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## Preview

### 1.1 Scope

The object of this book is to provide both geologists and those associated with the coal industry, as well as teachers of courses on coal, its geology and uses, with a background of the nature of coal and its varying properties, together with the practice and techniques required in order to compile geological data that will enable a coal sequence under investigation to be ultimately evaluated in terms of mineability and saleability. In addition, the alternative uses of coal as a source of energy together with the environmental implications of coal usage are also addressed.

Each of these subjects is a major topic in itself, and the book covers only a brief review of each, highlighting the relationship between geology and the development and commercial exploitation of coal.

### 1.2 Coal geology

Coal is a unique rock type in the geological column, it has a wide range of chemical and physical properties, and has been studied over a long period of time. This volume is intended to be a basic guide to understanding the variation in coals and their modes of origin, and to the techniques required to evaluate coal occurrences.

The episodes of coal development in the geological column (e.g. Carboniferous, Cretaceous, Paleogene and Neogene Periods – note that the Paleogene and Neogene Periods are sometimes referred to collectively as Tertiary) are given together with the principal coal occurrences worldwide. It is accepted that this is not totally exhaustive and that coal does occur in small areas not indicated in the figures or tables.

Current estimates of global resources and reserves of coal together with coal production figures are listed, and

although these obviously become dated, they do serve to indicate where the major deposits and mining activity is currently concentrated.

In relation to the extraction of coal, understanding of the geophysical and hydrogeological properties of coals is an integral part of any coal-mine development, and these are reviewed together with the principal methods of mining coal. The increasing use of computer technology has had a profound impact on geological and mining studies. Some of the applications of computers to these are discussed.

An important development in recent years has been the attempts to use coal as an alternative energy source by either removing methane gas from the coal and coal mines *in situ*, or by liquefying the coal as a direct fuel source, or by underground gasification of coal *in situ*. These technologies together are particularly significant in areas where conventional coal mining has ceased or where coal deposits are situated either at depths uneconomic to mine, or in areas where mining is considered environmentally undesirable.

### 1.3 Coal use

The principal uses of traded coals worldwide is for electricity generation and steel manufacture, with other industrial users and domestic consumption making up the remainder.

Lack of environmental controls in the use of coal in the past has led to both land and air pollution as well as destruction of habitat. Modern environmental guidelines and legislation are both repairing the damage of the past and preventing a re-occurrence of such phenomena. An outline is given of the types of environmental concerns that exist where coal is utilized, together with the current position on the improvements in technology in

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mining techniques, industrial processes and electricity generation emissions.

The marketing of coal is outlined together with the contractual and pricing mechanisms commonly employed in the coal producer/coal user situation.

### 1.4 Background

In most industrial countries, coal has historically been a key source of energy and a major contributor to economic growth. In today's choice of alternative sources of energy, industrialized economies have seen a change in the role for coal.

Originally coal was used as a source of heat and power in homes and industry. During the 1950s and 1960s cheap oil curtailed the growth of coal use, but the uncertainties of oil supply in the 1970s led to a resumption in coal consumption and a rapid growth in international coal trade. This in turn was followed by an increasingly unfavourable image for coal as a contributor to greenhouse gas (GHG) emissions and thus closely identified with global warming. The coal industry has responded positively to this accusation and modern industrial plants have much lower emissions levels than in previous years. Currently coal accounts for 20% of all GHG emissions.

The world consumption of fossil fuels, and thus emissions of CO<sub>2</sub>, will continue to increase, and fossil fuels still meet around 90% of primary energy requirements. The objectives of the 'United Nations Framework Convention on Climate Change' (UNFCCC) signed at the 1992 Earth Summit in Rio de Janeiro, is to 'stabilise GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system'. No set levels were identified but emissions in developed countries were expected to be reduced to 1990 levels. A series of annual meetings by the international body under UNFCCC – the Conference of

the Parties (COP) – have taken place, notably COP-3 in Kyoto, Japan in 1997, at which the Kyoto Protocol was drawn up, setting emissions targets for all the countries attending. However, Government Ministers at COP-6 in The Hague in November 2000 failed to agree on the way forward to meet the Kyoto Protocol targets. This placed the whole of the Kyoto Protocol's ambitious and optimistic plan for a global agreement on GHG emissions reduction in an uncertain position (Knapp, 2001). This could be an indication of overambitious goals rather than any failure in the negotiations and it is up to the parties concerned to establish a realistic set of targets for emissions reductions in the future. The Copenhagen Accord in 2009 reinforced the need for emissions reductions together with providing financial assistance to help developing countries cut carbon emissions. It still remains to be seen whether such ambitions can be translated into a binding international agreement.

It remains a fact that many economies still depend on coal for a significant portion of their energy needs. Coal currently accounts for 29% of the world's consumption of primary energy, and, importantly, coal provides fuel for the generation of around 42% of the total of the world's electricity. In 2010, traded black coal amounted to 938 Mt of which 676 Mt was steam coal and 262 Mt was coking coal.

Coal reserves are currently estimated to be around 860 billion tonnes, and the world coal reserves to production ratio is nearly six times that for oil, and four times that for natural gas. This, together with the globally democratic distribution and secure nature of coal deposits, will ensure that coal will continue to be a major energy resource for some considerable time to come.

With this scenario in mind, this volume is intended to assist those associated with the coal industry, as well as educationalists and those required to make economic and legislative decisions about coal.

The philosophy and views expressed in this book are those of the author and not the publisher.