Environmental Studies
FACT SHEET
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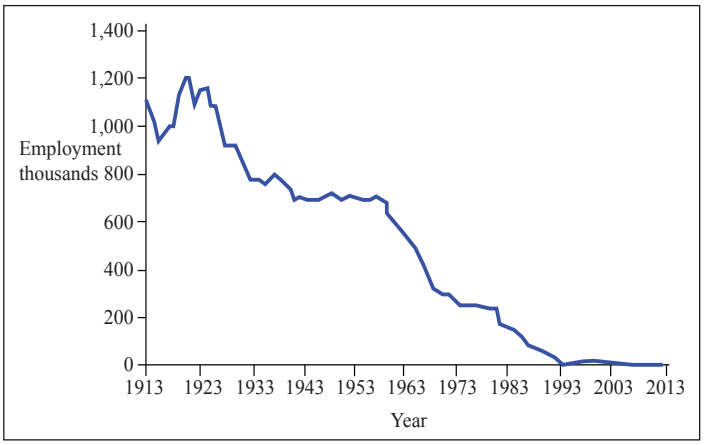
Reopening UK Coal Mines

In 1920 British coal mines provided employment to over a million men in the UK but by 2010 only three mines remained active. So what was the cause for such a drastic decline and is this an industry with potential of revival?

This Factsheet examines:

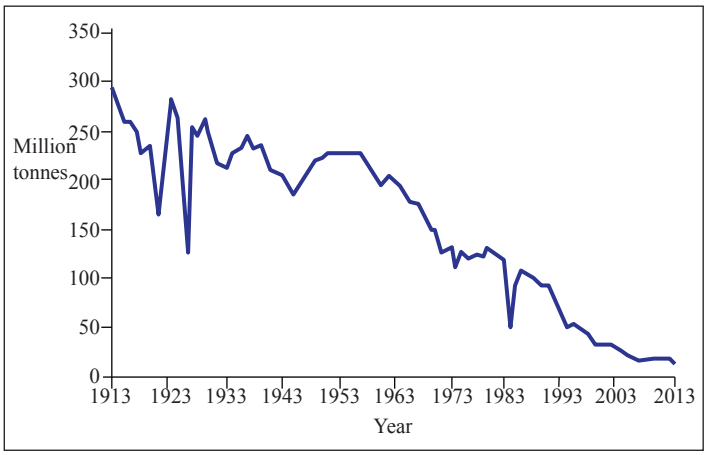
- The cause of industry decline
- Potential prospects of UK coal mines in 2014
- Likelihood of the prospects being utilized

Fig. 1 UK coal mine employment 1913-2013



Reasons for Decline in UK coal industry

Fig. 2 UK total coal output 1913-2013



Many compounding factors are responsible for the rapid decline of the UK coal industry.

- Import Costs - As world trade advanced import costs of coal to the UK reduced. As a result the UK coal industry became uncompetitive. Coal was imported from other countries at a cheaper cost per unit. In 2012 coal imported from Russia, Colombia and the USA accounted for 96% of imports

Fig. 3 Mining 1970 - 2013

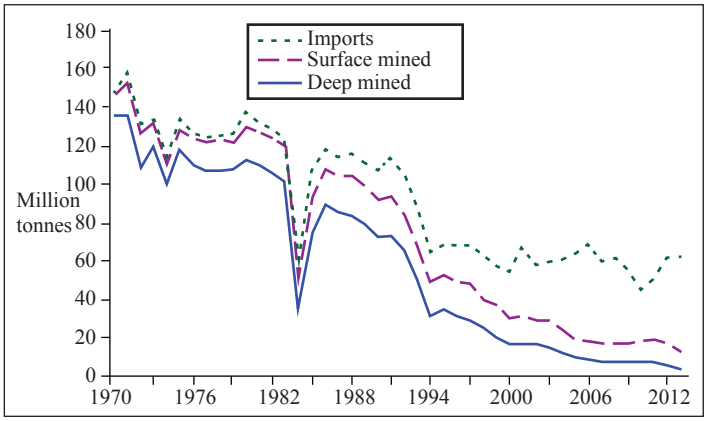
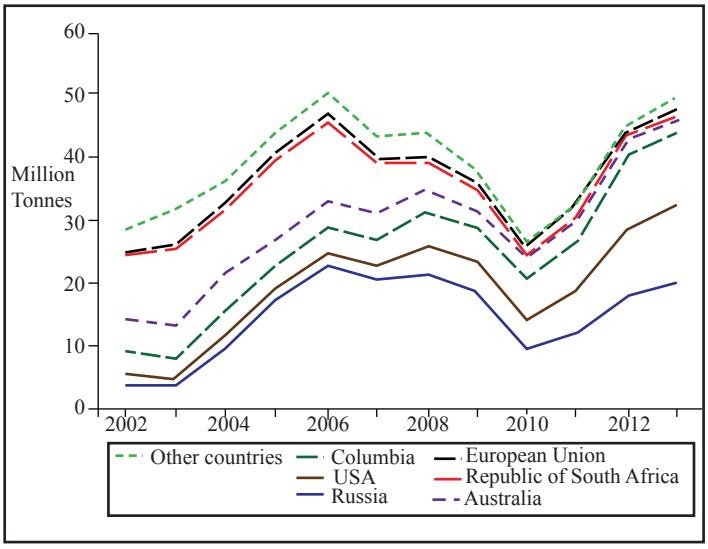


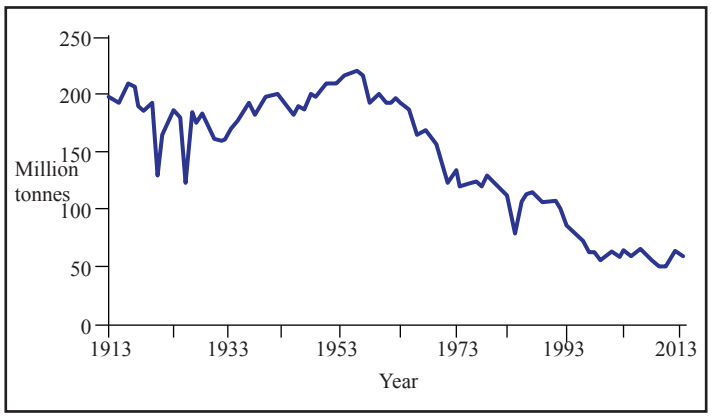
Fig. 4 Total UK coal imports by country of origin 2002 - 2013



- Fuel Development - Development in other fuel sources provided cheaper 'greener' alternatives to coal. North sea gas and oil were cheaper options and renewables such as wind and solar provided other options. Nuclear power also provided a new alternative to coal. This change in sourcing reduced UK dependency on coal.

- Demand – Services that were once heavily dependent on coal started to source alternative options. For example, National Rail replaced coal steam powered engines with diesel and electric. UK homes replaced coal central heating with modern alternatives after the 'Clean air act of 1956'.

Fig. 5 UK inland coal consumption 1913 - 2013



- Political issues – miners unions in the UK were extremely powerful both economically and politically. With the ability to bring the country to a standstill if they decided to strike. However after the success of the Margaret Thatcher campaign in 1984 the coal unions lost their economic power and became powerless to stop the stream of closures of UK mines after this
- Coal mine Nationalization act 1946- some argue nationalizing the coal industry limited investment potential and reduced productivity leading to greater decline
- Coal mine Privatization 1994 – in 1994 UK coal plc was formed to take control of the UK industry. At this time there was only 15 pits in production. Experts speculate that this combined with no government support further reduced the UK's ability to compete with global coal prices

Future of UK coal

The decline of UK coal supply and demand is unarguably significant, however many experts still believe UK coal has a future role to play.

Coal is still responsible for providing 40% of UK electricity, this figure sometimes rising to 50% in winter periods. Some experts believe a combination of developing coal to make it 'greener' and global fuel supply issues will provide coal and coal mines a future in the UK.

Potential - How much coal is left in the UK?

Several companies and organizations have estimated how much coal remains in the UK, both on and offshore.

Coal Accessibility

- Accessing on shore coal would require rebuilding of lost infrastructure
- Abandoned mines are commonly flooded and reopening would require vast pumping
- Removal of mine water is expensive and the water is usually heavily contaminated with heavy metals e.g. iron, lead and cadmium
- Contaminated water must be treated and disposed of correctly, this again increases cost and decreases feasibility

Off shore coal

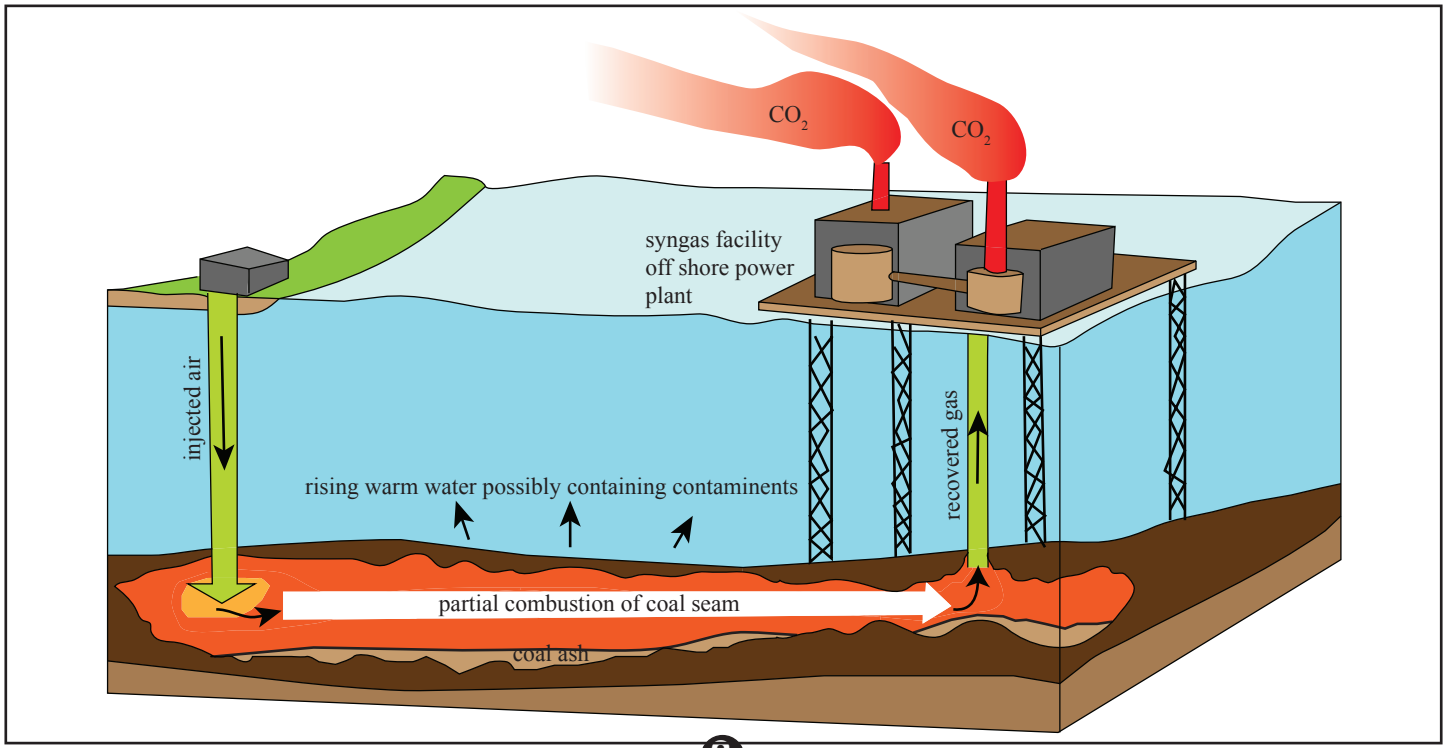
- Off shore coal provides a different challenge. It is inaccessible by traditional methods because the coal is too deep, low grade, or the seams too thin
- Off shore coal requires new techniques to access coal

Underground coal gasification (UCG)

Underground coal gasification (UCG) involves drilling into the coal bed deep underground and igniting it. The gas that is formed during this process (syngas) is collecting when it escapes through another borehole. To obtain the gas two wells are drilled - an injection well that brings steam and oxygen or air underground to ignite the coal seam and maintain the process, and a production well which pumps out the raw syngas

Syngas is s a mixture comprising of carbon monoxide, carbon dioxide, and hydrogen. Syngas has 50% of the energy density of natural gas. It cannot be burnt directly, but is used as a fuel source.

Fig. 6 Off Shore combustion of syngas



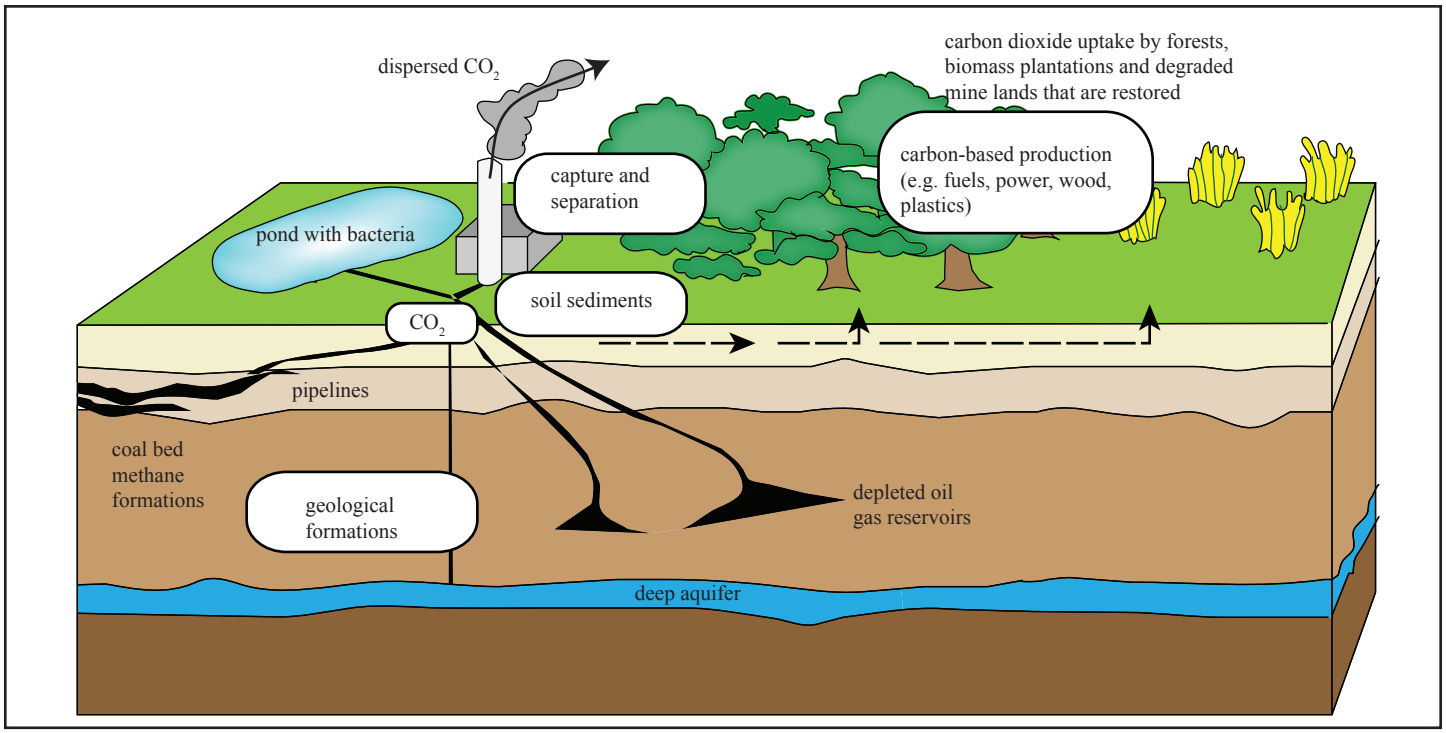
Benefits of UCG:
- Decreases some negative environmental impacts of coal mining as no coal is brought to the surface
- Reduces cost per unit of electricity if conditions are correct. i.e. coal seam is deep enough and at the right depth
- There is no creation of tailings (mine dumps)
- Sulfur emissions are reduced
- Ash, mercury and tar emissions are reduced because there is no physical handling of coal

Costs of UCG:
- It is a process prolonging the life of fossil fuels
- It would mean human caused emission of carbon dioxide would continue
- If carbon capture storage were to implemented to limit CO_2 emissions the cost per unit of electricity would significantly increase
- Groundwater contamination – Because of the high underground cavity pressure some of the syngas and tar can be released into the surrounding formation, thereby contaminating the water

Carbon Capture Storage

Another possibility for the future of coal in the UK is carbon capture storage (CCS).

Fig. 7 Carbon capture storage



What is CCS?

The process captures carbon dioxide from a large point source i.e. coal and sequesters (deposits) it at another location so it cannot enter the atmosphere

Benefits:

- Can reduce CO_2 emissions by approximately 80-90%
- Helps prevent global warming and ocean acidification
- Economic potential of CCS could be between 10-55% of the total carbon mitigation
- Injecting CO_2 into geological features such as oil fields can increase oil recovery

Potential Costs

- There is no long term experience in storage of CO_2 in this form, there are still only estimates of potential leakage over time
- There is a risk when injecting CO_2 into geological features that leakage will occur
- If leakage occurs CO_2 emissions become higher than before
- It is expensive to retrofit current coal sites with this technology, especially if the sequestration site is not close to the plant

Summary

- The UK coal industry has drastically declined due to cheaper import costs and demand
- There is still a demand for coal in the UK – It accounts for 40% of the UK energy mix
- Carbon capture storage and underground coal gasification are two alternatives that offer promise. However both are still largely untested and are expensive
- The UK coal industry requires new support from the government by investing in these new technologies if it is to succeed

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