Deforestation in Indonesia

You may need to answer a question about deforestation using a case study that you have studied. This case study looks at the causes and impacts of deforestation in Indonesia.

5 Case study

Indonesia

Indonesia is located in South-East Asia, between the *Indian Ocean* and the *Pacific Ocean*. It is one of the most important areas of tropical rainforest in the world, but deforestation is a serious problem. In 2000, 85 per cent of Indonesia was covered by trees, but since then huge areas of forest have been destroyed.

The annual rate of deforestation varies. It was highest in 2012, when over 840,000 hectares of trees were cut down, the most forest lost by any country in the world that year. The lowest rate was in 2003, when only 230,000 hectares of forest were cleared.

Although the average rate of deforestation decreased significantly in 2013, it rose again in 2014, and the general trend in the years 2000–2015 has been a steady increase in the rate of deforestation.

Figure 1 Among other things, the rainforest in Indonesia is home to at least 500 mammal species and 40,000 plant species.

5 Causes

- **Logging** – poorer local people can earn far more from logging than from farming.
- **Gold and copper mining** – forests are cleared for mines and the roads that lead to them.
- **Road building** – roads are built through the forest to transport resources, such as gold and timber.
- **Commercial plantations** – large areas of forest are cleared for plantations, such as for palm oil.
- **Subsistence farming** (where people farm to produce enough only to feed themselves and their families) – farmers cut or burn down forest to clear land for farming.
- **Construction of hydroelectric dams**
- **Population growth and settlement** – Indonesia's population has grown rapidly from around 87 million in 1960 to nearly 258 million in 2015. Forests have been cleared to provide land to build houses on.

5 Impacts

- Loss of rainforest habitat for the thousands of species.
- Local people have been exploited by mining or logging companies, often having to work in dangerous conditions for low wages.
- Deforestation increases soil erosion as there are no trees to protect the soil from the heavy tropical rain, leading to greater surface run-off and flooding.
- Carbon dioxide is released when trees are felled or burned, which increases greenhouse gas emissions.
- Valuable exports, such as gold, copper and palm oil, bring in a lot of money, which has helped Indonesia to develop its economy very quickly – it is now the sixteenth largest economy in the world.
- Investment in renewable energy, such as hydroelectric dams, will help Indonesia provide energy for its growing population and decrease its reliance on fossil fuels.

There have also been violent conflicts between private companies and local people trying to protect their forest.

The increasing rate of deforestation in Indonesia has resulted in the country becoming one of the biggest emitters of greenhouse gases.

The command word 'describe' means you need to refer to specific points, and 'explain' means you need to give reasons. Include specific details from your tropical rainforest case study to show your knowledge and support your points.

10 Exam-style practice — Grades 5–7

Describe and explain the impacts of deforestation on **one** tropical rainforest you have studied. **[6 marks]**

Sustainable rainforests

Sustainable management of tropical rainforests is vital to protect their biodiversity.

15 Rainforest management strategies

Rainforest management strategies are essential to slow the increasing rates of deforestation, particularly in Indonesia and South America.

Selective logging and replanting

- Selective logging is the practice of cutting down trees when they are over a certain height, and only harvesting one or two species of tree in an area of forest. The Indonesian government is working with non-governmental organisations (NGOs), like the World Wide Fund for Nature (WWF), and international organisations to promote the trading of timber from legally verified sources.
- In Sumatra, Indonesia, millions of trees are being replanted to restore animal habitats that have been lost due to palm oil production.

International agreements

- In 2006, the International Tropical Timber Agreement was established, supported by the United Nations (UN).
- The main aim of the agreement was to promote the global trade of tropical timber (including hardwoods) from sustainably managed forests. Sustainability is defined by the UN as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'.

Conservation and education

- The WWF works closely with stakeholders to help conserve the world's rainforests. One strategy has been campaigning for the creation of national parks to protect the diverse range of plant and animal species.
- The WWF also promotes sustainable production of wood products through an initiative called the Global Forest and Trade Network.
- A powerful incentive is debt reduction, where some of a country's debt is written off in return for commitments to protect their rainforest.
- Working with local communities to ensure they can make a sustainable living from the rainforest is essential to its protection. A successful example is Brazil nut production, in Bolivia. The Bolivian government protects the rainforest because a healthy forest is needed to produce a good crop and the industry employs over 20,000 people.

Ecotourism

- In Borneo, in South-East Asia, soft trekking – where tourists walk through specifically designated trails – helps to preserve the plants and wildlife species.
- Huts for small tour groups can be built from locally sourced timber, providing a source of income for the local communities.
- Trekking guides can be hired by tourists, which provides an income for local people.

Strategies such as the development of ecotourism and working with local communities are very important. They provide a powerful incentive to local people to protect the rainforest by helping them to make a living from it. This can combat causes of deforestation such as clearing forested land for subsistence farming.

You can save time by writing an abbreviation like the one for non-governmental organisations in the worked example.

5 Worked example — Grade 4

Suggest **one** way non-governmental organisations can help to manage tropical rainforests in a more sustainable way. **[2 marks]**

NGOs can work with governments and international organisations to implement initiatives that promote sustainable development. An example is promoting the trade of sustainably sourced timber.

5 Exam-style practice — Grade 5

Explain how tropical rainforests can be managed sustainably. **[4 marks]**

Characteristics of hot deserts

Hot deserts are primarily located in belts along the lines of 30 °N and 30 °S latitude and are known for their hostile and challenging conditions. The largest desert in the world is the Sahara in northern Africa.

2 Location of hot deserts

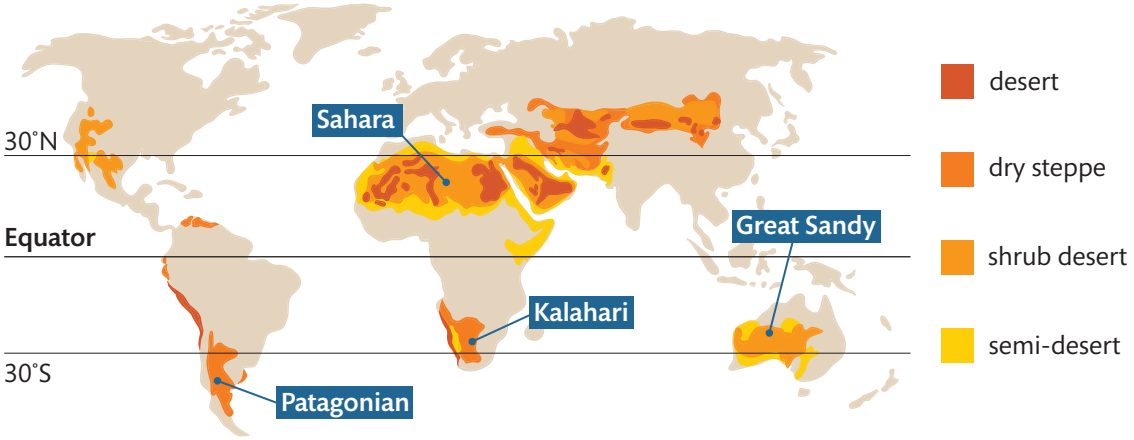

Figure 1 Deserts cover approximately 20 per cent of the Earth's land surface.

5 Key characteristics

- Hot deserts usually have less than 250 mm of rainfall per year.
- The climate during the day is hot and dry, with some locations recording temperatures above 50 °C, but temperatures can get very cold at night, sometimes falling below 0 °C.
- Freshwater oases, which act as biodiversity hotspots rich in rare plants and animals, are being threatened by warming temperatures, less predictable rainfall and habitat degradation.

5 Animal adaptations

- Owls and bats are only active at night when the temperatures are much lower.
- Lizards and snakes are only active during the early morning before finding shelter from the Sun under sand and rocks.
- Camels conserve water by sweating as little as possible, and have a fatty hump so that their energy store doesn't insulate their whole body and cause them to overheat.

5 Plant adaptations

Figure 2 Giant Saguaros in West Tucson, Arizona, USA

- Cacti are xerophytes, which can store water and have no leaves in order to reduce transpiration.
- Desert lilies have a very short reproductive life cycle. They bloom vigorously for a few weeks in the spring after rain has fallen and lie dormant for the rest of the year. Their bulbs and seeds are heat and drought resistant, too.
- Phreatophyte plants have long roots, enabling them to draw water directly from the water table.

5 Worked example — Grade 5

Explain **two** ways plants have adapted to survive in hot deserts. **[4 marks]**

Plants, such as cacti, have adapted to survive in hot deserts by having no leaves, which reduces transpiration and allows them to store water.

Some plants, such as the desert lily, have adapted their behaviour so that they lie dormant during the hottest seasons, and then rejuvenate during the spring. This enables them to capture the water they need before going back into a dormant state.

5 Exam-style practice — Grades 3–5

1. State **one** characteristic of hot deserts. **[1 mark]**
2. Describe the distribution of hot deserts. **[3 marks]**

Opportunities and challenges in a hot desert

You may need to answer a question about opportunities and challenges in a hot desert using a case study that you have studied. This case study looks at the Sahara.

Case study

The Sahara

Over 50 per cent of the Sahara receives less than 26 mm of rain per year. When rainfall occurs, it normally does so in heavy torrential downpours.

It is home to a range of plant and animal species, including the deathstalker scorpion, but biodiversity levels are low, mainly due to the extreme conditions. Plants and animals need to be highly adapted to survive in the challenging conditions. For more about adaptations, go to page 23.

Figure 1 The Sahara is the world's largest hot desert. It stretches across northern Africa and covers approximately 9 million square kilometres.

Opportunites

Economy

The oil and gas sector is vital for the economy of countries like Algeria, accounting for 35 per cent of its total gross domestic product (GDP).

Tourism

There are camel trekking and 4×4 tours around Erg Chebbi, Morocco.

Development opportunities

Solar energy

Morocco is building the Noor 1 solar power plant, which will be the largest in the world, capable of producing an estimated 580 megawatts of energy.

Farming

The soil is mainly infertile with most farming being subsistence farming. The main commercial crops are dates and fruit.

Mineral extraction

Key minerals like limestone, copper and phosphate are found in the Sahara.

Challenges

1. **Extreme temperatures** – the Sahara is one of the driest places on Earth, with a mean temperature of 30 °C, and temperatures reaching up to 50 °C during the summer.
2. **Water scarcity and drought** – these threaten life, livelihoods and food security.
3. **Inaccessibility** – the Sahara's harsh rocky landscape of mountains and plateaus makes the construction of infrastructure difficult.

Worked example — Grades 4–5

Explain **one** way in which hot deserts provide opportunities. **[3 marks]**

Hot deserts provide an opportunity for mineral extraction, which creates jobs for locals and generates income for the economy. For example, the Sahara has an abundance of minerals like copper.

You could write about other opportunities including farming, energy and tourism that are specific to the case study you have studied.

Exam-style practice — Grades 5–8

Discuss how hot deserts can create both opportunities and challenges. **[6 marks]**

Desertification

Desertification is the process of fertile land turning into a desert over time. Areas on the edge of hot deserts are particularly at risk of desertification.

10 Causes of desertification

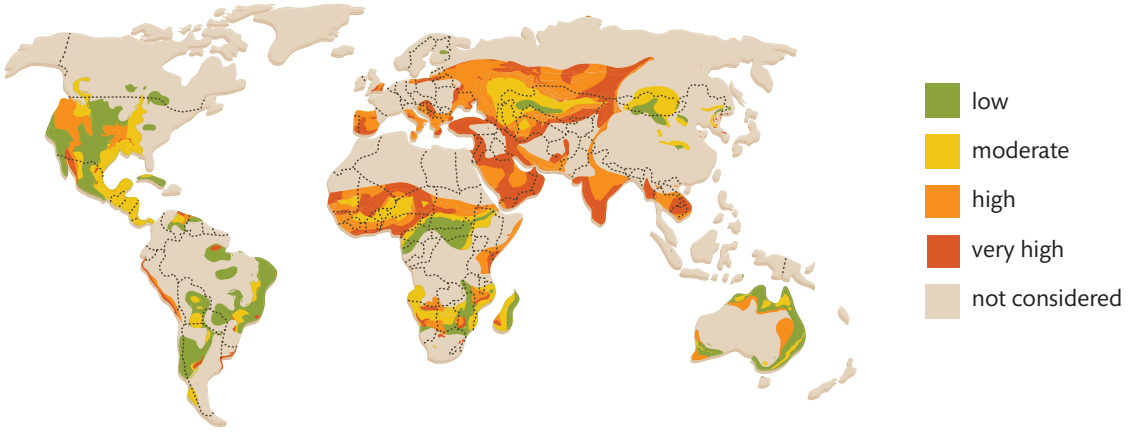

Figure 1 A map showing the level of risk of desertification induced by human activity. Desertification tends to occur on the edge of existing deserts.

- **Overgrazing** – the intensive grazing of land by animals leads to the soil becoming bare, compacted and prone to drying out and cracking.
- **Over-cultivation** – the intensive growing of crops to meet the demands of a growing population, without giving the land a chance to recover, causes the soil to become infertile, exposed and vulnerable to erosion.
- **Population growth** – rising population puts pressure on demands for resources.
- **Removal of fuel wood** – cutting down trees to use the wood for fuel causes the roots to die, removing the binding agent for the soil.
- **Climate change** – hotter and drier conditions are increasing the susceptibility of land to desertification.

5 Management strategies

- **Water and soil management** – appropriate planting and harvesting of crops ensures the soil can recover. The use of water can be managed using small-scale irrigation projects, such as catching and storing rainwater and using sprinklers to irrigate farmland.
- **Tree planting** – this helps to reduce soil erosion as the tree roots help to stabilise the soil structure.
- **Appropriate technology** – this involves the use of technology (or techniques) that can be easily repaired or replicated by locals. An example is the use of rocks to create small walls around farmers' fields to trap water, helping to increase crop production and yields.

Exam focus

Not all questions indicate how many points you should include. You should be guided by the number of marks. For example, this question is worth four marks, so you should provide two causes with thorough explanations.

5 Worked example — Grade 5

Explain the causes of desertification.

[4 marks]

One of the causes of desertification is the over-cultivation of land due to rising populations. This means that farmers intensively farm the same piece of land continuously, not allowing the soil time to recover. This over-cultivation strips nutrients from the soil, leaving it infertile and limiting plant growth. The lack of plant cover means that the soil is then easily eroded by the wind and rain.

Another cause of desertification is trees being cut down to be used for fuel wood. The tree roots, which had held the soil together, die and the soil becomes loose. The soil can again easily be blown or washed away.

5 Exam-style practice — Grade 5

Explain how the rate of desertification can be reduced. **[4 marks]**

Characteristics of cold environments

The cold environments of the Arctic tundra and polar regions are some of the most extreme places on Earth, in which the climate, soils, plants, animals and people interact and depend on each other for survival.

Key facts

- The **Arctic tundra** and the **polar regions** are some of the coldest places on Earth, with average winter temperatures ranging from −40 °C in the Arctic tundra to −60 °C at the South Pole.
- Many animal species, such as wolves, musk ox and Arctic foxes, live in the Arctic tundra. The musk ox is adapted for survival with powerful hooves that can break the ice to access the water underneath for drinking, and thick fur to keep it warm.
- The polar regions are home to animal species such as seals, whales, polar bears and penguins. Seals and whales are adapted to keep warm in the freezing water with a thick layer of fat (blubber). Polar bears also have a thick layer of fat, up to 11 cm thick.
- The Antarctic ice sheet covers about 98 per cent of Antarctica.
- Plants are highly adapted to the extreme conditions, which include soil that is frozen for most of the year. Arctic moss grows in lakes and bogs where it can store nutrients in its leaves. Snow saxifrage grows close to the ground to reduce potential damage from the wind and ice.

Interdependence

Plants and lichens have adapted to the extreme temperatures, by growing quickly in spring when temperatures rise. They provide a habitat for ground-nesting birds, like geese, and are food for herbivores, such as reindeer and hares. These herbivores are hunted by wolves, bears and foxes, which are adapted to the extreme cold with thick layers of fur. Indigenous people living in cold environments, such as the Inuit in Greenland and Athabascan in Alaska, rely on these animals for food, tools and clothing.

Biodiversity

Biodiversity in cold environments is low. This is because the extreme cold and low levels of precipitation make it difficult for organisms to survive. These conditions also mean that decomposition is slow, so soils are generally thin and infertile; this limits the plant species which can grow. Biodiversity does increase in summer, when hours of sunlight and temperatures increase and migratory animals and birds arrive. However, the ecosystem is fragile, and any changes can have an impact on the whole food web.

Worked example — Grade 5

Study **Figure 1**. Explain **two** ways the Arctic fox is adapted to cold environments. **[4 marks]**

One way the Arctic fox is adapted to cold environments is its thick fur coat, which changes colour from brown-grey in summer to white in winter. This insulates it against the cold and helps to keep it camouflaged all year round, making it easier for it to hunt small mammals such as hares. The Arctic fox also has a very thick tail, which it uses to help it balance and to wrap around itself as protection against the wind and cold.

Figure 1 An Arctic fox in winter

Exam-style practice — Grades 1–4

1. State **one** characteristic of the Arctic tundra biome. **[1 mark]**
2. Explain **one** way plants have adapted to cold environments. **[2 marks]**