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concentrations roughly double those of the era before the Industrial Revolution, would yield a concentration of about 550 ppmv, which many believe would prevent dangerous interference with the climate system. Engineers and technologists are faced with a mind-boggling array of options for achieving specific target concentrations of greenhouse gases. Options include reducing emissions of CO₂ from fixed and mobile sources, sequestering carbon dioxide, reducing the emissions of other greenhouse gases, and using geoengineering (e.g., injecting dust or other particulate matter into the stratosphere to reduce the amount of solar radiation reaching Earth) on a global scale (Box 1).

BOX 1
Options for Reducing Concentrations of Atmospheric Greenhouse Gases

Reductions in Emissions of CO₂ and Other Greenhouse Gases

- Increase the efficiency of both mobile and fixed sources of CO₂ (e.g., the Partnership for a New Generation of Vehicles [PNGV]).
- Increase the efficiency of electric power generation by changing power-station fuel sources from coal and oil to gas and by introducing turbines and distributed energy sources.
- Increase the use of renewable energy sources, such as wind power, photovoltaics, biomass, and hydropower.
- Increase the use of already-proven nuclear energy, a CO₂-emission-free energy source that is widely used for power production in France and other countries.
- Continue the development of new types of energy systems, such as fuel cells for use in automobiles and in fixed locations operating on hydrogen stripped from fossil hydrocarbons.

Carbon Sequestration

- Increase sequestration by growing trees and other plants, which consume carbon dioxide through photosynthesis. This approach can be enhanced through biotechnology by producing fast-growing trees. Carbon might also be sequestered in soil.
- Sequester carbon stripped from hydrocarbons by pumping it into deep geological structures, and use the hydrogen to power fuel cells.

Geoengineering

- Inject CO₂ into oceans at depths that allow the formation of CO₂ hydrates.
- Fertilize the oceans by adding iron or phosphorus to increase the production of algae, which would then sequester more carbon in the oceans.
- Disperse dust or inject SO₂ into the stratosphere to reduce sunlight and thereby lower global temperatures.