13 Carbon Removal, Fuel Cycle Shift and Efficiency Measures: a Sectoral View

The Intergovernmental Panel on Climate Change (IPCCa 1996) distinguishes between technological options and policy measures. The dividing line between the two is fuzzy because technological options stand behind most policy measures. (The only other major source of emission reductions is consumer behaviour). In this report, we focus on technological measures, but we discuss policies and consumer behaviour where we think it influences our analysis in an important way.

There is a close interplay between technological possibilities, policies, and consumer behavior in situations in which recipients of benefits are different from those who carry the costs. A prominent example of this is the construction of a residential facility with rental units. Here, the costs of effective insulation are borne by the owner, who has an incentive to keep construction costs low. The benefits in the form of reduced expenditures for room heating and cooling accrue to the tenants. Whenever market rates for rents do not properly reflect efficient insulation costs, the incentive for reaching an overall economic optimum by high levels of insulation is low. The policy response to this and similar problems is standard setting. In the U.S., it is estimated that the National Appliance and Energy Conservation Act (NAECA) which establishes residential appliance standards during the period 1995–2015 will yield an overall net benefit of US$60 billion (IPCC 1996b).

Another important distinction can be made between measures that are taken solely in response to the threat of global climate change and those that represent a simple continuation of historical trends in technological progress. The latter is often referred to as dynamics-as-usual (DAU). Distinguishing between these two kinds of measures is conceptually important but beyond the scope of this chapter. To illustrate the difference between the historical trend of carbon intensity and

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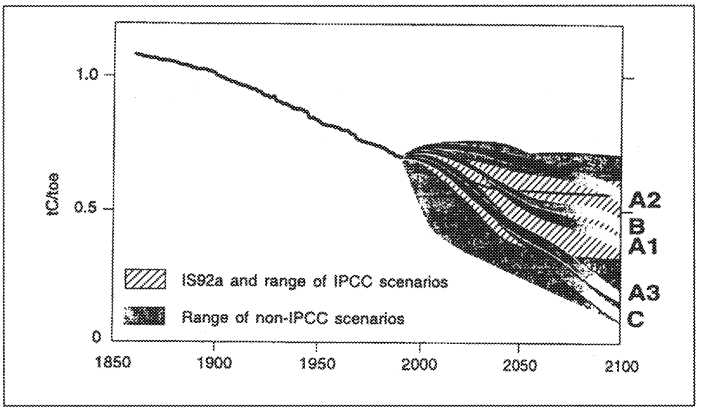
"conventional wisdom," we show, in Figure 13-1 the average global carbon intensity since 1850 and ranges CO_2 projections under different scenarios.



Source: WEC-IIASA 1995.

Figure 13-1: Decarbonization of global primary energy, historical development and ranges of contemporary scenarios.

According to the figure, a break in the historical trend has already occurred. The question is, how temporary is this? The answer is intimately connected to the choice of a reference scenario. Such a choice must be made to assess the costs and benefits of new technological options and is therefore a key to designing successful R&D strategies.

13.1 Carbon Removal and Sequestration

Since combustion of fossil fuels always emits CO_2, any measure aiming at a substantial reduction of carbon emissions from fossil fuel use must include the decarbonization of such fuels or of the flue gas. The removal of carbon in the course of technical processes is usually energy-intensive but leads to high rates of carbon emissions reduction. Alternatively, the sequestration of carbon from the atmosphere by biomass growing is independent of energy-related carbon emissions because it directly reduces atmospheric concentrations of carbon dioxide.

The eventual disposal of carbon removed can be thought of as a two-step process. The first step is the separation and recovery of CO_2; the second step is CO_2