Table 2.8 Possible 'technological fixes' for climate change using geo-engineering

Strategy	Analysis	Evaluation
Carbon capture and storage (CCS)	CCS involves capturing carbon dioxide released by the burning of fossil fuels and burying it deep underground (Figure 2.34). This technique promises to be extremely important (given that coal will remain a very significant part of the global energy budget for years to come due to its abundance and low cost). CCS works in three stages: **1** The carbon dioxide is separated from power station emissions. **2** The gas is compressed and transported by pipeline to storage areas. **3** It is injected into porous rocks deep underground or below the ocean for permanent storage (geo-sequestration). CCS could make an enormous difference to the size of the anthropogenic carbon store. The IPCC estimates that CCS (1) has the potential to reduce coal-fired power station emissions by up to 90 per cent and (2) could provide up to half of the world's total carbon mitigation until 2100.	• So far the technology has been piloted at only a handful of coal-fired power stations worldwide: it is far from being a mature technology. • CCS will be expensive because the technology is complex and still being developed. • There is uncertainty over how successful it will be. For carbon dioxide to remain trapped underground there must be no possibility of any leak to the surface. The gas cannot be a allowed to re-enter the atmosphere once it has been removed. • Pilot projects in the UK were cancelled recently owing to rising costs (of over US$1 billion). The plan had been for carbon to be transported by a pipeline to the North Sea and stored in depleted gas reservoirs. The UK government has cut public spending in many areas because of the global financial crisis and its after-effects.
Sunlight reflection methods (SRM)	SRM technologies aim to readjust the global energy balance. The hope is to reduce incoming solar radiation to offset the global heating caused by rising greenhouse gas emissions. These technologies include: **1** placing mirrors in near-Earth space orbit in order to reflect more sunlight back into space. **2** mimicking the global dimming effect (see page 39) of huge volcanic eruptions by injecting tiny sulfate aerosol particles into the stratosphere where they would scatter sunlight back to space **3** whitening low-level marine clouds by spraying seawater into them; the increased albedo (see page 40) would lead to more reflected sunlight.	• Costs and safety risks associated with the introduction of potentially millions of orbital mirrors are likely to be very high. • Stratospheric aerosol injections might disturb regional weather systems around the world, including storm systems. • Geopolitical tensions may arise if one country using this technology disrupts another country's weather. • Aerosol particles destroy stratospheric ozone (contributing to the 'ozone hole' effect). Ozone depletion allows cancer-causing ultraviolet radiation to penetrate the atmosphere. • Screening out some of the Sun's radiation will reduce the efficiency of solar power systems.

Source: Mike Hulme