M09/4/ECOSO/SP2/ENG/TZ0/XX/T

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ECOSYSTEMS AND SOCIETIES
STANDARD LEVEL
PAPER 2

Thursday 7 May 2009 (morning)

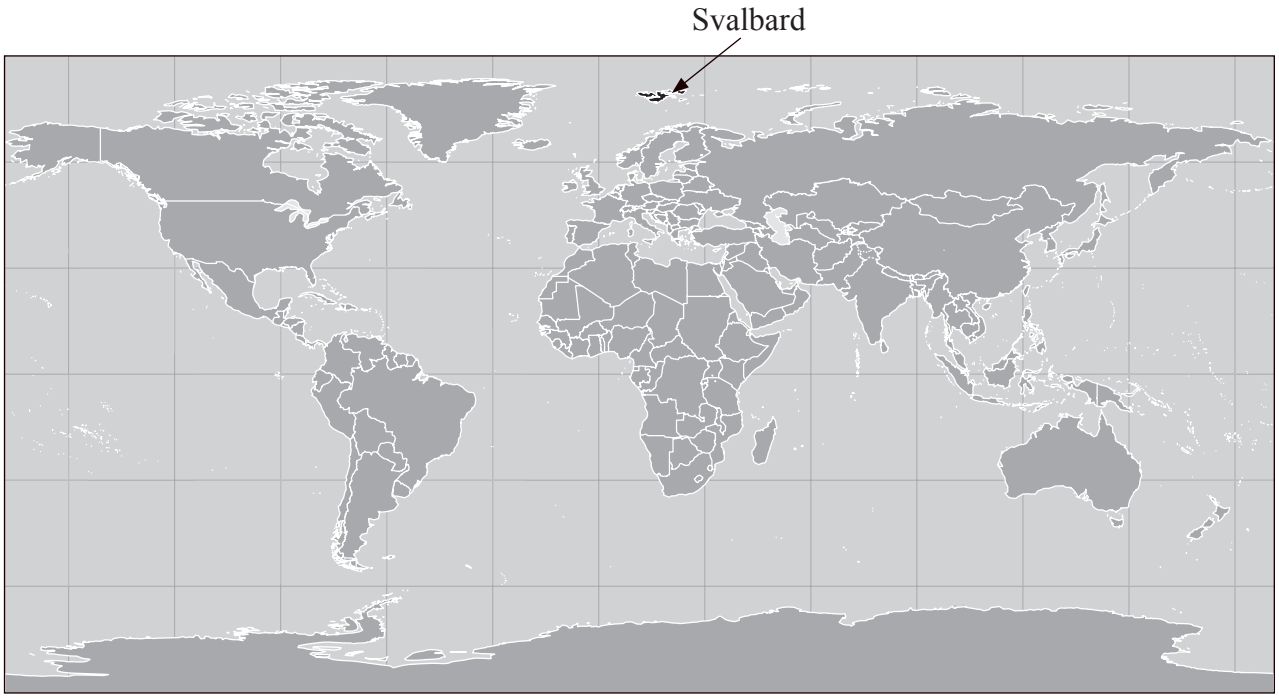
2 hours

RESOURCE BOOKLET

INSTRUCTIONS TO CANDIDATES

- Do not open this booklet until instructed to do so.
- This booklet contains **all** of the resources required to answer question 1.

Figure 1 World map showing the area covered by this case study



[Source: Based on a UN map of the world (http://www.un.org/Depts/Cartographic/map/profile/world.pdf). By permission of the UN Cartographic Section.]

Figure 2 Introduction

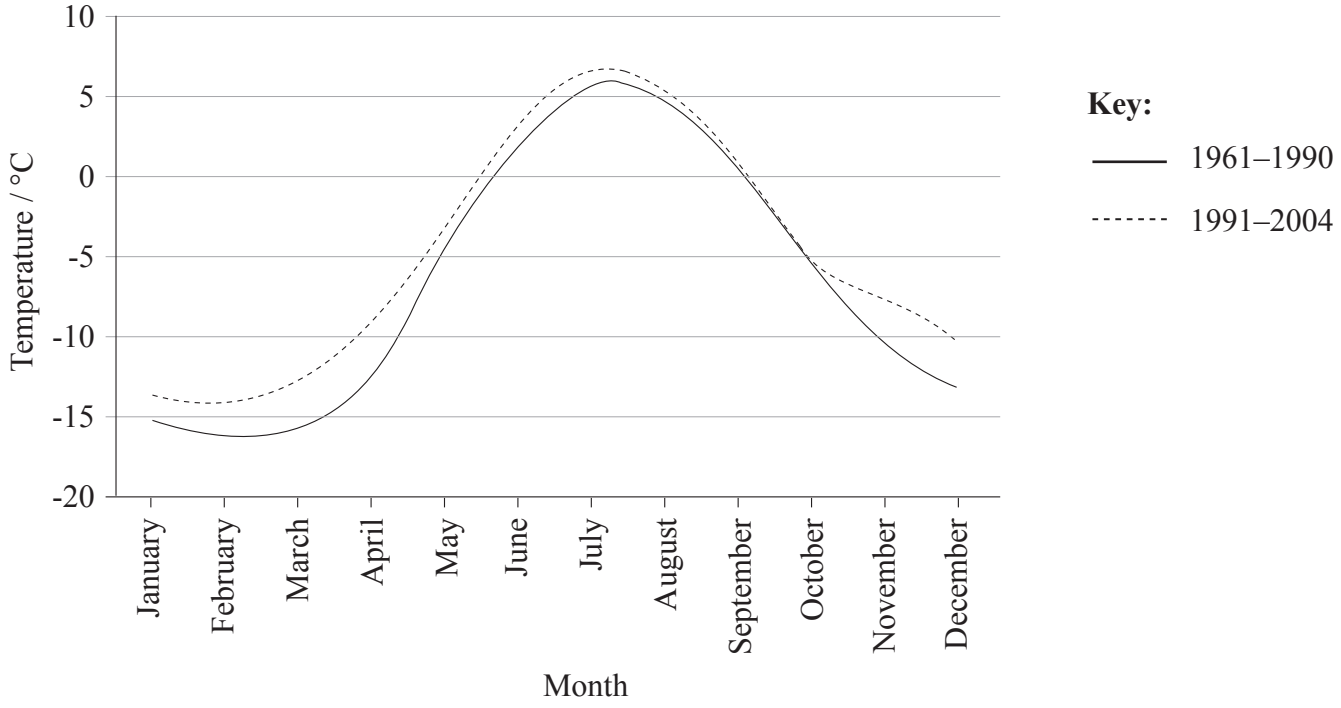
Svalbard is a group of islands within the Arctic Circle and 1000 km north of Norway. For nearly four months of the year it is in complete darkness. Glaciers and snowfields cover 60% of the total area. The sea freezes for part of the year. Spitsbergen is the largest island in the group, with the only permanent settlements. There are no roads except within and close to these settlements.

Figure 3 Fact file on Svalbard

- the warm, North Atlantic Current flows along the west and north coasts of Spitsbergen
- Svalbard has a permafrost layer 450 metres deep, only the top metre of soil melts during the summer
- natural resources include coal, iron ore, copper, zinc, phosphate, wildlife and fish
- reserves of oil and gas are believed to lie beneath the seas round Svalbard
- there are no trees
- many scientists come to the islands to study the glaciers and the region's unique wildlife
- a global seed store for conserving seeds collected from all over the world has recently been built on the island
- tourism is becoming increasingly important

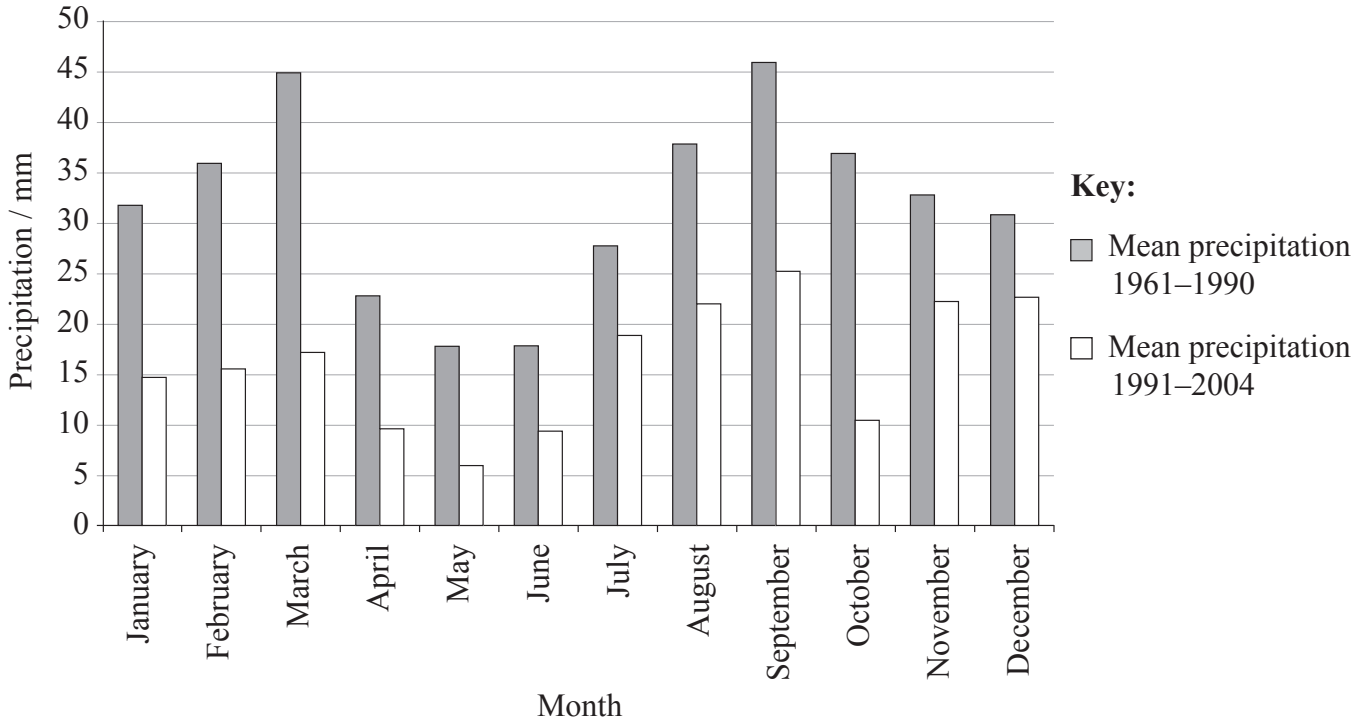
Figure 4 Temperature and precipitation data for Svalbard

The mean monthly air temperature for two consecutive time periods (1961–1990 and 1991–2004)



[Source: data adapted from Norwegian Meteorological Institute]

The mean monthly precipitation for two consecutive time periods (1961–1990 and 1991–2004)



[Source: data adapted from Norwegian Meteorological Institute]

Figure 5 Plants and animals of Svalbard

Svalbard reindeer
(*Rangifer tarandus platyrhynchus*)

[Marius Fiskum, www.fototopia.no]

Arctic fox
(*Alopex lagopus*)

[Source: Mr Per Herald Olsen, no.wikipedia]

Purple saxifrage
(*Saxifraga oppositifolia*)

Rock ptarmigan
(*Lagopus muta hyperboreus*)

[Source: Wojsyl, wikipedia]

Common eider
(*Somateria mollissima*)

Snow bunting
(*Plectrophenax nivalis*)

Mosquito
(*Culex Pipiens*)

[Source: Alvesgasper, wikipedia]

Boreal jacobs-ladder
(*Polemonium boreale*)

[Source: Michael Haferkamp, wikipedia]

[Sources: www.wikipedia.org and www.arcticphotos.co.uk]

Figure 6 Reindeer on Svalbard

Some of the animals and plants found on Svalbard are unique. The Svalbard reindeer (*Rangifer tarandus platyrhynchus*) is a different subspecies to the wild reindeer of Scandinavia and Russia and the caribou of North America (*Rangifer tarandus*). Svalbard became an island about 40 000 years ago when sea levels rose, leaving a small reindeer population trapped on the island.

	WILD REINDEER / CARIBOU **IMAGE REMOVED FOR COPYRIGHT REASONS** [Source: www.uncommonyukon.com]	**SVALBARD REINDEER** **IMAGE REMOVED FOR COPYRIGHT REASONS** [Source: www.sciencemuseum.org.uk]
Physical features	• long legs • lean body • large antlers	• short legs • large amounts of body fat stored for winter • small antlers • extra large stomachs to digest poor quality food
Behaviour	• live in large herds • move frequently while grazing as food supply is rapidly exhausted • can run fast, even when very young	• live singly or in small herds • remain in the same grazing area for long periods • move slowly
Food	• a lichen called reindeer moss, often found beneath snow cover in winter	• small Arctic flowering plants of very low nutrient value, containing natural toxins
Intraspecific competition	• compete for food and mates with other members of herd	• little direct competition for grazing because animals are widely dispersed in their habitat
Predators	• wolves	• none
Parasites	• warble flies burrow under their skin and lay eggs, that then hatch into maggots	• no warble flies live on Svalbard
Common causes of death	• predation, parasites, injuries caused by fighting other reindeer	• starvation when teeth are lost or worn out

Figure 7 Coal mining on the coast of Svalbard

Coal has been mined on Svalbard for over 100 years. There are plans to open a new coal mine. The diagram below shows the potential environmental problems of opening a new coal mine.

[Source: http://www.fennerdunlop.com/arctic_Mining,
© Fenner Dunlop, used with permission]

Figure 8 Model to show fate of coal extracted from mines on Svalbard

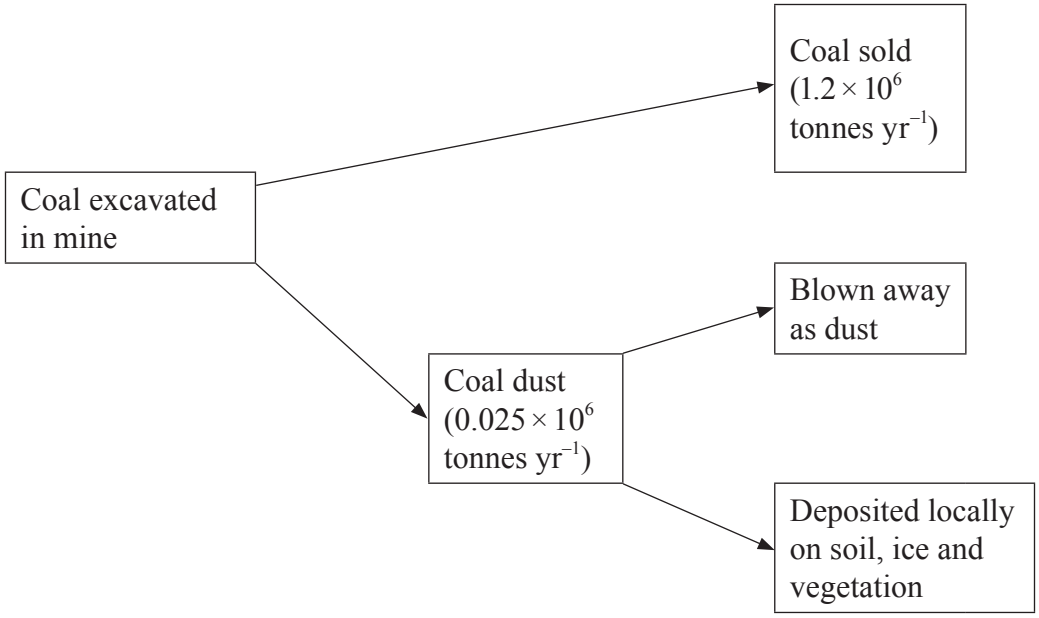
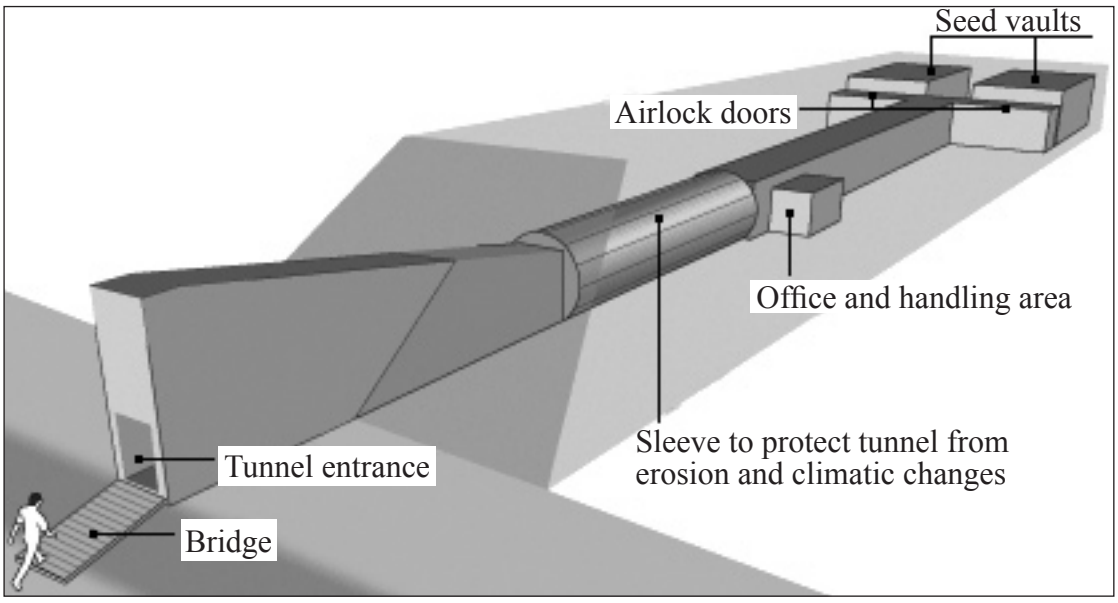


Figure 9 Svalbard International Seed Vault



[Source: adapted from www.croptrust.org/main/arctic]

Species are becoming extinct at an alarming rate. The Svalbard international seed vault has been built to preserve up to 2 billion seeds from around the world, because other seed collections elsewhere could be lost. Threats to other seed banks include war, natural hazards, power cuts and poor management.

The Svalbard seed vault has been dug out of a permanently frozen hill side. Even without electricity the samples will remain frozen because of the permafrost. Seeds will only be released from the vault if all other seed sources have been lost.

Figure 10 Arctic polar projection

IMAGE REMOVED FOR COPYRIGHT REASONS

[Source: adapted from www.britannica.com/eb/art-58/
Southern-limit-of-Arctic-tundra-and-approximate-line-of-demarcation]