by the natural environment for consumption or use by people. Obviously food and water are essential to life, so it would be meaningless to attempt to quantify their importance. There is also a limit to the amount of natural resources (land, water, sunshine, et cetera) we have available to produce these goods. It is possible however to increase the efficiency with which the natural environment produces goods, through changing other inputs such as human labour, technology or natural supporting services.

4.14 What this section does is provide some context around the scale of how people use the environment to produce a range of different foods, medicines and biochemicals, and the impact of environmental changes on this production.

Theory of change



Can the benefit be quantified?

4.15 Only on a small scale. It is possible for instance, to identify how much extra of a crop could be produced by adding a unit of additional input (water, soil, et cetera). However, it would be impossible and meaningless to attempt to quantify the total value of goods provided by the environment. Much of the evidence below refers to the economic significance of these goods, as quantified by the market value of the goods produced.

How strong is the evidence?

4.16 It goes without saying that people depend on the natural environment for a wide range of foods and other resources. Some of this evidence is presented below.

Evidence

- The Millenium Ecosystem Assessment notes a range of products and the organisms from which they are derived. These include: antibiotics from plants, molluscs, bacteria and ants; anti-fouling paints from sea moss and marine algae; industrial enzymes from primitive bacteria and fungi; and engineering materials from snails (Beattie, Barthlott et al. 2005).
- 17.2 million hectares, 70 percent of land in the UK, is used for agriculture. Gross Value Added (agriculture's contribution to GDP) was £8.6 billion, or around 0.65 per cent of total GDP in 2011 (Department for Environment Food and Rural Affairs, Department of Agriculture and Rural Development (Northern Ireland) et al. 2012).
- UK fish landings in 2008 were worth £596 million (Bateman 2011).
- Rain which infiltrates the ground is stored in underground aquifers. This groundwater is particularly valuable because it is normally pure and needs little treatment. Groundwater directly provides one third of the water we drink and is vital source of water for rivers and wetlands (Environment Agency 2007).
- Since 1940, 48.6 percent of all small molecules for cancer treatment have been derived from natural products (Newman and Cragg 2012).

- Crops Wild Relatives, and rare breeds, provide an essential genetic bank for producing food in novel circumstances (Foresight 2011) Additionally plants or fungi which are not normally considered crops may have potential for food (Juárez-Montiel, León et al. 2011) or as forage.
- Around 2.2 million tonnes of topsoil is eroded annually in the UK. It is estimated that this results in lost production worth £9 million per year (Department for Environment Food and Rural Affairs 2009)[54].
- In 2010, 50 percent of fish stocks assessed were being harvested unsustainably. UK seabed trawl landings per unit of fishing power[55] have declined by 94 percent in the past 118 years, reflecting the increased effort required to catch smaller numbers of fish (Bateman 2011). Essentially, unsustainable fish harvesting has resulted in a decline in the ability of the fish stock to regenerate and support future fish supply.
- There is a risk that non-sustainable harvesting of natural products for biochemicals, natural medicines and pharmaceuticals may negatively impact on the environment. In the US, for instance, the search for supplies of the anticancer drug paclitaxel resulted in conflict because a primary source of the drug was the old-growth forests of the Pacific Northwest, also home to the endangered spotted owl (Kingston 2011).
- There are few studies into the effects of less intensive farming, but those that exist support the view that less intensive farming leads to increased infiltration to groundwater aquifers due to greater presence of features such as grass buffers and hedgerows, and healthier soil (O'Connell, Beven et al. 2005). Wetlands also play a role in aquifer recharge (World Resources Institute 2008).

Link with climate change

- Modelling done for the UK National Ecosystem Assessment suggests that with climate change, northern areas of the UK are likely to benefit from increased agricultural production, whereas farms in the south of England are likely to be negatively impacted. Beef cattle and sheep production across southern England are likely to decline (Bateman 2011)[56].
- Climate change poses multiple threats to the ecosystems on which farming relies including changes to growing seasons, droughts and floods, increased heat stress in livestock, more storm damage and increased risks of pests and diseases (Department for Environment Food and Rural Affairs 2009). It may also reduce organic matter in soils (Jenkinson, Adams et al. 1991), which would lead to loss of fertility, water holding capacity and poorer soil structure, exacerbating pollution and flooding.
- Climate change may reduce the recharge of aquifers, leading to the consequent lowering of groundwater levels. It may also lead to higher demand for water by households and for crop irrigation (Environment Agency 2008).

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[54] These figures originate from an Environment Agency report and have not been reviewed for this report.

[55] A measure of the commercial productivity of fisheries.

[56] This model is based on historical data which may not be a strong predictor of future farm responses to changing climate. It also does not include future technological innovation and the impacts of this on farm management.

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