

Answers to data response and decision making exercises

1. Guinea is a small West African country (about the same size as the UK) that borders the North Atlantic Ocean between its neighbouring countries of Guinea-Bissau and Sierra Leone. It has a population of twelve million. Mangrove forest grows along the flat coastal plain and river banks, whilst higher inland areas are covered with thick savannah woodland and tropical rainforest. Biodiversity is very rich and varied. Over 700 species of bird and 15 000 species of plants (including 2000 species of orchid) have been recorded. Mammals include the endangered chimpanzee and vulnerable forest elephant, and there are three species of lizard, five species of insect and three species of spider that exist nowhere else in the world.



Fig. 1.20 Rainforest, Labé, Guinea.



Fig. 1.21 Location of Guinea.



Fig. 1.22 Guinea.

Look carefully at the data about the people of Guinea in the table below, and then answer the questions that follow.

Gross domestic product per person (purchasing power parity)	US\$1200 (Qatar US\$146 000)
Per person purchasing power parity world ranking	176 out of 183 countries (Qatar 1/183)
Percentage of population living below the poverty line	47% (Austria 6.2%)
Infant mortality rate	53/1000 (Iceland 2.6/1000)
Life expectancy	60 years (Japan 83.7 years)
Number of doctors per 1000 patients	0.1 (Spain 4.9 per 1000 patients)
Number of hospital beds per 1000 people	0.3 (Finland 15.1 per 1000 people)
Percentage of population with access to improved water supplies	78% (Australia 100%)
Percentage of population with access to improved sanitation	20% (South Korea 100%)
Adult literacy rate	30% (Canada 100%)
Child labour level (percentage of children under 15 years in full time work)	25% (Singapore 0%)

- a) Explain what 'infant mortality' measures.

The number of children dying at birth or before their first birthday per 1000 live births in a country. It tends to be relatively high in LEDCs such as Guinea, which lack adequate resources to ensure everyone has appropriate medical care, housing, education and a nutritious diet. In MEDCs it is much lower because care standards for pregnant women and babies are advanced in comparison.

- b) Explain what 'access to improved sanitation' measures.

This is a sewerage system that effectively and hygienically removes and processes human waste quite separately from sources of drinking water. Almost everyone in MEDCs has improved sanitation. The poorer a country is then generally the lower levels of improved sanitation it will have and the greater the risk of water-borne diseases such as diarrhoea.

- c) Suggest what type of work many of the children are likely to be doing instead of attending school.

Many will be working on their family farms to boost subsistence food production and to perhaps create a small surplus for sale. Others could have moved to larger towns and cities to work in factories or on the streets picking up informal work where they can, such as becoming market traders and barrow boys and girls. Much of their earnings will be sent back to their families in rural areas.

2. Guinea is one of the most mineral ore rich countries in the world. At current world prices it possesses US\$222 billion worth of bauxite reserves (used to manufacture aluminium) that will last another 444 years at the current rate at which it is being mined. The following is an extract from the Central Intelligence Agency (CIA) fact book for 2016:

"Guinea is a poor country that possesses the world's largest reserves of bauxite and largest untapped high-grade iron ore reserves as well as gold and diamonds. In addition, Guinea has fertile soil, ample rainfall, and is the source of several West African rivers. Guinea's hydro potential is enormous and the country could be a major exporter of electricity. The country also has tremendous agriculture potential."

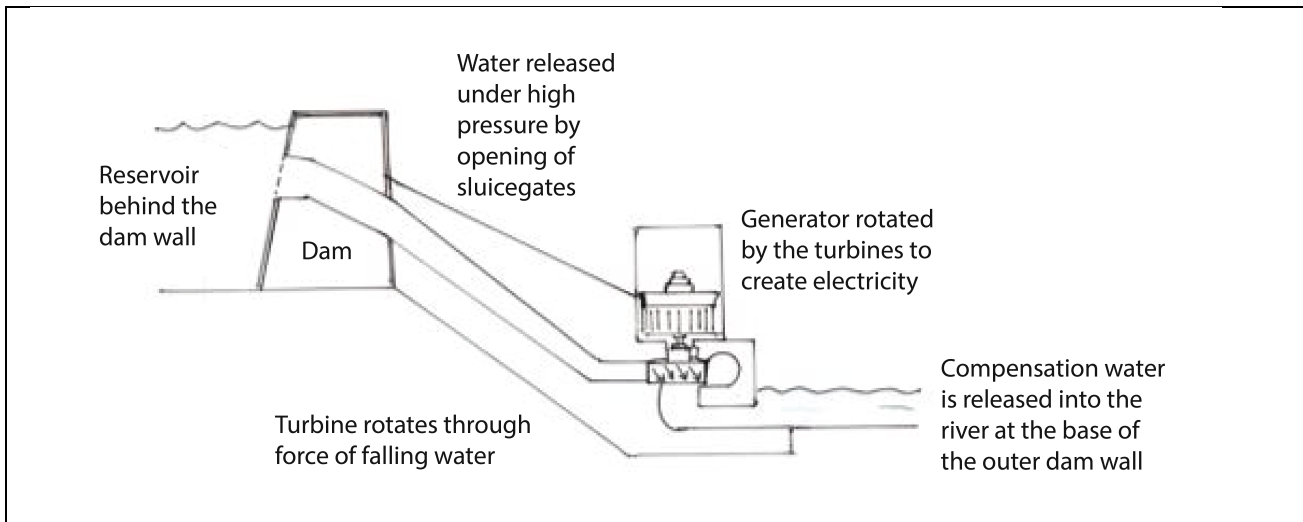
- a) What is iron ore used to manufacture?

After refining, iron ore is used to manufacture a wide range of different types of steel.

- b) Explain what a 'fertile' soil is.

A soil that contains sufficient minerals such as magnesium and nutrients like nitrogen for healthy plant growth. It will also have adequate topsoil and micro-organisms such as bacteria, fungi and earthworms. Chemical fertilisers are often used to replace depleted soil nutrients.

c) Explain using a labelled diagram how water can be used to generate electricity.



d) Although Guinea has a small population, and a wealth of natural resources and potential for farming, it remains the eighth poorest country in the world. Suggest why this is.

In order to exploit any natural resource such as minerals, or potentially fertile farming land, the government of any country will first require considerable sums of money to invest in modern infrastructure. This will include mine machinery, dams which provide irrigation water, roads and railways, and often a skilled workforce. As one of the poorest LEDCs in the world, Guinea does not possess this finance and so its rich resources remain largely untapped. One alternative is for its government to borrow the money required from governments and banks in MEDCs. This would allow it to exploit its resources, but a large proportion of the income generated each year from processing and exporting them will be used to pay off the debt with interest. As a result, the people of Guinea may not benefit that much in the long run.

3. Guinea has the largest untapped reserves of bauxite in the world. The government of the country has recently announced a ten year plan to increase production of the mineral through opening at least eight new mines. All current bauxite mines are surface opencast mines and new mines will use the same extraction methods.



Fig. 1.23 Bauxite mine in Sangaredi, Guinea, West Africa.

- a) Describe how minerals such as bauxite are extracted using surface mining methods.

When rocks containing a mineral (the ore body) are found relatively close to the surface, the soil and rock overlying the ore body (the overburden) can be stripped away by explosives and heavy earth-moving machinery. This exposes the ore, which is then scooped up by massive dragline and bucket wheel excavators, or large bulldozers, and carried away for processing.

- b) In the box below, suggest one positive and one negative environmental, economic and social impact that opening eight new opencast mines could have in Guinea.

	Positive impact	Negative impact
Environmental	After restoration, nature reserves such as North Cave in Yorkshire, can be created. Sometimes such ecosystems contain a greater biodiversity than existed before mining.	Habitat loss such as deforestation will reduce numbers and variety of local wildlife. Levels of visual, air, noise and light pollution are likely to increase.
Economic	New direct (e.g. miners) and indirect employment (e.g. shop workers) will be created for local people and average incomes are likely to rise.	Existing small scale mining businesses and the services that support them, such as local transport companies, could be put out of business.
Social	Governments and local councils will collect more tax from mining companies and workers. Some of this will be spent on improving local services such as schools.	Resentment and sometimes violence can arise when local indigenous peoples have to leave their ancestral homes to make way for mining. People are not always compensated.

4. Read the following passage about bauxite in Guinea:

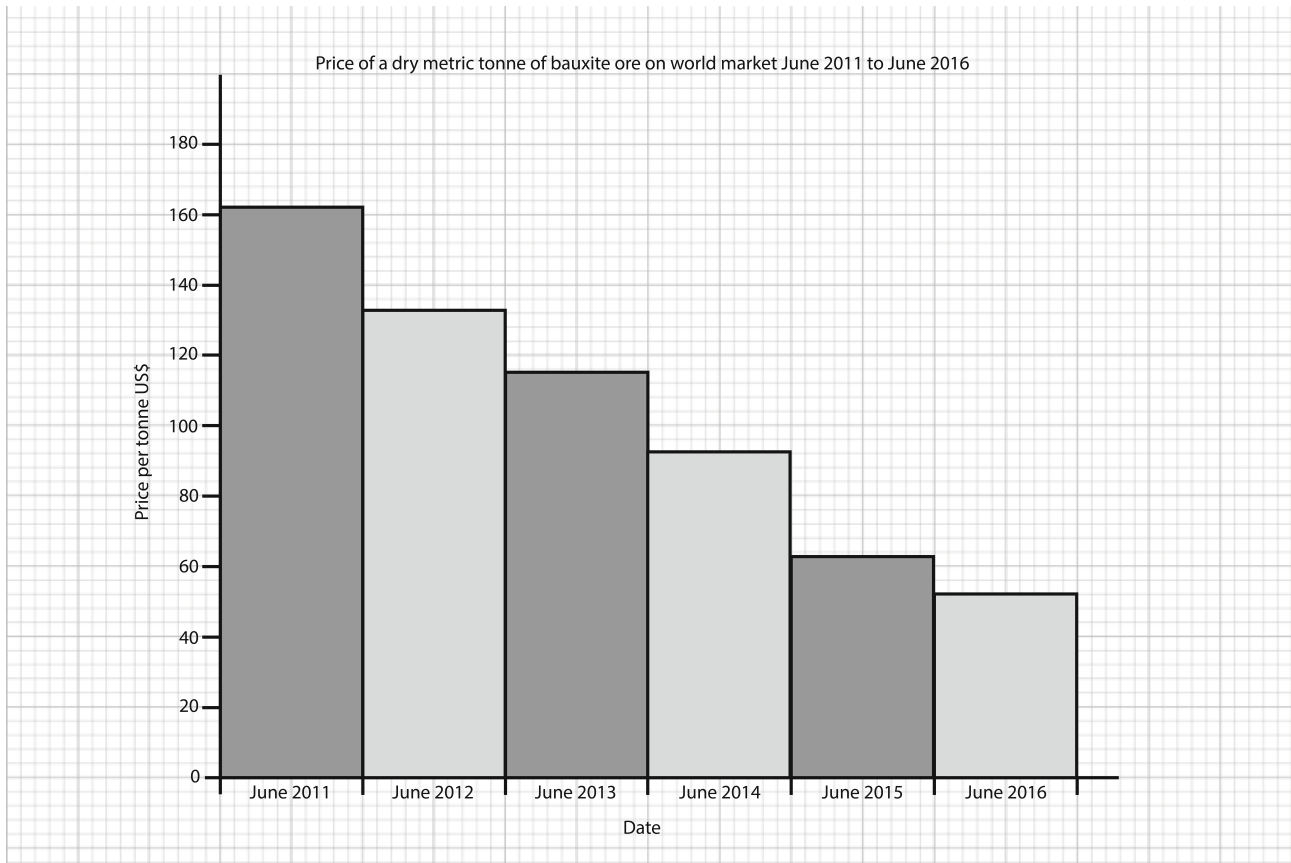
Supervisor David Smith states that one of his excavators, complete with rotating shovel, can extract up to 750 tons of rock an hour. This would be enough to fill seven trucks.

Bauxite earth is transported by truck to the station, where it is then moved onto a freight train and taken to the provincial capital Kindia. It is then taken to Conakry port where it will travel to Ukraine by boat. In Ukraine, aluminium is made from the bauxite and exported to locations all over the world. Even though Guinea has been independent for over 50 years, there is still no industry to convert bauxite into aluminium.

- a) On the grid provided below draw a bar graph to display the following data.

Date	Price per tonne US\$*	Date	Price per tonne US\$*
June 2011	162	June 2014	93
June 2012	135	June 2015	63
June 2013	115	June 2016	52

*Price of a dry metric tonne of bauxite ore on world market June 2011 to June 2016.

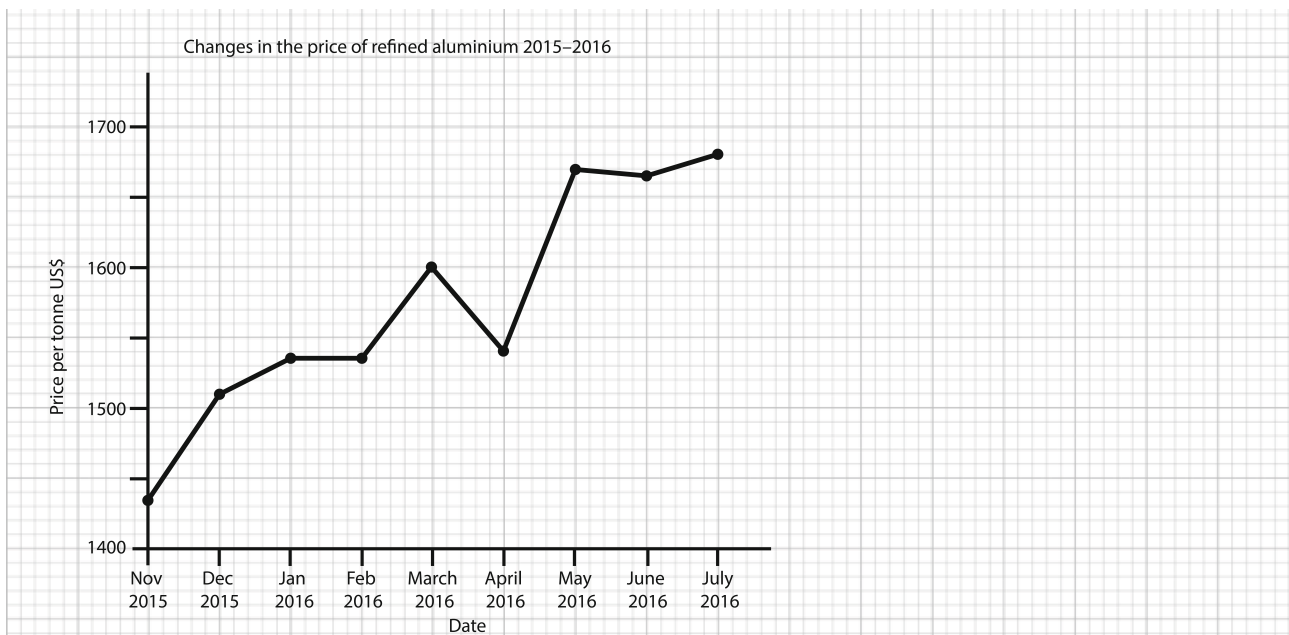


- b) By what percentage did the price of a tonne of bauxite ore fall on the world market between June 2011 and June 2016?

68 per cent

- c) Aluminium is a lightweight, corrosion-resistant metal, used mainly in the aerospace industry, as a construction material in buildings, in food packaging, motor vehicles and trains. Draw a simple line graph below to show how the price of a refined tonne of aluminium (US\$) changed on the world market between November 2015 and July 2016.

Date	Price per tonne (US\$)
November 2015	1435
December 2015	1510
January 2016	1535
February 2016	1535
March 2016	1600
April 2016	1540
May 2016	1670
June 2016	1665
July 2016	1680



- d) By what percentage did the price of a tonne of refined aluminium rise on the world market between November 2015 and July 2016?

17 per cent

- e) Suggest why it would make more economic sense for the government of Guinea to invest in building processing factories that will convert the bauxite ore they already mine to aluminium metal, rather than opening new mines to extract more ore.

The government will want to earn the maximum it can from its natural resources. This income will improve the quality of people's lives such as paying for the building of new hospitals and training doctors. At the moment all Guinea is doing is selling its raw ore which has been falling in price for many years. The countries which import and refine the ore are making increasing profits as the price of refined aluminium is rising. What Guinea needs to do is build its own aluminium smelters and refine its own ore. It could then export only the higher-priced processed aluminium and not the low-priced ore, which would increase its income greatly.

- f) Because Guinea is the eighth poorest country in the world, it is going to have to apply for loans from richer MEDCs to cover the cost of opening new mines or constructing new ore refining plants. Suggest why MEDC governments, banks and multinational businesses are likely to look more favourably on loaning money to pay for opening new mines rather than building ore processing factories.

Most processing of bauxite into high value aluminium occurs in manufacturing industries located in MEDCs such as Canada, the United States and Australia. The governments of these countries and their banks will not want to loan funds to countries such as Guinea to build bauxite processing plants which will quickly compete with their own domestic processing industries. They will worry about a drop in profits and possible factory closures and job losses in their own countries if Guinea opens its own processing industries. As a result, loans for processing plants will very likely carry a much higher interest rate over a shorter term, compared to those for funding the opening of new mines and the export of bauxite ore.

5. In September 2015, the government of Guinea began talks with the China International Water and Electric Corporation (CRE) to build a US\$2 billion hydropower dam. Lansana Fofana, a government energy ministry official, announced that the idea of the 550 megawatt Souapiti dam “is to feed the mining industry”. He said, “We want to build refineries for our bauxite and become an exporter of electricity”. Souapiti will be built on the Konkoure River, about two kilometres upstream from the 240 megawatt Kaleta dam completed by CRE in July 2015. The Kaleta dam project tripled Guinea’s electricity production. The reservoir behind the Souapiti dam will be huge, allowing both hydroplants to function even when the river loses most of its flow during the six-month dry season. It will require at least 15 000 people to be resettled from massive areas of flooded land. The Export-Import Bank of China is likely to loan the government of Guinea the money to build the dam and plant. The loan will then be paid back with interest once income is being earned from the sale of its electricity. The bank loaned three-quarters of the US\$526 million needed to build the Kaleta complex.

a) Guinea earns US\$6 billion a year from goods and services it sells to other countries. This sum is referred to as its Gross Domestic Product (or GDP). Suggest why borrowing US\$2 billion from an overseas bank, that will have to be repaid with interest, could be risky.

What Guinea is borrowing represents one third of what the country earns in a year. This will not be a problem unless Guinea’s income drops because prices of exports, such as bauxite, fall. This might occur through no fault of its own, for example, due to an economic recession in MEDCs. However, the government is still going to have to meet its loan repayments and may have to do this by reducing spending on public services such as sanitation. If this happens, the quality of people’s lives in Guinea will fall in what is already one of the poorest countries in the world.

b) Huge multipurpose dam projects can have environmental, economic and social impacts. Using examples of projects that you have studied, what would you advise Lansana Fofana to consider carefully to ensure that the Souapiti project is a sustainable development for the environment and for the people of the country.

There are already approximately 50 000 dams in the world, each enclosing reservoirs of three million cubic metres or more, and many more are planned. There are currently 400 dams in the planning or construction phase in the Amazon Basin of Brazil alone. Most dams built today have more than one use and are referred to as multipurpose dams. For example, a water supply dam can also be used for irrigation, flood control and navigation as well as hydropower generation. Such massive and very expensive dam projects are popular globally because they can certainly contribute to economic and social development through, for example, providing fresh drinking water to communities without access to potable sources, irrigating unused countryside to boost food production and providing power to new manufacturing industries. However, multipurpose dams are rarely examples of sustainable development and as a result can have serious environmental and social impacts. For example, 100 000 people in Egypt, and over a million in China, were expelled from their land when the Aswan and Three Gorges dams were built. Flooded valleys and diverted rivers adversely affect wildlife habitats, and deforested hillsides can lead to erosion and the sedimentation of rivers. In Egypt, farmers in the Nile valley downstream from the Aswan Dam no longer benefit from annual flooding, which brought a covering of fresh fertile silt each year. In China, there is real concern that the endangered Baiji River Dolphin may not have survived the construction of the Three Gorges Dam. Sustainable development seeks to balance economic progress and the

improvement in the quality of people's lives that all countries seek with ensuring that the ecosystems and social communities upon which all life depends on Earth are not threatened in the process. To achieve this, Lansana Fofana must first carry out a detailed environmental, economic and social survey of the area to be developed for the proposed dam. In doing this, he will be able to discover where ecosystems are richest, indigenous communities are well established and local groups are already prospering economically. The dam and reservoir can then be sited where they will have minimum impact overall. He will have to accept that this decision will be a compromise and may not end up being the site where power production and profits are maximised. However, in the long term, having a massive increase in electricity in the country, together with healthy ecosystems and thriving indigenous communities that attract foreign high-paying ecotourists, will benefit the country more than going all out to maximise power generation without any thought as to the consequences. A degraded environment, together with millions of potentially poverty stricken and angry indigenous people, will become a burden on the state. In the end, solving these problems may cost the government more than they will earn from the power that the new dam will generate. Throughout the process of planning and construction, it will be important for Fofana to consult with representatives of local communities. This will ensure that any adverse effects of the development are minimised and as many benefits as possible can be gained from the generations of knowledge and experience they possess.