UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

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| CANDIDATE NAME | | | | | | | | | |
| CENTRE NUMBER | | | | | | CANDIDATE NUMBER | | | | |

*7124728426*

**ENVIRONMENTAL MANAGEMENT** **0680/43**

Alternative to Coursework **October/November 2012**

**1 hour 30 minutes**

Candidates answer on the Question Paper.

Additional Materials: Calculator
Ruler

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

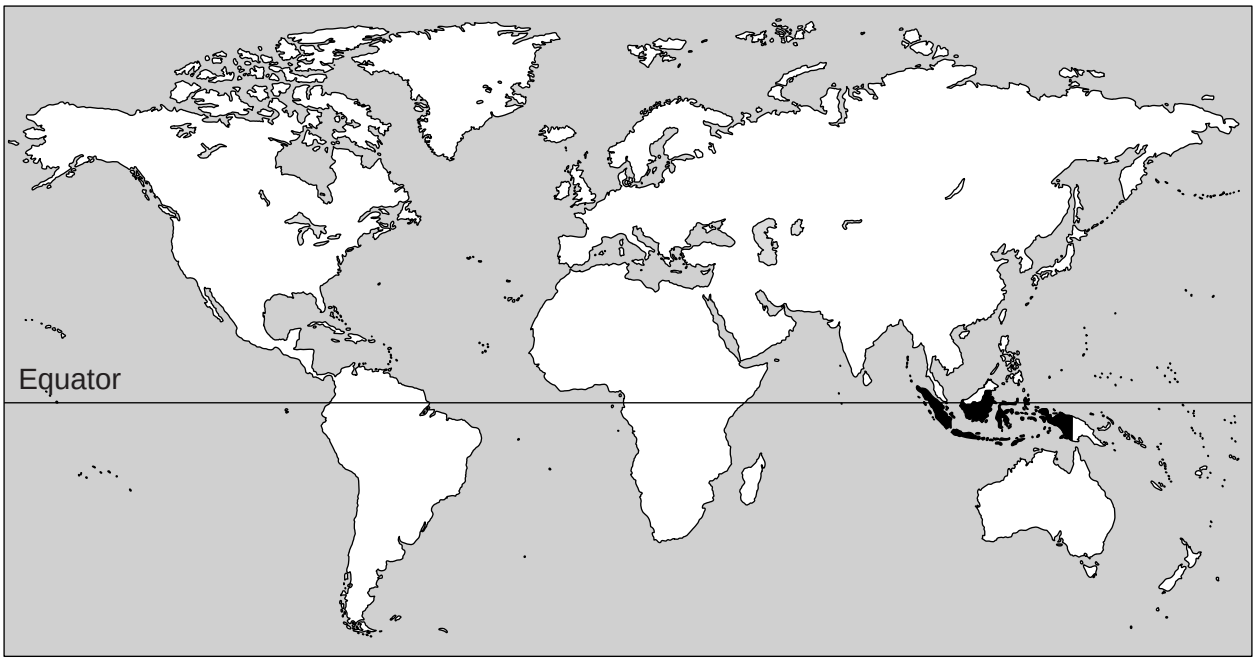
Answer **all** questions.
Study the appropriate source materials (on pages 2 and 3 in this question paper) before you start to write your answers.
Credit will be given for appropriate selection and use of data in your answers and for relevant interpretation of these data. Suggestions for data sources are given in some questions.
You may use the source data to draw diagrams and graphs or to do calculations to illustrate your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

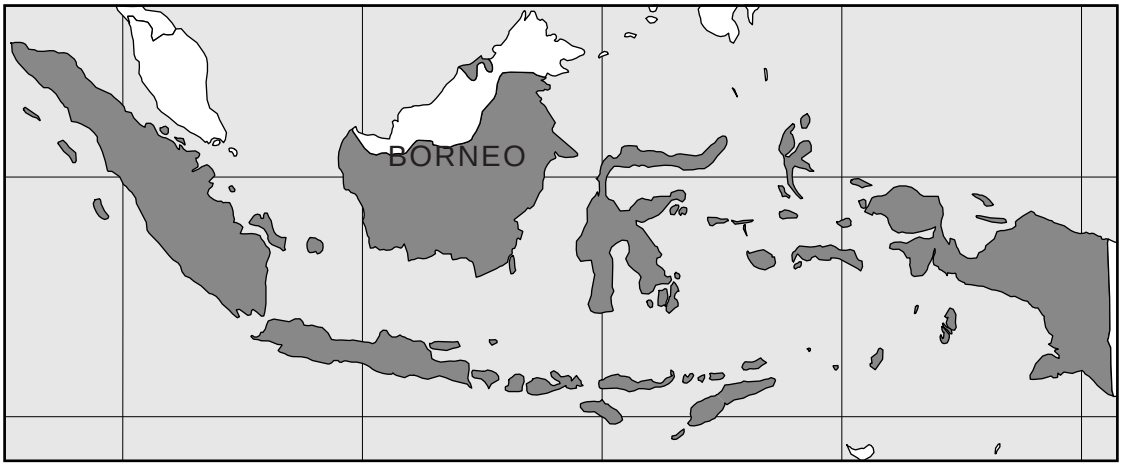
| For Examiner's Use | |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| Total | |

This document consists of **16** printed pages.


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**World map showing Indonesia shaded**




**Map of Indonesia showing the location of Borneo**

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**Map of the Indonesian part of Borneo with some details of the state of Kalimantan**

**Area of Indonesia**: over 1 900 000 sq km

**Population**: 240 million

**Children per woman**: 2.3

**Life expectancy**: 71 years

**Currency**: Indonesian rupiah (10.5 IDR = 1US$)

**Languages**: Bahasa Indonesia, plus over 700 local languages of which the most widely spoken is Javanese. Dutch is still used for some legal purposes.

**Climate**: hot wet tropical; more moderate temperatures in the highlands

**Terrain**: mostly coastal lowlands; ranges of mountains in the interior

**Main exports**: petroleum products, garments and textiles, natural gas, electrical goods, timber, plywood and rubber.

Indonesia is a country made up of many islands including a large part of the island of Borneo. Indonesia is rich in natural resources. Exports based on coal mining, logging, oil and natural gas provide the government with high revenues. Its population has grown rapidly in recent years. Domestic consumption remained strong during the world recession of 2008–10. The government is attempting to reduce poverty, improve educational standards and prevent illegal logging.

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**1** **(a)** Suggest why the government of Indonesia wants to

**(i)** improve educational standards, .....

.....

**(ii)** prevent illegal logging. .....

..... [2]

**(b)** The state of Kalimantan was covered with tropical rainforest. However, for many years the government has been issuing licences to carry out logging. About half of the logging is illegal, often because trees are cut down beyond the licensed areas. Only 5% of the tropical rainforest remains.

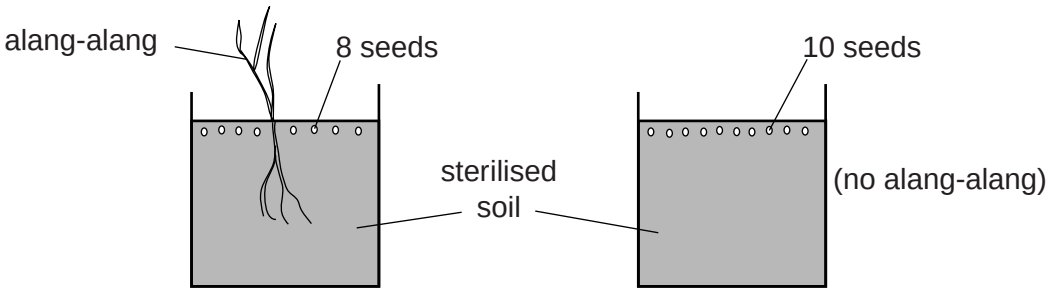
The cleared forest is left to recover. Unfortunately a fast-growing grass called alang-alang colonises the cleared areas and seems to prevent other plant seeds from germinating.



A student wanted to find out if alang-alang really does prevent the germination of seeds of other plants. He prepared three plans, as shown below.

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Plan **A**




- Temperature range 26–29 °C
- Each pot watered every day
- Seed growth recorded every day

Plan **B**

The same as above, but three pots with alang-alang and three without, each with 20 seeds.

- Temperature range 26–29 °C
- 50 $cm^3$ of water added to each pot every day
- Seed growth recorded every day

Plan **C**

The same as above, but three pots with alang-alang and three without, each with seeds as shown above.

- Temperature range 26–29 °C
- 50 $cm^3$ of water added to each pot every day
- Seed growth recorded every day

**(i)** Which plan would you carry out? Give reasons for your choice.

.....

.....

.....

.....

.....

..... [4]

**(ii)** Suggest **two** other soil factors that the student could have kept the same in plans **A** and **B**.

.....

..... [2]

**(iii)** The results from a similar experiment are shown in the table.

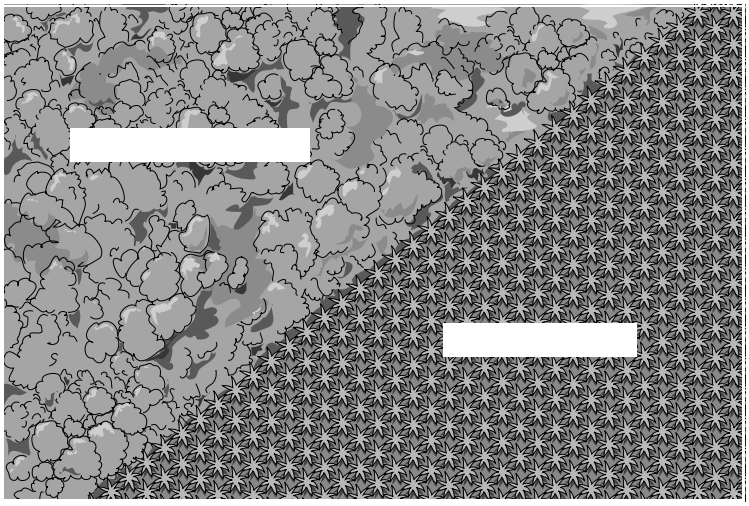
| | percentage of seeds that germinated |
|---|---|
| without alang-alang | 85 |
| with alang-alang | 35 |

Suggest one way in which alang-alang might stop seeds germinating.

..... [1]

**(c)** In some of the cleared areas of the tropical rainforest, oil palm trees have been planted close together in rows. The oil palm fruits are harvested, their kernels are removed and oil is extracted.

*For Examiner's Use*



**(i)** Suggest reasons why oil palm trees are planted close together.

.....

.....

..... [2]

**(ii)** Palm oil is exported all over the world. It is often processed into biofuels. Scientists have mixed views on biofuels produced in this way. Some think this is a sustainable activity, others think that it is not sustainable and a poor use of resources.

Explain why some think that producing biofuel by processing plant products such as palm oil is a sustainable activity but others think it is not.

sustainable activity .....

.....

not sustainable .....

..... [3]

**(iii)** Clearing tropical rainforest and planting oil palm trees reduces biodiversity.

What is meant by the term *biodiversity*?

.....

..... [1]

**(iv)** Describe **one** advantage of maintaining biodiversity in the state of Kalimantan.

.....

..... [1]

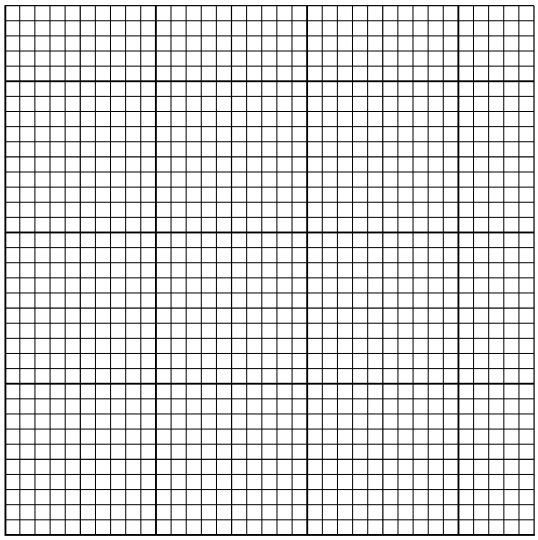
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**(d)** A research scientist wanted to find out how much fruit could be harvested from oil palm trees planted in an area covered by alang-alang. The scientist divided the area into two plots. The oil palm trees in one plot were left to grow naturally. Fertiliser was added to the second plot every year. Fruits with kernels inside are produced after several years. The results are shown in the table.

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| | **fruit yield / tonnes per hectare** | |
|---|---|---|
| **years after planting** | **plot without fertiliser** | **plot with fertiliser** |
| 3 | 0 | 0 |
| 4 | 2 | 6 |
| 6 | 10 | 15 |
| 8 | 15 | 19 |
| 10 | 17 | 23 |
| 12 | 18 | 30 |

**(i)** Draw a graph to show the results.



[4]

**(ii)** Use the graph to estimate the harvest nine years after planting

without fertiliser, .....

with fertiliser. ..... [1]

**(iii)** The world prices of palm oil and fertilisers are increasing. How would a plantation manager decide if adding fertiliser was worthwhile?

.....

..... [1]

After several years oil palm fruits with kernels are produced. The fruits grow in bunches.

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**(iv)** The scientist went on to collect data about the weight of the fruit bunches from the two plots. The results are shown in the table.

| years after planting | average weight of each fruit bunch / kg | | difference / kg |
|---|---|---|---|
| | without fertiliser | with fertiliser | |
| 5 | 8.5 | 9.0 | ..... |
| 6 | 9.5 | 12.0 | ..... |
| 7 | 12.0 | 15.0 | ..... |
| 8 | 14.0 | 17.0 | ..... |
| 9 | 13.0 | 19.0 | ..... |
| 10 | 15.0 | 19.0 | ..... |

Complete the table by working out the differences in average weight between fruit bunches from oil palm trees grown with and without fertiliser. [2]

**(v)** 15 years after planting, the average weight of each fruit bunch on the plot without fertiliser was 13 kg. The average weight of each fruit bunch on the fertilised plot was 19 kg.

Calculate the percentage increase in the average weight of each fruit bunch from the fertilised plot compared with the plot without fertiliser.

Space for working.

..... % **[1]**

**(vi)** Suggest why a plantation manager would like to produce larger, heavier bunches of fruit.

.....

..... [1]

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**(e)** Many growers have only small farms and rely on rubber trees as a cash crop. About every 25 years the farmers carry out slash and burn to open up new clearings. In the clearings they plant rubber tree seedlings and for the first few seasons grow crops such as rice between the growing rubber trees. The farmers then allow the rubber trees to grow among the vegetation that grows back naturally in the clearings. The vegetation between the mature rubber trees includes medicinal plants and plants that can be used for food.

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Such agro-forestry can sustain 50% of the biodiversity compared with vegetation that grows back without being planted with rubber trees. Rubber trees grown in this way begin to produce rubber after 8–10 years and produce rubber for up to 25 years.

- The farms are small, with 64% having an area of 1 hectare or less.
- Rubber yield is approximately 300–600 kg per hectare per year.
- Overall the area of forest in Kalimantan fell by 9.2% between 2000 and 2008, but areas used for rubber agro-forestry have resulted in local increases in forest cover in parts of Kalimantan.
- Scientists produced high yielding clones of rubber trees and researched the best ways of managing the areas in which the rubber trees grow without reducing the biodiversity. An increasing number of farmers are now taking up the resulting new Rubber Agro-forestry Systems (RAS).

Small scale rubber agro-forestry benefits both the farmer and the environment.

Explain these benefits

for the farmer, .....

.....

.....

.....

.....

for the environment. .....

.....

.....

.....

..... [6]

For Examiner's Use

**2** **(a)** The state of Kalimantan has large coal deposits which are being mined and exported. In 2009 a survey was carried out in a town in Kalimantan. An area of rainforest next to the town was cleared in 2010 and the cleared area was used for an opencast mine. The survey was repeated in the town in 2012, two years after the mine had opened. The table shows an overall summary of the results.

**percentage of responses that were positive ('yes' responses)**

| | **2009** | **2012** |
|---|---|---|
| Have you ever been affected by flooding? | 0 | 100 |
| Have you been affected by flooding more than once during the last year? | 0 | 100 |
| Do you suffer from serious lung infections? | 10 | 13 |
| Do your children suffer from serious lung infections? | 5 | 10 |

**(i)** Suggest reasons why flooding events have increased in the town since 2009.

.....

.....

.....

.....

..... [3]

**(ii)** What longer term damage can be caused by flooding here?

.....

..... [1]

**(iii)** Suggest a reason for the increase in the number of serious lung infections in the town.

.....

..... [1]

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**(iv)** Use the data to compare the increase in serious lung infections in children and adults between 2009 and 2012.

.....

.....

.....

..... [2]

**(b) (i)** What would you have done to make sure that the survey of 2012 could be compared with the one carried out in 2009?

.....

.....

..... [2]

**(ii)** Would you expect the number of cases of malaria to have increased between 2009 and 2012? Explain your answer.

.....

.....

..... [2]

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**3** **(a)** After tropical rainforest has been cleared by licensed logging, the licence holders often apply for permission to mine coal. The coal deposits are found near the surface so the costs of mining are relatively low. The estimated costs for a new mining operation in Kalimantan are shown in the table.

| | | **estimated costs / US$ per tonne of coal mined (December 2005 prices)** |
|---|---|---|
| **mining** | stripping surface of vegetation and soil | 2.1 |
| | extracting | 2.8 |
| | crushing | 0.1 |
| | labour | 6.0 |
| **transport** | trucking | 1.0 |
| **loading for export** | river barge | 1.7 |
| | transhipment to ocean-going vessels | 2.8 |
| | coal terminal fees | 3.2 |
| total cost per tonne of coal mined | | ..... |

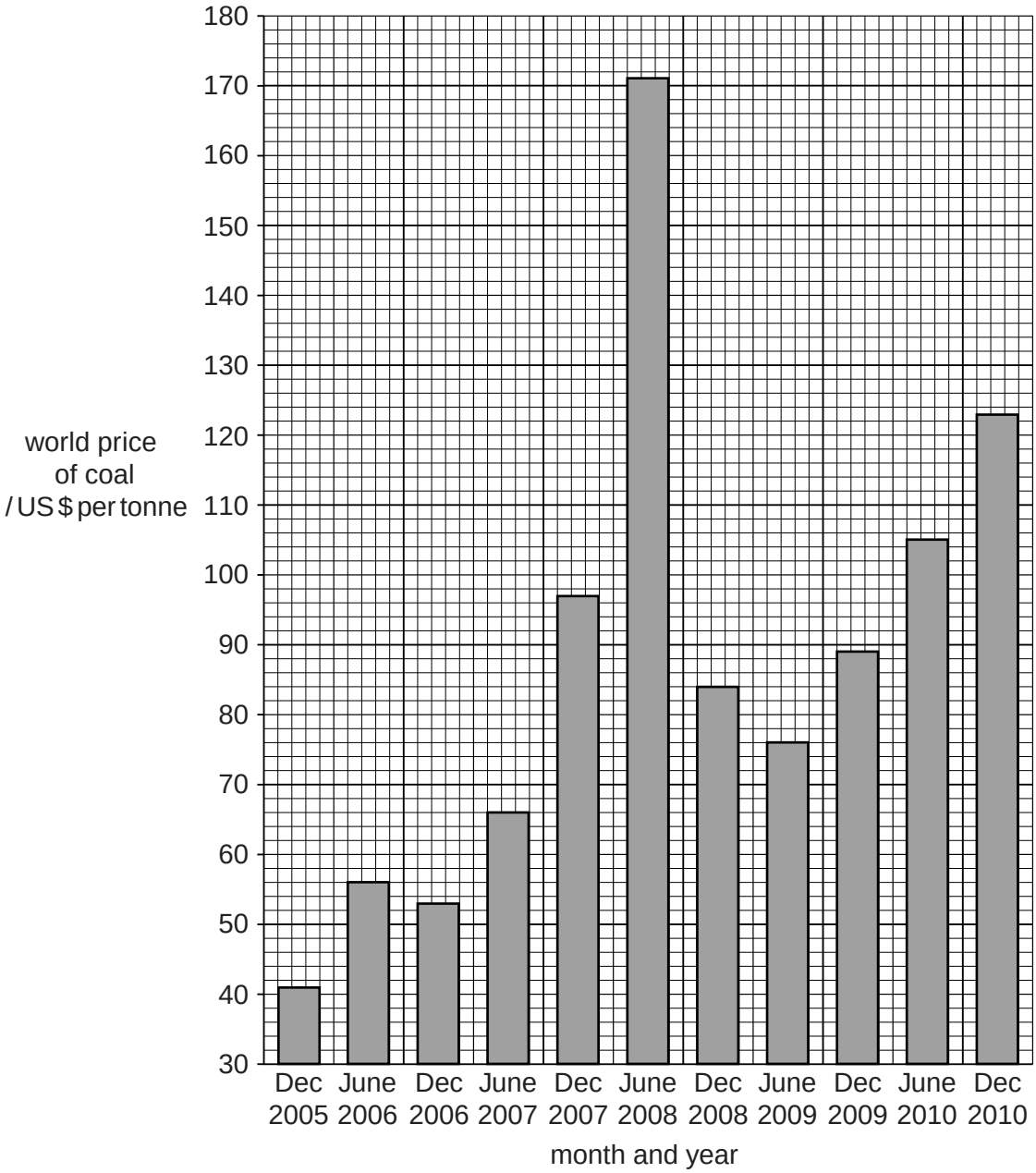
**(i)** Calculate the total cost per tonne of coal mined. Write your calculated value in the space in the table.

Space for working.

[1]

**(ii)** Look at the graph showing the world price of coal from 2005 to 2010.

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Using the data shown in the graph, calculate whether the mine was profitable when it opened in December 2005.

Show your working.

..... [1]

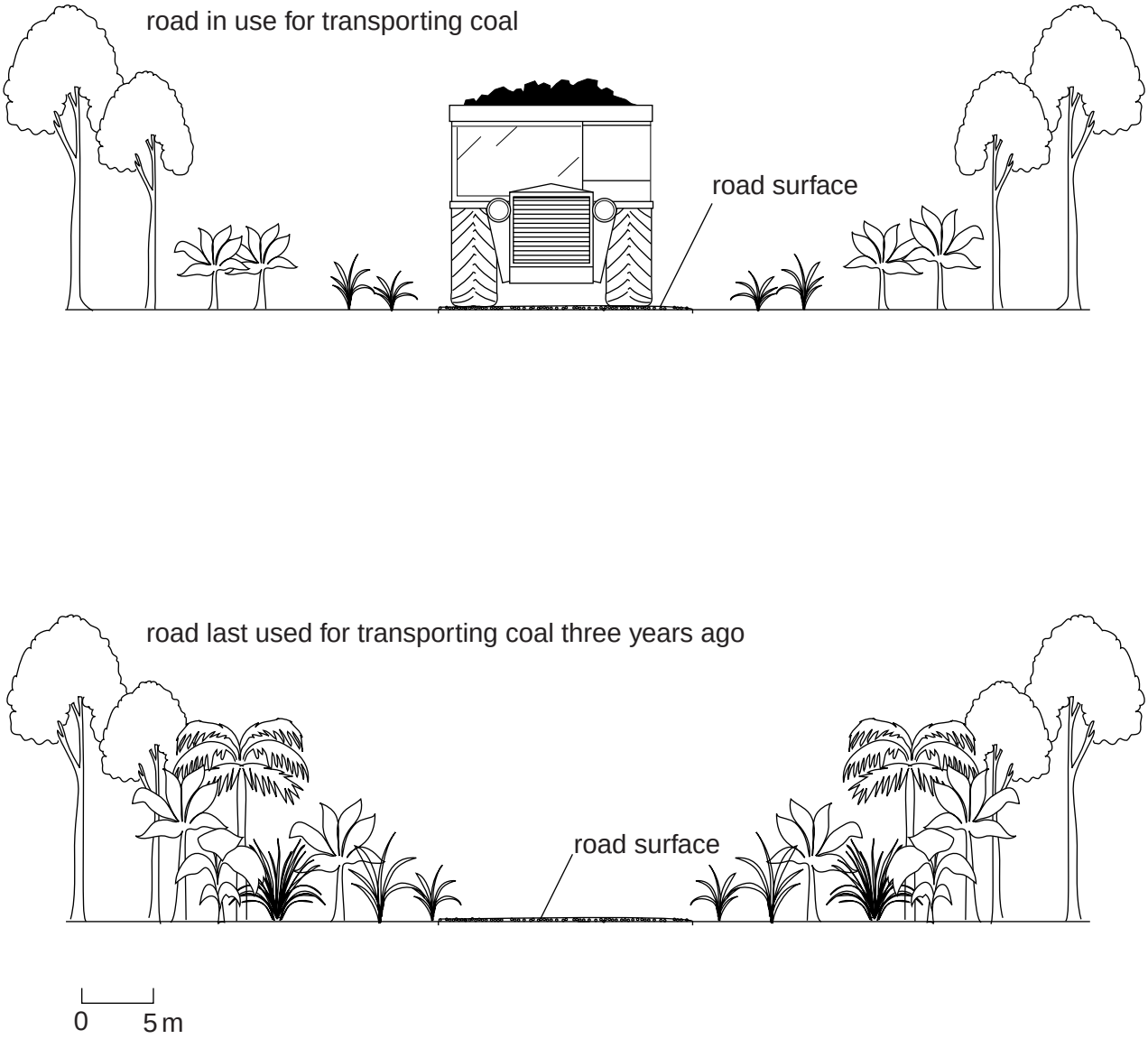
**(iii)** Assuming that costs remained at December 2005 levels when was the mine most profitable?

..... [1]

**(b)** Mining and transporting coal both damage the environment. A student studied the vegetation next to roads used for transporting coal by trucks to river barges.

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Look at the sketch.




**(i)** Describe the environmental damage, shown in the sketch, caused by transporting coal.

.....

.....

..... [2]

**(ii)** In your opinion, is the environmental damage long-lasting? Give your reasons.

*For Examiner's Use*

.....

.....

..... [2]

**(iii)** The student wanted to take measurements from beside the road to record how well the vegetation was recovering. Describe a method that the student could use now and in the future.

.....

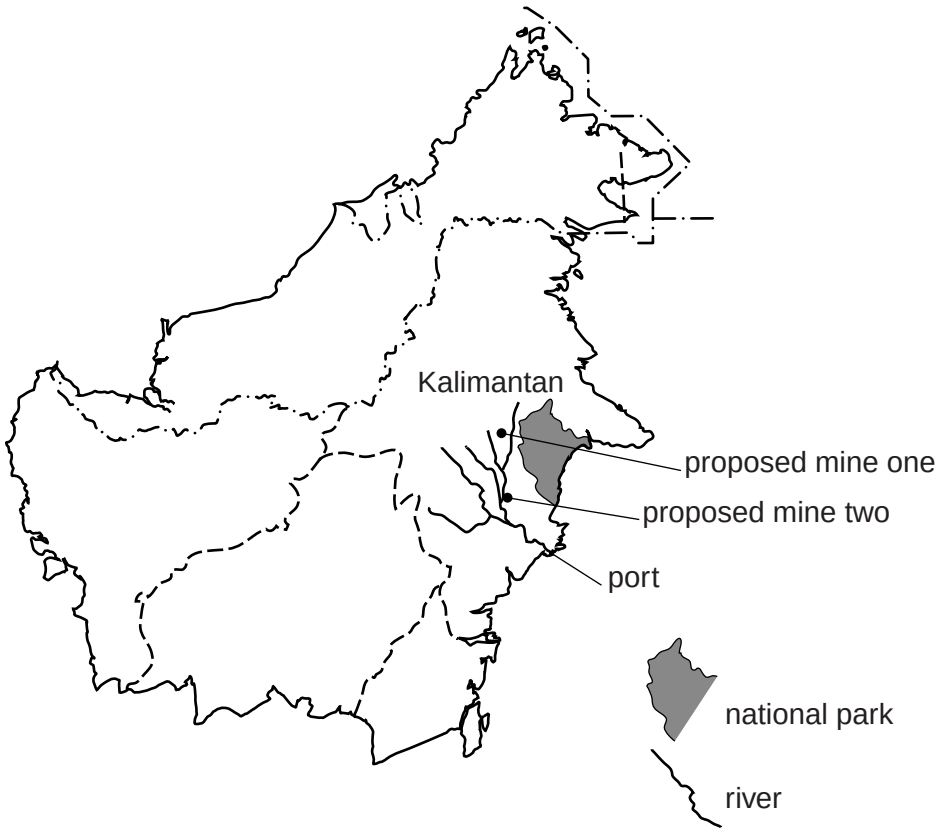
.....

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..... [2]

**(c)** Kalimantan has an internationally important national park containing many endangered species including orang-utans. Many ecotourists visit the park to see the orang-utans. The government is considering two proposals for new mines near the national park. If the plans are approved, coal will be transported down rivers in barges to a nearby port for export.



| | proposed mine one | proposed mine two |
|---|---|---|
| mining area / hectares | 5000 | 6000 |
| estimated reserves / million tonnes | 78 | 35 |
| working life / years | 15 | 10 |
| distance from mine to river / km | 40 | 5 |

*For Examiner's Use*

**(i)** Using the information given, state which proposal should be given a licence to start mining and explain why.

proposed mine .....

reasons .....

.....

.....

.....

.....

.....

.....

..... [6]

**(ii)** Give two reasons why the national park should be protected by the government of Kalimantan.

1. .....

.....

2. .....

..... [2]

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