

Chapter 12

Non-renewable Resource Use – Coal Mining in New Zealand

The NCEA Level 1 Geography material in this chapter is from **Achievement Standard 1.3 (AS 90204) 'Examine resource use in a farming or mining context'**, and requires knowledge of distribution pattern(s), how farming and mining operations function as systems, and perceptions about sustainability of resources and environmental impacts.

- How people perceive resources and their sustainability.
- The distribution pattern of coal mining.
- How a coal mining operation functions as a system; a system refers to inputs, processes, outputs and feedback
- Different ways people perceive the environmental impacts of coal mining operations and measures taken to resolve these impacts.

Introduction

Coal is made from anaerobically decomposed plant matter that has carbonised under high pressure over millions of years. Coal is a fuel which, when burned, produces high levels of heat energy. It is a non-renewable resource – once coal is extracted from the ground, the resource cannot be replenished.

In New Zealand, over 3 million tonnes of coal (worth over \$180 million) are mined per year. In 2002, nearly 4.5 million tonnes were mined. This coal has many uses:

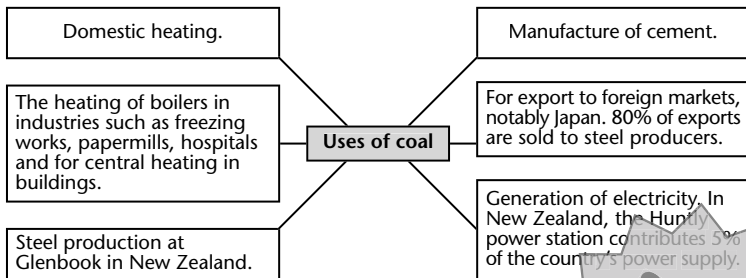


Fig. 12.1: Uses of coal.

Despite the high usage of coal, there is little fear of exhausting New Zealand's supply of coal in the foreseeable future because New Zealand has vast reserves. In fact, coal is New Zealand's largest energy resource. Over 8.6 billion tonnes is potentially recoverable – enough to support New Zealand's economy for over 1 000 years.

While coal use has many benefits, eg the production of heat energy, using coal also causes problems. When coal is burned it produces both ash and oxides of sulfur which cause air pollution. However, in New Zealand mostly low-sulfur coals are found so the problem of air pollution is not as severe as in other countries. Also, much research is currently under way to develop new technology using coal which produces less pollution.

Activity 12A: Coal – a non-renewable resource**1.** Why is coal a non-renewable resource?

Study the table below, then answer the questions which follow:

Coal	84%
Oil and gas	8%
Geothermal	8%

Fuel reserves in New Zealand.

**SAMPLE
NCEA
QUESTIONS**

- Construct a pie graph showing the reserves of fuel resources in New Zealand.
- Suggest a reason why coal is likely to outlast the other non-renewable resources.
- Suggest a reason why the government in the past has provided tax incentives for oil and gas exploration in New Zealand.

The Formation of Coal

Coal takes millions of years to form from the remains of plants and trees.

- These plants and trees grew in low-lying and swampy areas. When they died, they fell into the swamps where they slowly rotted and were covered by mud and sand.
- The swamp covered the dead plants and trees, sealing the plants off from the air and preventing further decay.
- Over time, the partly decomposed material compacted because of the increasing weight of material above. This material was known as **peat**.
- This process continued, forming more and more peat deposits of increasing thickness. The weight of the material above the peat also grew, increasing the pressure on the peat and burying it deeper underground. While this was happening, the oxygen and water content of the peat was decreasing, but the carbon was increasing. The peat was transforming into coal.
- Millions of years later, **coal seams** (layers of coal in the earth) were compressed further and pushed nearer the surface through tectonic activity. Some seams were also tilted on their side and are now vertical.

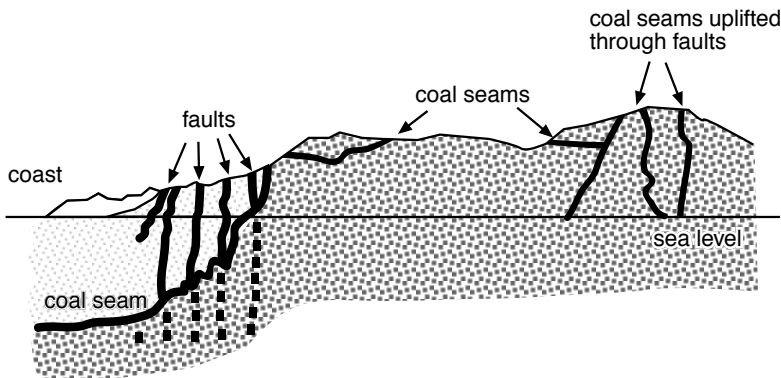


Fig. 12.2: Cross-section of a typical coalfield.

The oldest coalfields in New Zealand are in the South Island (Greymouth, Ohai and Kaitangata) which began forming over 70 million years ago, while the coalfields of the Waikato region are about 40 million years old.

Types of Coal

Coal is classified by its appearance and by the heat energy it produces when burned.

There are five types of coal, each with different properties.

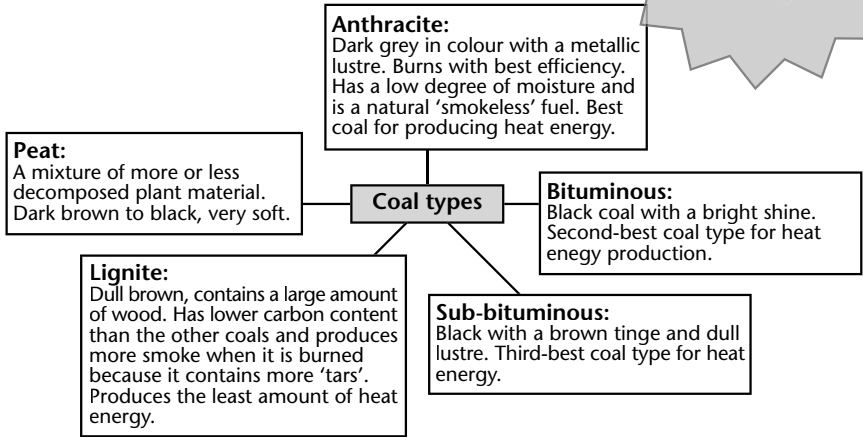


Fig. 12.3: Coal types.

These differences in coal types are due to the amount of change the peat undergoes as it is buried. The deeper the peat deposits are buried, the more the peat is changed and the better the quality of coal (if a peat deposit stays near the surface it may never become coal). Better quality coals produce more heat energy because they have a greater carbon content. (fig. 12.4)

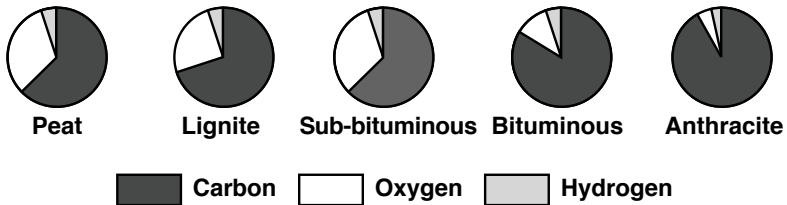


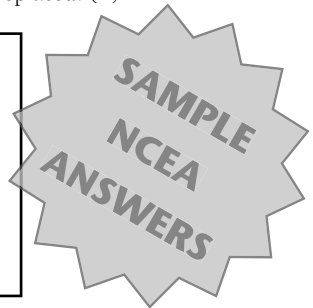
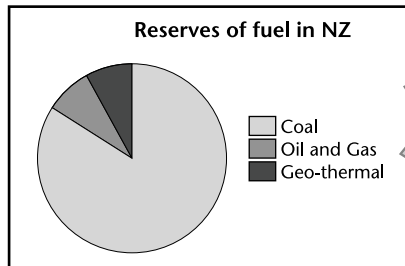
Fig. 12.4: Contents of coal types.

In New Zealand, lignite (26% of coal reserves) is the most common type of coal, with sub-bituminous (19%) and bituminous (5%) coal also being found.

Chapter 12

Activity 12A: Coal – a non-renewable resource

1. Because coal is in limited supply and once mined cannot be replaced. (A)
- 2.



Frame = 1 mark; title (what, where) = 2 marks; key and shading = 2 marks; accuracy (all pie pieces accurate) = 1 mark; total = 6 marks

(A – 3 or 4 marks; M – 5 marks; E – 6 marks)

3. Because it has the largest reserves. (A)
4. Because New Zealand imports much of its oil. (M)

— Page Break —

Glossary / Index

aftershocks 85: small, shallow earthquakes which follow a main earthquake.

age-sex pyramids 138, 155: display of population in different age groups, according to sex.

ageing population 134: the proportion of the population who are elderly is increasing.

air pressure 21: the weight or pressure the air exerts on the ground at any point. It is measured in millibars.

air pressure cell or system 21: an anticyclone, depression or tropical cyclone.

alluvial 236: developed from deposits from rivers.

anthracite 253: type of coal which is best for heat energy.

anticyclone 22: high pressure zone.

aquifer 295: groundwater table.

artificial insemination 223: injection of semen into the uterus by artificial means.

ash 52: very fine particles of pyroclastic rock, less than 2 mm in diameter.

atmospheric events 31: events which occur above the surface of the Earth, in the atmosphere.

atoll 119: see coral atolls.

baby boom 144: a high birth-rate causing a rapid rise in the population in New Zealand and other Western countries in the decades following World War II.

bar graphs 5: show comparisons between data values or frequencies.

basalt 69: a dark volcanic rock.

beltwagon 280: a moveable, bridging conveyer belt used in iron sand mining.

birth-rate 137: the number of live births per 1 000 people.

bituminous 253: black coal with second-best heat energy rating of all coal types.

