> determines whether economic models are used at all. (Redclift, 1999)

Clearly, sustainable development without the political pain that would accompany a reduction of resources or a redistribution of existing resources requires some level of growth. There are two difficulties associated with measuring that growth in order to present an accurate picture of well-being and a true picture of environmental depreciation. The first is the method by which economic growth or well-being is measured. The second concerns how we measure the use and abuse of environmental resources. We have seen how difficult it is to measure the value attributed to the environment. 'Economic growth' in the past has been measured using some misleading indicators. GNP is constructed in such a manner that it does not fully express the standard of living of the population: for example, if pollution damages health, resulting in the cost of health care rising, this results in an increase of GNP. A rise in GNP of this nature would seem to be an improvement in living standards and not a decrease in the quality of life. In national accounting, the cost of the depreciation of man-made capital is recorded, while the value of the degradation in the environment or the depreciation of environmental capital is fraught with difficulty. Using up natural resources is equivalent to the capital depreciation of machines and infrastructure. It has, however, been suggested that one could be traded-off against the other, so that if natural resources are used to create man-made infrastructure useful for future generations, then the total stock of capital would be undiminished: such a proposition begs many questions, not least of which is the actual resource depleted in such action and its 'value'. Just how environmental costs are quantified and how GNP takes such costs into account or how it is adjusted to reflect more closely the development of human well-being is debatable.

The debate depicted as 'growth versus environment' is still very much a live issue in the context of sustainable development. In some cases growth may involve loss of environmental quality or a decrease in non-renewable resources. In other situations, conservation of the environment may mean the loss of the possibility of economic growth: 'but sustainable development attempts to shift the focus to the opportunities for income and employment possibilities from conservation, and to ensuring that any trade-off decision reflects the full value of the environment' (Pearce *et al*., 1989). Redclift (1999) would define this as 'ecological modernization', but still within the neo-classical economic tradition. This may be the most that is possible in the present political climate.

Traditional forestry and fishing industries have long practice in the art of maintaining sustainable yields from the environment by harvesting at a rate that is equal to or less than the regenerative capacity of the crop. Failure of the industry to conserve its capital stock would result in the disappearance of the resource, and with it the industry. This analogy is appropriate in some ways for a discussion of sustainable development: it emphasizes a concern for the future and the value of good husbandry, or living within the capacity of the supporting environment. National economies, however, do not rely entirely upon renewable resources, nor does the analogy apply

comfortably to economies which aim to grow or increase output. The over-exploited North Sea fishing grounds may be a better analogy for industrial growth without regard to stocks: a time arrives when the industry itself is in danger, and draconian measures are necessary to conserve stocks and ensure regeneration of the resource. The decimation of the British and Irish fishing fleets are witness to the greedy exploitation of a valuable 'common'. Non-renewable resources such as oil or natural gas when used for human well-being must – if sustainable development is a goal – be capable of being replaced by other renewable resources. For example, the use of fossil fuels should be accompanied by the development of renewable energy sources such as wind, water and solar power. Interesting experiments in the development of renewable energy sources – though not always welcomed by the local population – have been or are being implemented throughout Europe.

Proposals by the Crown Estate to build 250 wind turbines off the Lincolnshire coast, which form part of the world's largest programme of offshore wind farm development, aim to meet some of the objections to such turbines being located inland in sensitive areas of natural beauty. According to UK Government Minister Stephen Tims, 'These wind farms will not only put us on the path to providing 10 per cent of energy from renewable sources by 2010, but they will also help us to meet our aim of generating 20 per cent of our energy from renewables by 2020.' (*Planning*, 4th July 2003 and 9th April 2002). Projects like this are part of the UK energy strategy, but they are thought to be overoptimistic according to the report *State of the Nation 2003* (quoted in *Planning*, 11th July, 2003).

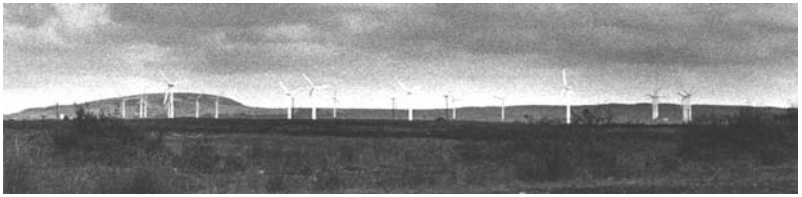

Figure 1.3 Wind farm, Bellacorick, County Mayo, Ireland. The wind farm is sited on 'cut-away-bog'

If that report's prognosis for the parlous state of UK energy supplies when North Sea gas runs out early this century is correct, then projects like this become even more important for the national interest. An earlier example of an experimental wind farm was established in Bellacorck, Mayo, Ireland, on cut-away-bogland: it is far less damaging to the landscape than its near-neighbour, a more traditional generator (Figures 1.3 and 1.4). Projects like this illustrate Pearce's line of reasoning, which leads him to develop further the definition of sustainability: 'So, sustainability means making sure that substitute resources are made available as non-renewable resources become physically scarce, and it means ensuring that the environmental impacts of using those resources are kept within the Earth's carrying capacity to assimilate those impacts.' (Pearce *et al*., 1993).

Figure 1.4 Power Station, Bellacorick, County Mayo, Ireland. The power station is fed by local peat bogs