Earth's physical resources: extracting coal & oil

Coal formation

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This is one of some 30 workable scenes in the Northumberland coalfield. They extend over several hundreds of kilometres throughout the coalfields of North-east England. Here we have, in fact, a split seam, with a dirt band in the middle, but the two leaves of coal together, will give us something like a metre of coal, very typical of the coalfields of Great Britain. So here we've got a bed of organic matter, very wide in extent, but only very thin, and separated by several metres of plastic materials, like this, from the next seam, which must lie above or down beneath us. Most people throw the coal on the first without really looking at it, but there's a wealth of detail to be seen there. If we examine it fairly closely we can see several of the components, or mackerels', which make up the coal itself. And here are some examples. Here we can see the bright, lustrous, vitrinite made up of the decomposed plant, or bark, material. This is the dull, splint, durian containing much inordinate material. And here we can see the charcoal-like powder, which is believed to have been formed in forest fires. But that is the organic matter in the seam; there is also the impurity as well, and here we can see examples of those. Here a dirt band, and here the yellow pyrites, which, when the coal is burned, will give us sulphur dioxide. We've talked about the coal seam being formed of organic matter, so here is some of the evidence for it. This is a fossilised plant remain which has been preserved in the shale's associated with the coal-seam. And in this specimen we can see rootlets of the plants, which originally grew to form the coal-seams, and which have been preserved in the clays underneath the seam, so indicating that this was a fossil soil. Above the seam there are a series of sedimentary layers of mudstone and sandstone until we get to another seam. So here is a cycle of deposits: soil, coal, sediments, and then another coal. In this part of the world this sequence is repeated at least five times below and 20 or more times above. But this isn't just a regular pile of continuous sheets on top of one another. We said you can trace a seam for several kilometres but, locally, look at this here. What happens to our top leaf? Here, our top leaf is missing completely. A river channel has cut down through the sediments overlying the coal-seam and has cut away the coal-seam itself. This is a washout. And elsewhere on the site we have seen a seam split into two separate beds: a seam split.

Narrator

So, in what type of environment would this diverse, and rapidly-changing series of sediments, be deposited? Coal-forming plants, it's thought, thrived in very flat, coastal, swampy areas, with soils at or below water level. Gradual subsidence allowed dead plant material to accumulate in the anaerobic waters to from peat. Swamps like this exist today in certain parts of the southern USA. But in Britain, some 300 million years ago, during the carboniferous period, the swamps formed between the distributaries channels of huge delta complexes. The channels brought vast quantities of sediment from distant highlands and built up high mud-banks running above the swamp level. If these banks failed escaping water would cut through the soft swamp deposits, causing a washout. Often sand or silt would be deposited here and the channel would change its course. Water, however, was not always confined to channels. During floods fine sediment was deposited all over the swamp; these produce the muddy dirt partings in the coal. And occasionally the sea covered the delta, and this left fossil fibrous mud known in the coalfields as marine bands. During regional subsidence this complex of environments was buried and compacted as more and more sediments were deposited. During burial the temperature and pressure rose sufficiently for the peat deposits to be converted to coal. These complex sedimentary processes make predicting what's in front of the coalface very difficult, and they're complicated still further by later geological processes.