



- A** Coal is expected to continue to account for almost 27 per cent of the world's energy needs. However, with growing international awareness of pressures on the environment and the need to achieve sustainable development of energy resources, the way in which the resource is extracted, transported and used is critical.

A wide range of pollution control devices and practices is in place at most modern mines and significant resources are spent on rehabilitating mined land. In addition, major research and development programmes are being devoted to lifting efficiencies and reducing emissions of greenhouse gases during coal consumption. Such measures are helping coal to maintain its status as a major supplier of the world's energy needs.

- B** The coal industry has been targeted by its critics as a significant contributor to the greenhouse effect. However, the greenhouse effect is a natural phenomenon involving the increase in global surface temperature due to the presence of greenhouse gases - water vapour, carbon dioxide, tropospheric ozone, methane and nitrous oxide - in the atmosphere. Without the greenhouse effect, the earth's average surface temperature would be 33-35 degrees C lower, or -15 degrees C. Life on earth, as we know it today, would not be possible.

There is concern that this natural phenomenon is being altered by a greater build-up of gases from human activity, perhaps giving rise to additional warming and changes in the earth's climate. This additional build-up and its forecast outcome has been called the enhanced greenhouse effect. Considerable uncertainty exists, however, about the enhanced greenhouse effect, particularly in relation to the extent and timing of any future increases in global temperature.

Greenhouse gases arise from a wide range of sources and their increasing concentration is largely related to the compound effects of increased population, improved living standards and changes in lifestyle. From a current base of 5 billion, the United Nations predicts that the global population may stabilise in the twenty-first century between 8 and 14 billion, with more than 90 per cent of the projected increase taking place in the world's developing nations. The associated activities to support that growth, particularly to produce the required energy and food, will cause further increases in greenhouse gas emissions. The challenge, therefore, is to attain a sustainable balance between population, economic growth and the environment.

The major greenhouse gas emissions from human activities are carbon dioxide (CO₂), methane and nitrous oxide. Chlorofluorocarbons (CFCs) are the only major contributor to the greenhouse effect that does not occur naturally, coming from such sources as refrigeration, plastics and manufacture. Coal's total contribution to greenhouse gas emissions is thought to be about 18 per cent, with about half of this coming from electricity generation.

- C** The world-wide coal industry allocates extensive resources to researching and developing new technologies and ways of capturing greenhouse gases. Efficiencies are likely to be improved

dramatically, and hence CO₂ emissions reduced, through combustion and gasification techniques which are now at pilot and demonstration stages.

Clean coal is another avenue for improving fuel conversion efficiency. Investigations are under way into superclean coal (3-5 per cent ash) and ultraclean coal (less than 1 per cent ash). Superclean coal has the potential to enhance the combustion efficiency of conventional pulverised fuel power plants. Ultraclean coal will enable coal to be used in advanced power systems such as coal-fired gas turbines which, when operated in combined cycle, have the potential to achieve much greater efficiencies.

- D Defendants of mining point out that, environmentally, coal mining has two important factors in its favour. It makes only temporary use of the land and produces no toxic chemical wastes. By carefully pre-planning projects, implementing pollution control measures, monitoring the effects of mining and rehabilitating mined areas, the coal industry minimises the impact on the neighbouring community, the immediate environment and long-term land capability.

Dust levels are controlled by spraying roads and stockpiles, and water pollution is controlled by carefully separating clean water runoff from runoff which contains sediments or salt from mine workings. The latter is treated and re-used for dust suppression. Noise is controlled by modifying equipment and by using insulation and sound enclosures around machinery.

Since mining activities represent only a temporary use of the land, extensive rehabilitation measures are adopted to ensure that land capability after mining meets agreed and appropriate standards which, in some cases, are superior to the land's pre-mining condition. Where the mining is underground, the surface area can be simultaneously used for forests, cattle grazing and crop raising, or even reservoirs and urban development, with little or no disruption to the existing land use. In all cases, mining is subject to stringent controls and approvals processes.

In open-cut operations, however, the land is used exclusively for mining but land rehabilitation measures generally progress with the mine's development. As core samples are extracted to assess the quality and quantity of coal at a site, they are also analysed to assess the ability of the soil or subsoil material to support vegetation. Topsoils are stripped and stockpiled prior to mining for subsequent dispersal over rehabilitated areas. As mining ceases in one section of the open-cut, the disturbed area is reshaped. Drainage within and off the site is carefully designed to make the new land surface as stable as the local environment allows: often dams are built to protect the area from soil erosion and to serve as permanent sources of water. Based on the soil requirements, the land is suitably fertilised and revegetated.