



General Certificate of Education  
Advanced Level Examination  
January 2013

## Geography

## GEO4B/PM

### Unit 4B Geographical Issue Evaluation Advance Information Booklet

**Date of issue: On or after Thursday 1 November 2012**

#### Instructions

- This Advance Information Booklet will be issued on or after Thursday 1 November 2012 in advance of the examination for Unit 4B. You should make yourself familiar with the information in the booklet.
- This booklet must be kept **unmarked** for use in the forthcoming examination.

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**STUDY ALL THE INFORMATION IN THIS BOOKLET**

The information in this booklet comprises the following:

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## Item 1 The proposed Belo Monte dam – background to a conflict

On 21 May 2008, there was a meeting between about 1000 indigenous people from the Xingu River area in Brazil and representatives of the state electricity company, Eletrobras. Eletrobras had called the meeting to describe and explain its plans to build a hydroelectric power station on the Xingu River at Belo Monte (see **Figure P1**). One of the company's engineers, Paulo Rezende, was addressing the meeting when he was approached by a group of people wearing traditional costumes and body paint and wielding machetes. No-one is quite sure what happened next but Rezende came away from the ensuing melée with his shirt ripped off and with blood pouring from a machete wound to his arm and shoulder. Rezende was not seriously injured and no-one was arrested or charged after the incident, but it did cause worldwide media interest.

**Figure P1 – Sketch map showing the location of the Belo Monte dam site**



### How had this incident arisen?

In the late 1980s, the Kayapo people forced the Brazilian government to abandon plans to build six huge dams on the Xingu River. The international uproar over environmental and human rights concerns was enough to persuade the World Bank to suspend its financing for all proposed dams in the Amazon Basin.

However, in 2005, Eletronorte, a subsidiary of Eletrobras, reintroduced its plans to build a first dam, the Belo Monte, on the Xingu River with suggestions for a smaller reservoir than the original design.

**Item 1 continues on the next page**

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The plan (see **Figure P2**) involves:

- building a dam across the Xingu River
- diverting the flow of the river to cut across the neck of a huge meander
- building a power station at Belo Monte
- generating power, mainly to meet the needs of the growing mining and metal processing industries in Carajás and other areas of mining and industry in Pará state.

**Figure P2**

Sketch map not reproduced here due to third-party copyright constraints.

However, the reduced scale of the planned project means that Belo Monte probably will not have enough water to generate electricity during the four-month dry season. Critics feel sure that sooner or later more dams will have to be built upstream to increase efficiency. These dams will have huge reservoirs that will double the amount of submerged rainforest in Brazil. The Earth's most biologically diverse region is threatened. One third of all of the world's species live in the Amazon River Basin; one third of the world's tropical woods (2500 tree species) are found only in the Amazon Basin. The Amazon River and its tributaries, including the Xingu, contain 20% of the Earth's fresh water and have the world's highest diversity of freshwater fish.

## Some important dates in the planning of the dam

- In July 2009, President Lula da Silva promised that “we will not force Belo Monte down anyone’s throat”.
- On 1 February 2010, the Brazilian environmental agency IBAMA released the first of three environmental licences needed to build the Belo Monte dam on the Xingu River.
- On 12 April 2010, Hollywood celebrities including *Avatar* star Sigourney Weaver came to Amazonia to publicise the campaign against the Belo Monte dam proposals and visited indigenous communities threatened by the dam.
- On 19 April 2010, Brazil’s electric energy agency ANEEL said that it had suspended the auction of the rights to build the Belo Monte hydroelectric dam that was planned for the following day. ANEEL’s decision came after an injunction filed by a public prosecutor in a federal court ordered it to suspend the auction.
- On 21 April 2010, the Brazilian High Court gave approval for the construction of the Belo Monte dam provoking ‘bloodshed’ threats from Amazon Indians.

The government dismissed the criticism, the auction went ahead and the government promised that the successful bidder would pay \$800m to protect the environment.

## Key features of the plan:

- The 11 000 MW dam would be the third largest in the world, after the Three Gorges (China) and Itaipu (jointly run by Brazil and Paraguay). Belo Monte is expected to provide enough electricity for 23 million homes.
- However, during low water, output could go down to 1000 MW and Belo Monte would become one of the most inefficient dams in the world.
- Official estimates put the construction costs at £7 billion, although private sector estimates go as high as £11 billion.
- The dam will start producing power from 2014/15.

Unfortunately the results are unlikely to affect overall electricity prices in Brazil because most of the energy is already set aside for specific clients – mainly in mining and industry, with only a small amount left for power markets.

Roberto Messias, head of Brazil’s environmental agency, said that the dam’s construction would affect about 12 000 people but that many of these people currently live in wooden riverside shacks and were likely to benefit from the dam’s construction. “Our studies show that today the population does not have adequate sanitation or healthcare. The conditions given in the licence are planned so that the local population has a superior quality of life ... at the end of the construction.” He said that the dam, power station and associated infrastructure should provide vital support for the development of mining, industry and commercial agriculture in Pará state, providing opportunities for much well-paid work for local people as well as for migrants from overpopulated areas, especially from the dry Nordeste region.

However, Francisco Hernández, an electrical engineer and joint co-ordinator of a group of 40 specialists who analysed the project, said that the dam would generate little electricity during the three to four month dry season. Describing the dam as a scheme of “doubtful engineering viability”, he said Belo Monte was an extremely complex project “that would interrupt the flow of water courses over an enormous area, needing excavation of earth and rocks on the scale of that carried out for digging the Panama Canal”.

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## Item 2 Brazil's energy mix

The following extracts are taken from the Energy Information Administration (EIA) Brief published by the United States Government's Department of Energy (DoE) in 2010.

Brazil is the tenth largest energy consumer in the world and the third largest in the western hemisphere, behind the United States and Canada. Total primary energy consumption in Brazil has increased significantly in recent years because of sustained economic growth. Also, Brazil has made great progress in increasing its total energy production, particularly oil, over the past decade. Increasing domestic oil production has been a long-term aim of the Brazilian Government, and recent discoveries of large offshore oil deposits could change Brazil into one of the largest oil producers in the world.

The largest share of Brazil's total energy consumption comes from oil (including ethanol), then hydroelectricity and natural gas. The large share of hydroelectricity in Brazil's energy mix shows the dependence on electricity generated from big dams. Natural gas currently provides only a small share of total energy consumption, but attempts to diversify electricity generation from hydroelectric power (HEP) to gas-fired power plants could cause natural gas consumption to grow (see **Figure P3**).

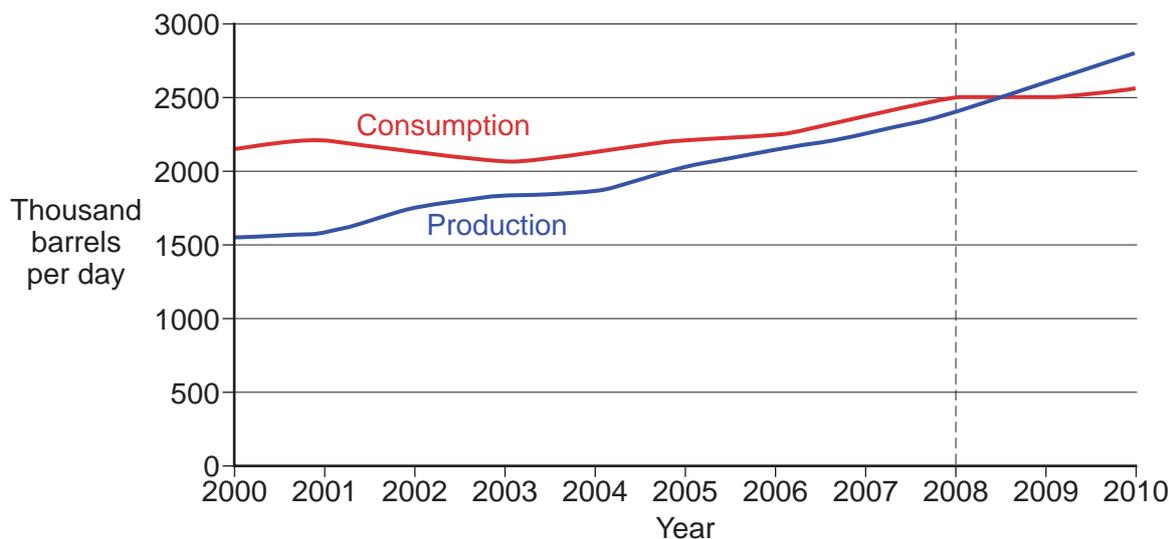
**Figure P3 – Total energy consumption in Brazil, by type (2006)**

Oil	49%
HEP	36%
Natural gas	7%
Coal	5%
Nuclear	2%
Other renewables	1%

## Oil

Brazil had 12.6 billion barrels of proven oil reserves in 2009, the second largest in South America after Venezuela. The offshore Campos and Santos Basins, located off the country's south-east coast, contain most of Brazil's proven reserves. Because of rising oil production and slow growth of consumption, the EIA expects that Brazil will become a net oil exporter in 2009 (see **Figure P4**).

**Figure P4 – Brazil's oil production and consumption (2000–2010)**



*Figures after 2008 are estimates*

## Ethanol

Ethanol is a substitute for petroleum, produced from plants, mainly sugar cane. Brazil is one of the largest producers of ethanol in the world and is the largest exporter of the fuel. In 2008, Brazil produced 454 000 barrels per day (b/d) of ethanol, up from 200 000 b/d in 2000. All gasoline in Brazil contains ethanol, with blending levels varying from 20–25%. Over half of all cars in the country are of the flex-fuel variety, meaning that they can use 100% ethanol or an ethanol–gasoline mixture.

The importance of ethanol in Brazil's domestic transport fuels market will only increase in the future. According to Petrobras, the state-owned oil company, ethanol is used for more than 50% of current light vehicle fuel demand, and the company expects this to increase to over 80% by 2020.

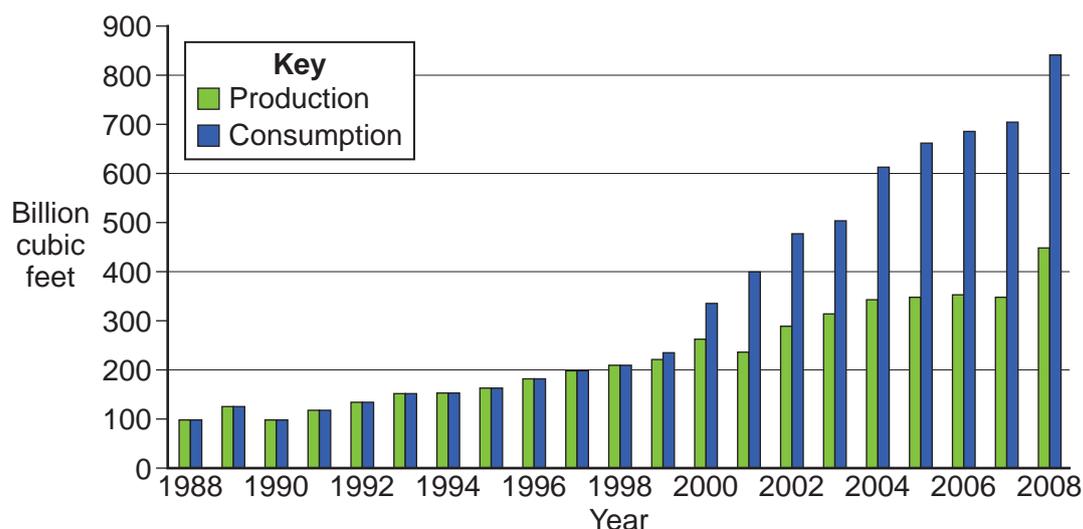
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### Natural gas

Natural gas consumption is a small part of the country's overall energy mix – only 7% of total energy consumption in 2006. However, natural gas demand is rising: in 2008, Brazil consumed 835 billion cubic feet (Bcf) of natural gas, up from 701 Bcf in 2007. High oil prices have helped increase the demand for natural gas in Brazil. It is mostly used as a substitute for fuel oil in industrial and power-generating applications. Domestic prices for natural gas are much lower than international fuel oil prices. The introduction of natural gas imports has increased available supplies, helping the growth in domestic consumption (see **Figure P5**).

**Figure P5 – Brazil's natural gas production and consumption (1988–2008)**



### Electricity

In 2007, HEP provided 85% of Brazil's electricity, with smaller amounts coming from conventional thermal, nuclear and other renewable sources.

**Figure P6 – Brazil's electricity generation, by source (in billion kilowatt hours) (1997–2007)**

Year	HEP	Thermal	Nuclear	Other renewables
1997	275	25	0	5
1998	280	25	0	5
1999	280	27	0	6
2000	282	25	1	6
2001	264	30	3	7
2002	270	30	5	8
2003	282	31	5	8
2004	295	33	5	9
2005	308	33	5	10
2006	312	35	5	12
2007	330	36	5	15

### Item 3 Wind helps Brazil diversify its energy mix

The following extract is taken from an article published on *infosurhoy.com* (December 2010).

The website *infosurhoy.com* is a one-stop source of news and information about, and for, Latin America and the Caribbean. It is sponsored by the US Southern Command (a US military organisation).

The same winds that brought the Portuguese caravels to Brazil more than 500 years ago are helping to diversify the country's energy mix.

Wind energy is renewable and clean, but only in the past five years has it proved to be economically feasible in Brazil.

The government is promoting a plan that will create 71 projects to generate wind energy. The projects will be on Brazil's national grid and should generate 1805 megawatts (MW) of power. The new projects must start operating by the end of 2012, adding to the already existing 1200 MW generated from wind power in Brazil.

The new wind farms will be mainly on high land in the south and north-east of the country.

According to the national electric energy agency (ANEEL), in 2010 wind energy makes up 0.56% of Brazil's electricity. By the end of 2012, wind energy should make up 3% of Brazil's electricity.

Pedro Perrelli, executive director of the Brazilian Wind Energy Association, says that wind energy cannot compete with large hydroelectric plants, since wind energy generation is always on a smaller scale.

Studies by the national institute for space research (INPE) show that Brazil has a great potential to use its winds: a long coastline and a constant wind circulation system at an appropriate intensity for wind generation. Enio Bueno Pereira, an INPE senior researcher for climate and renewable energy, says that having that much wind is not enough. Infrastructure for establishing wind farms, a proper distribution chain and government incentives to support wind energy are crucial.

"As happened when ethanol was subsidised by the government, wind energy needs a good push to get it started," Pereira says.

At present, the country's biggest wind farm is in Osório, a city 94 km north of Porto Alegre. Its power generation is enough to supply residential power to a town with a population of 750 000.

"We've been producing energy in the city of Osório for three years, using a clean and socially responsible method," the president of the generating company says. "The rural areas where wind power plants are placed can also be used for agriculture, increasing farm income."

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#### Item 4 Brazil – selected socio-economic statistics

The figures provided below were collected in 2010. Please note that updated figures may be available when this booklet is published.

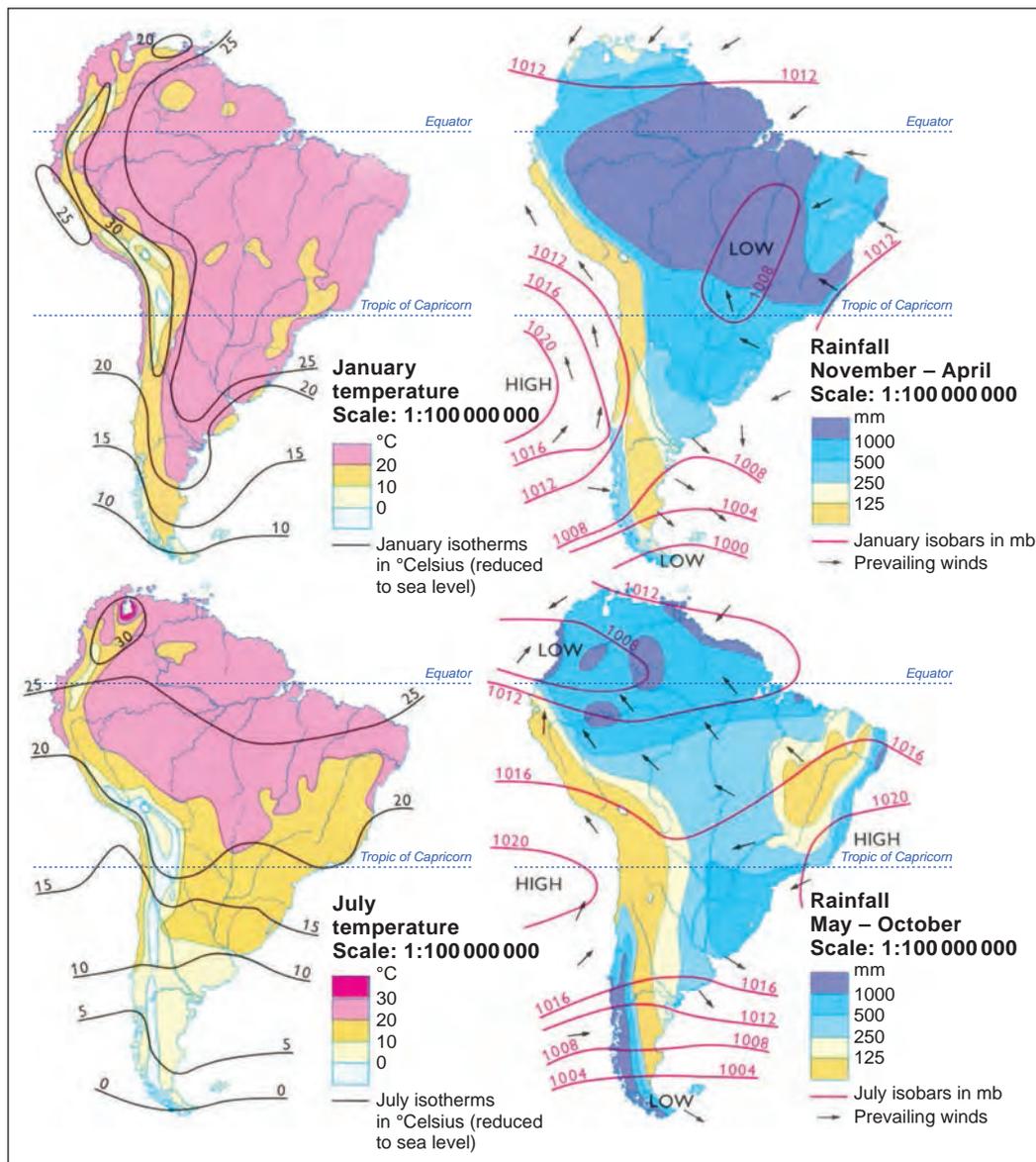
<p><b>Total population</b> (2010 estimated): 201 103 330</p>
<p><b>Age structure</b> (2010 estimated): 0–14 years: 26.7% 15–64 years: 66.8% 65 years and over: 6.4% <i>* Figures do not add up to 100% because of rounding.</i></p>
<p><b>Population growth rate</b> (2010 estimated): 1.17%</p>
<p><b>Birth rate</b> (2010 estimated): 18.11 births/1000</p>
<p><b>Death rate</b> (2010 estimated): 6.35 deaths/1000</p>
<p><b>Urbanisation:</b> urban population: 86% of total population (2008) rate of urbanisation: 1.8% annual rate of change (2005–10 estimated)</p>
<p><b>GDP per capita</b> (2009 estimated): \$10 100</p>
<p><b>GDP growth rate</b> (2nd Quarter – 2010): 8.8%</p>
<p><b>GDP composition by sector</b> (2009 estimated): primary: 6.1% secondary: 25.4% tertiary: 68.5%</p>
<p><b>Labour force – by occupation</b> (2003 estimated): agriculture: 20% manufacturing: 14% services: 66%</p>
<p><b>Unemployment rate</b> (2009 estimated): 8.1%</p>
<p><b>Population below poverty line</b> (2008): 26%</p>
<p><b>Illiteracy rate in the population aged 15 years and over</b> (2005): 11.1%</p>

**Item 5 Brazil – climate and energy supply**

**Figure P7** shows information on the climate of South America. It should be studied with an atlas map showing the relief and drainage of Brazil.

As part of your preparation for the examination, you should consider how climate conditions might affect plans for development of renewable energy supplies in different regions of Brazil.

**Figure P7  
Climate of South America**



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## Item 6 Further research

You should use the internet to carry out some further research to consider arguments for and against the Belo Monte dam. Several sites you might visit are listed below.

### Source 1

[http://www.boston.com/bigpicture/2008/05/indigenous\\_brazilians\\_protest.html](http://www.boston.com/bigpicture/2008/05/indigenous_brazilians_protest.html)

This is a news report on the incident referred to at the beginning of Item 1.

### Source 2

[http://www.gearthblog.com/blog/archives/2010/08/tour\\_of\\_the\\_proposed\\_belo\\_monte\\_dam.html](http://www.gearthblog.com/blog/archives/2010/08/tour_of_the_proposed_belo_monte_dam.html)

This video was produced by an organisation that is campaigning against the construction of the Belo Monte dam.

### Source 3

<http://www.youtube.com/watch?v=44LtZMKEPpE>

This video is an edited version of a report on Brazil's energy needs and production. It was produced for Al Jazeera.

There are **no** suggestions in this booklet for the planning and preparation of primary data collection.

## END OF ITEMS

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Figures P3, P4, P5 and P6 Source: U.S. Energy Information Administration (Jan 2010)  
 Item 3 Patricia Knebel, [www.infosurhoy.com](http://www.infosurhoy.com)  
 Item 4 CIA World Factbook, Central Intelligence Agency  
 Item 5 Philip's Certificate Atlas for Secondary Schools, © Philip's 1979

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