

Environmental systems and societies
Standard level
Paper 1

Friday 5 May 2017 (afternoon)

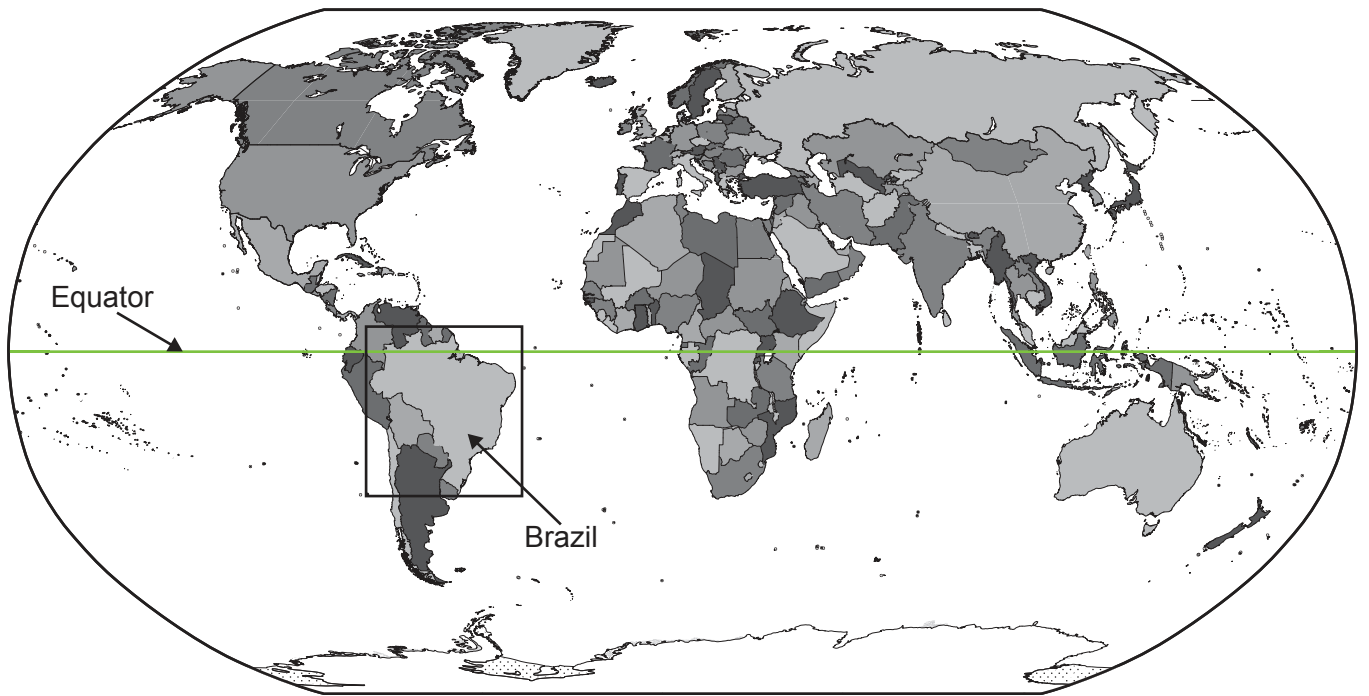
1 hour

Resource booklet

Instructions to candidates

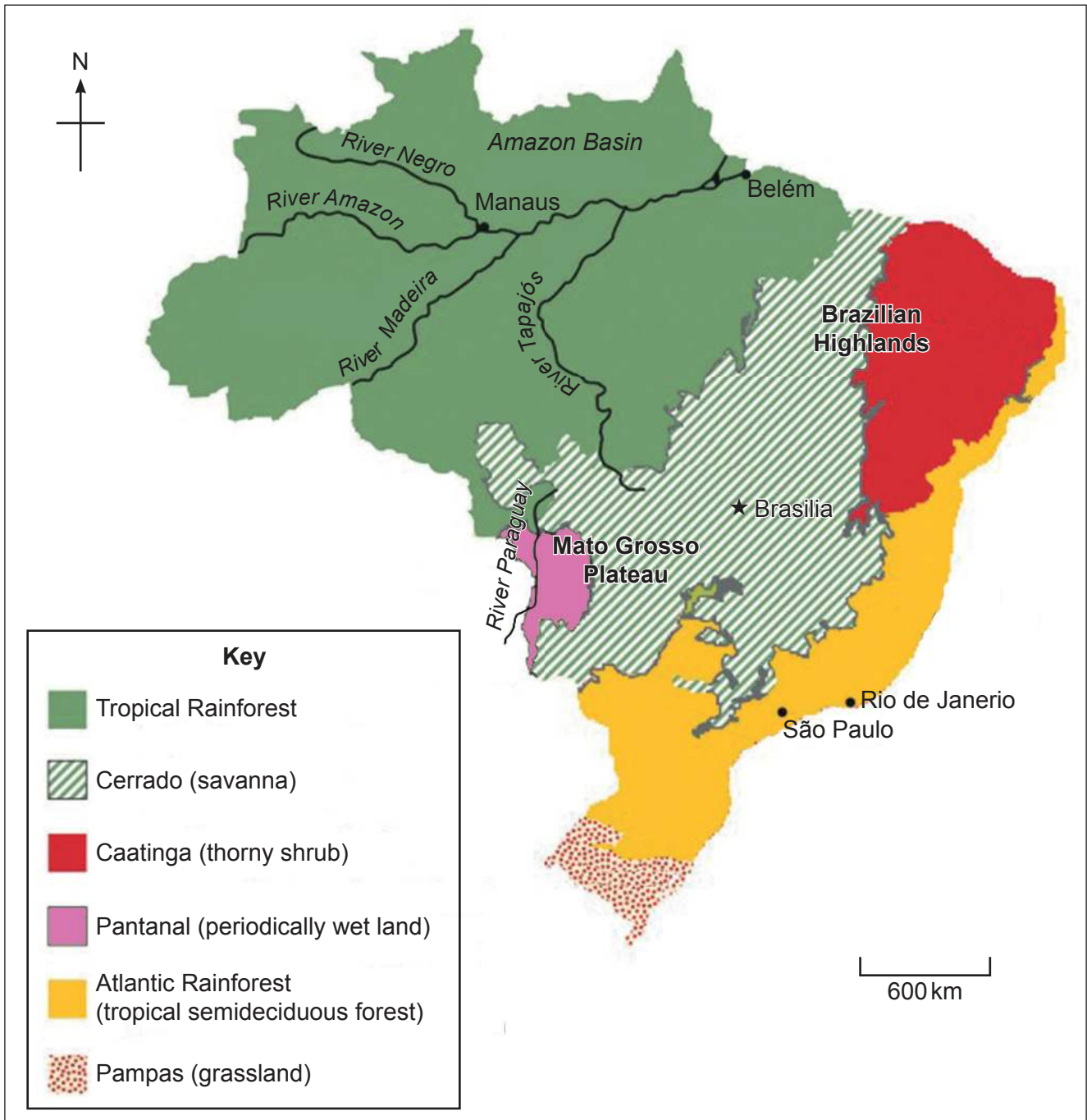
- Do not open this booklet until instructed to do so.
- This booklet contains **all** the resources to answer paper 1.

Figure 1: World map showing the location of Brazil



[Source: adapted from CIA World Factbook]

Figure 2: Map of Brazil's vegetation including location of Cerrado and Atlantic Rainforest



[Source: adapted from <https://mapcollection.wordpress.com/>]

Turn over

Figure 3(a): Fact file on biodiversity in Brazil

- Brazil is the largest country in South America, covering an area of over 8.5 million square kilometers.
- The country contains an exceptionally high number of species, many of which are endemic.
- Estimates of species numbers vary from 1.4 to 2.4 million, of which only a small fraction has been identified.
- Regions of high biodiversity include the Atlantic Rainforest (also known as the Mata Atlântica) and Cerrado (Savanna).
- The Atlantic Rainforest originally covered about 15 % of Brazil mainly along the Brazilian coast as well as extending into neighbouring countries of Paraguay and Argentina. The region comprises of various ecosystems including tropical and subtropical forests.
- The Cerrado region covers about 20 % of the land area in central Brazil and extends into the neighbouring countries of Paraguay and Bolivia. It comprises a range of ecosystems including grasslands, savanna regions and forests.

[Sources: www.conservation.org and www.nature.org]

Figure 3(b): Estimated number of species found within the Atlantic Rainforest and the Cerrado region

	Atlantic Rainforest	Cerrado
Plants	20 000 (8000 endemic)	10 000 (4400 endemic)
Birds	934 (144 endemic)	607 (17 endemic)
Mammals	264 (72 endemic)	195 (14 endemic)
Amphibians	456 (282 endemic)	186 (28 endemic)
Reptiles	311 (94 endemic)	225 (33 endemic)

[Source: www.cepf.net]

Figure 4: Photographs showing examples of species found in Brazil



Paraná pine trees (*Araucaria angustifolia*)
IUCN Red List status – critically endangered

[Source: https://en.wikipedia.org/wiki/Araucaria_angustifolia#/media/File:Araucaria-caxias-do-sul.jpg, by Ricardo Frantz]



Pau brasil (*Caesalpinia echinata*)
IUCN Red List status – endangered

[Source: <https://en.wikipedia.org/wiki/Paubrasilia#/media/File:ClosedeflordePaubrasil.jpg>, by Mauroguanandi]



Golden lion tamarin (*Leontopithecus rosalia*)
IUCN Red List status – endangered

[Source: https://en.wikipedia.org/wiki/Golden_lion_tamarin#/media/File:Golden_lion_tamarin_portrait3.jpg, by Jeroen Kransen]



Brazilian merganser (*Mergus octosetaceus*)
IUCN Red List status – Critically endangered

[Source: https://en.wikipedia.org/wiki/Brazilian_merganser#/media/File:Mergus_octosetaceus_2.png, by Prof. Sávio Freire Bruno – <http://www.wikiaves.com.br/182433&t=s&s=10048>]



Broad-snouted caiman (*Caiman latirostris*)
IUCN Red List status – least concern

[Source: https://en.wikipedia.org/wiki/Broad-snouted_caiman#/media/File:Jacare_de_papo_amarelo_zoo.jpg, by Miguelrangeljr]



Giant metallic ceiba borer (*Euchroma gigantea*)
IUCN Red List status – none, has not yet been assessed by the IUCN

[Source: https://en.wikipedia.org/wiki/Euchroma_gigantea#/media/File:Buprestidae_-_Euchroma_gigantea.JPG, by Hectonichus]

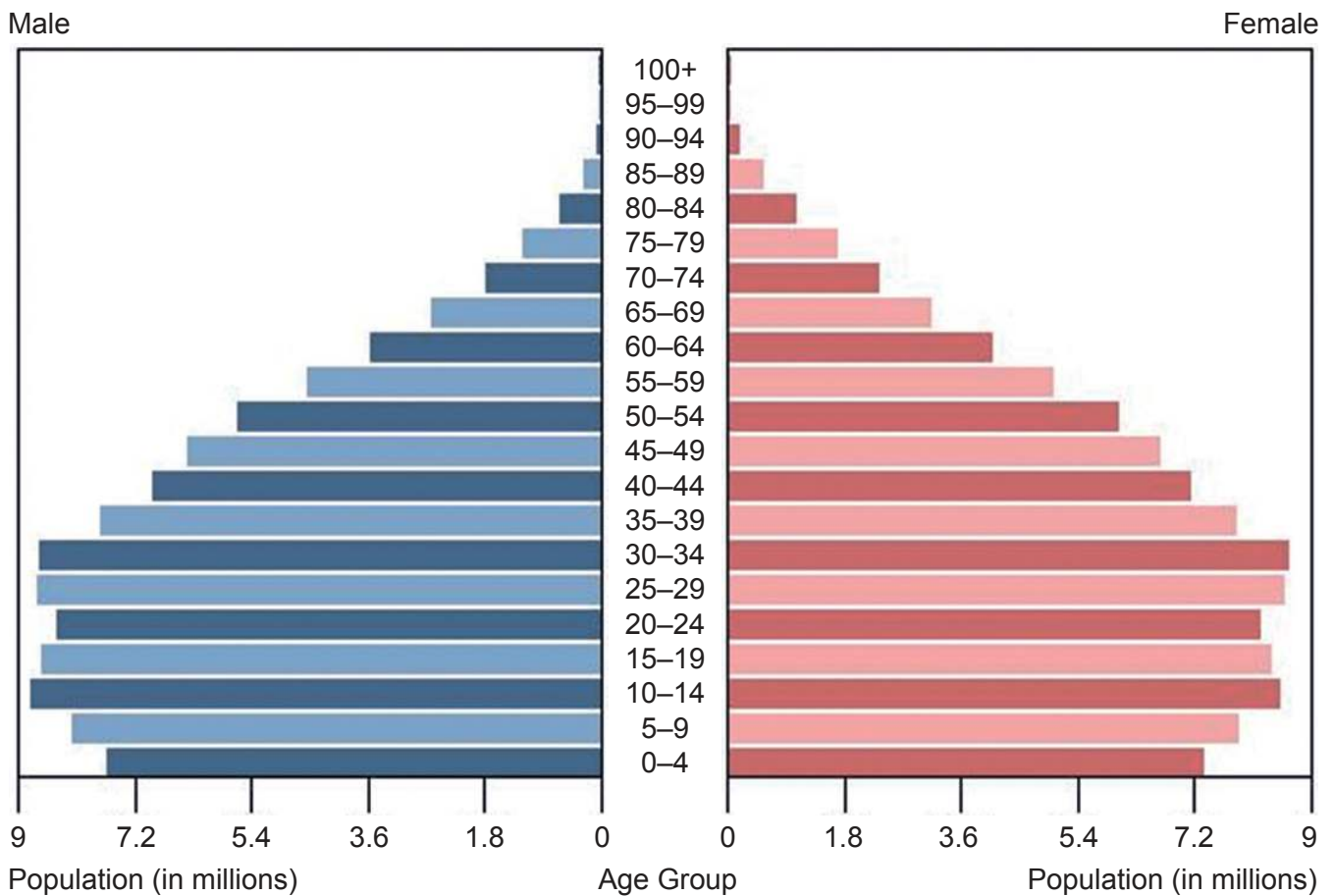
Turn over

Figure 5(a): Fact file on population

- Brazil’s population is approximately 204 million (July 2015).
- Approximately 86 % of the population live in urban areas.
- 240 indigenous tribes make up 0.4 % of the population.
- Over 70 % of the total country population live in the Atlantic Rainforest region.
- São Paulo is the largest city with a population of about 21 million, followed by Rio de Janeiro with a population of about 13 million.
- Brasilia, the capital city, is located in the Cerrado region and has a population of about 4 million.
- Birth rate: 14.46 births/1000 population (2015 estimate).
- Death rate: 6.58 death/1000 population (2015 estimate).
- Median age of population: 31.1 years.

[Sources: www.wwf.org.uk and www.survivalinternational.org]

Figure 5(b): Age-gender pyramid for Brazil, 2014



[Source: www.cia.gov]

Figure 6(a): Fact file on the human impacts on biodiversity

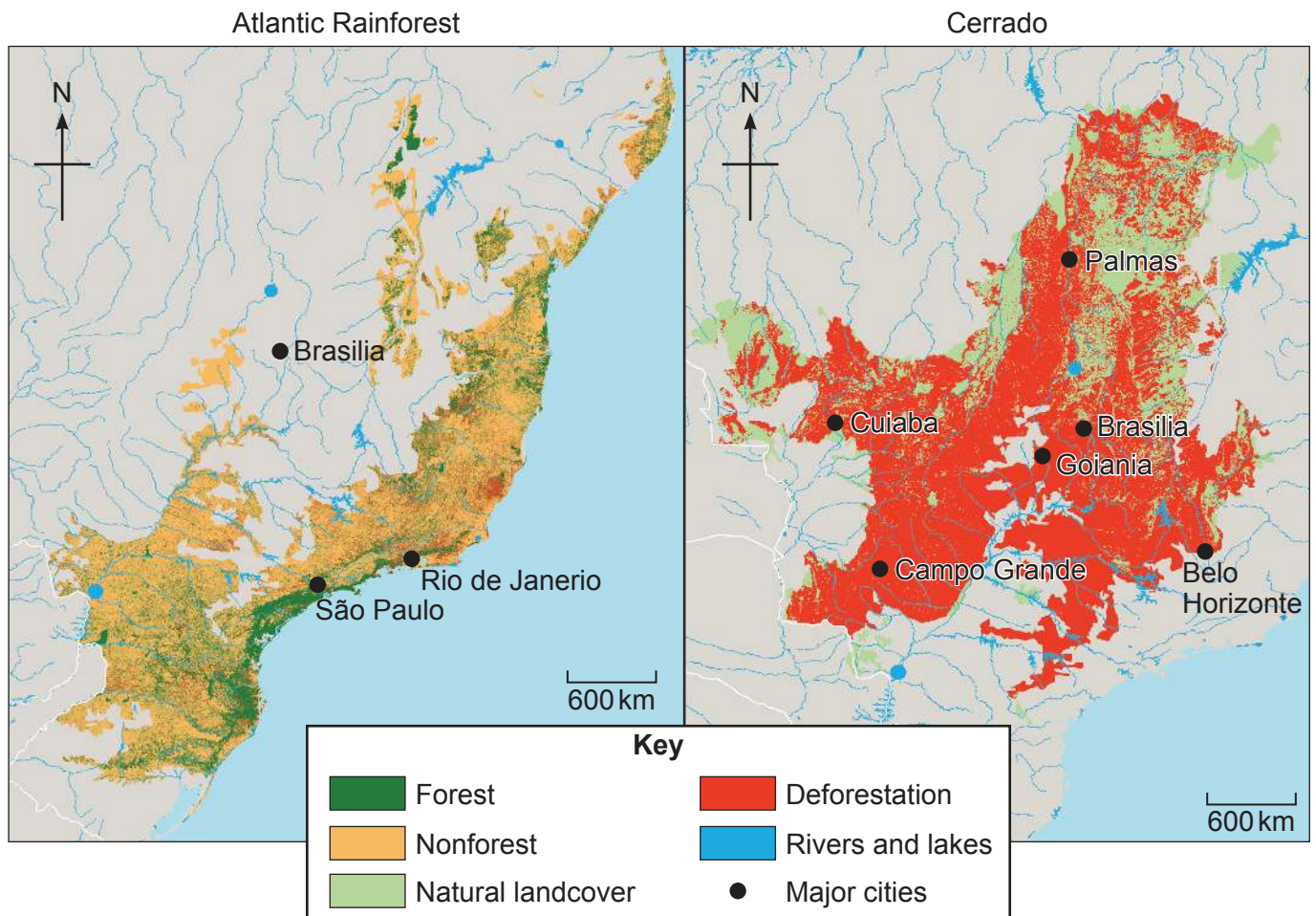
There have been a number of processes at work in Brazil that have caused significant losses in biodiversity. Of the original Atlantic Rainforest only about 10% remains, and of the original Cerrado vegetation only around 20% remains. These losses have occurred as a result of:

- Land clearance for crop production eg sugar cane, coffee, soy beans and biofuel crops. The amount of food and biofuel crops grown has increased significantly over the past 20 years.
- Land clearance for cattle ranching. Brazil has the largest number of cattle of any country in the world.
- Land clearance for forest plantations eg pine and eucalypt plantations
- Expansion and development of urban areas eg:
 - Rio de Janeiro and São Paulo in the Atlantic Rainforest region.
 - Brasilia the capital city in the Cerrado region.
- Infrastructure development eg road building schemes to support industrialization.
- Commercial logging.

Various businesses, non-governmental and governmental organizations actively support projects within the Atlantic Rainforest that:

- Restore forest habitats.
- Encourage sustainable use of natural forest resources.

Figure 6(b): Deforestation in the Atlantic Rainforest and the Cerrado



[Source: Atlantic rainforest map: http://wwf.panda.org/what_we_do/footprint/agriculture/soy/soyreport/soy_and_deforestation/the_atlantic_forest/

Cerrado map: http://wwf.panda.org/what_we_do/footprint/agriculture/soy/soyreport/soy_and_deforestation/the_cerrado/

Turn over

Figure 7(a): Fact file on energy and economic development in Brazil

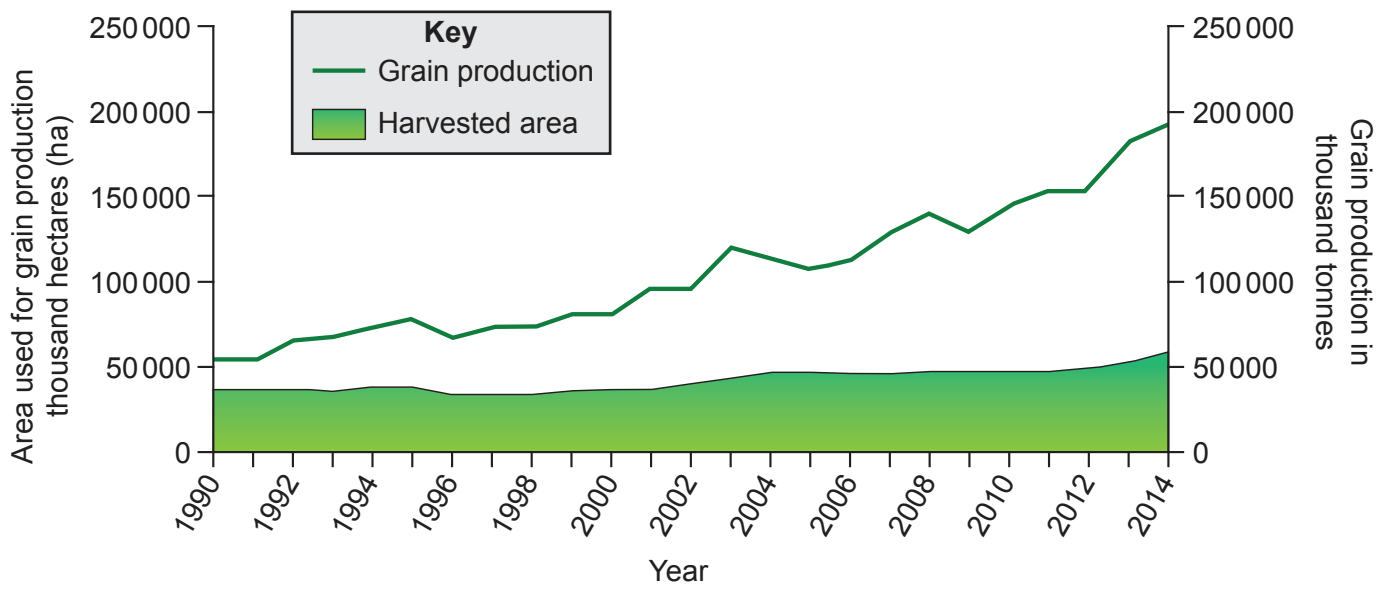
- Brazil has experienced fast economic growth and is one of the most influential nations in South America.
- Major industries include mining, agriculture and the manufacture of products ranging from motor vehicles and aircraft to computers.
- There has been significant growth in the service industries including the telecommunications, banking, commerce and computing sectors.
- Over 80 % of Brazil's gross domestic product (GDP) is generated in the Atlantic Rainforest region.
- Brazil is a major producer of oil. However about 70 % of its electricity comes from hydroelectric power (HEP).
- Brazil is also the largest global producer of bioethanol, a biofuel produced from plants such as sugar cane. Over 40 % of petrol (gasoline) use has been replaced by bioethanol.
- Brazil's energy policy has involved:
 - improving energy efficiency.
 - increasing energy production from renewable sources.
 - diversification of energy sources.

[Sources: adapted from www.economywatch.com, www.nature.org, <http://sugarcane.org> and www.reegle.info]

Figure 7(b): GDP, energy use, life expectancy and under 5 mortality rate in Brazil from 1990 to 2012

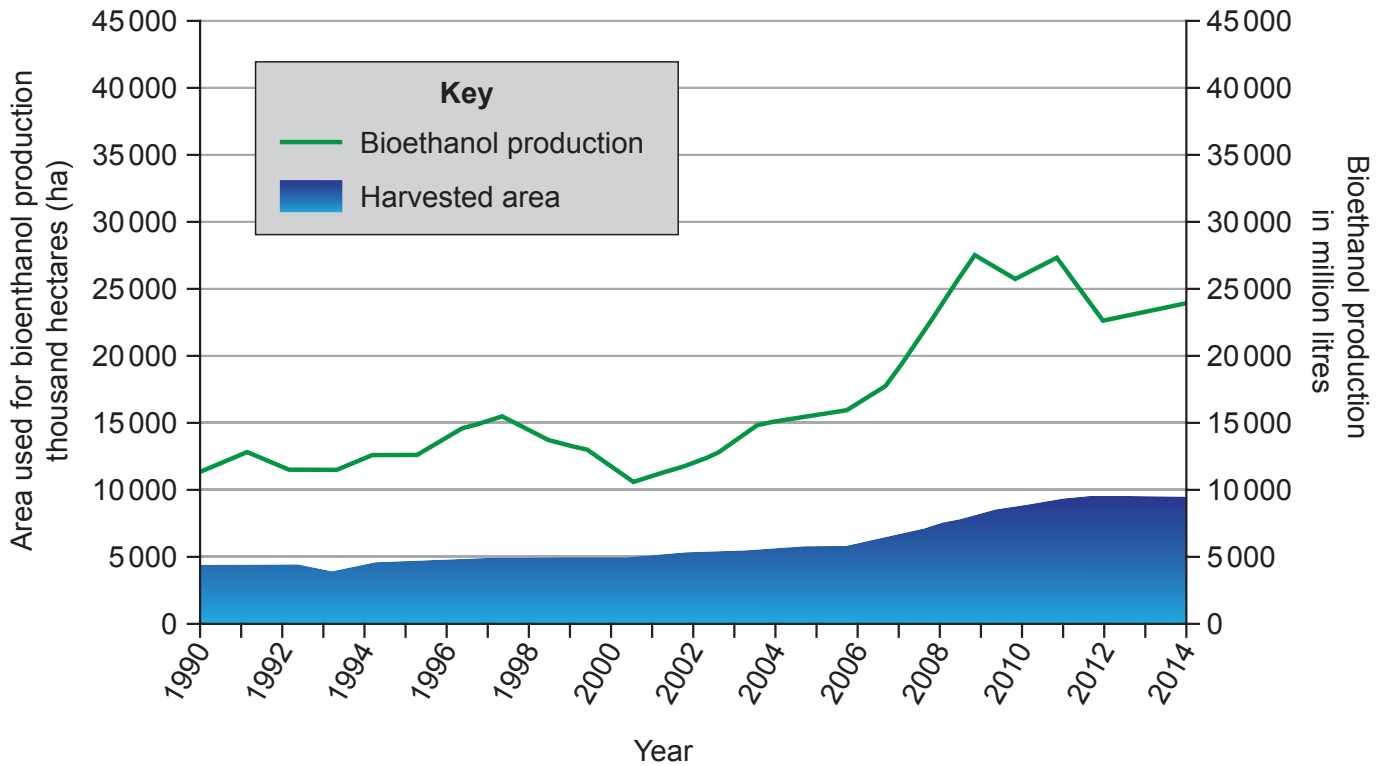
Removed for copyright reasons

Figure 8: Area used for grain production and quantity of grain produced between 1990 and 2014



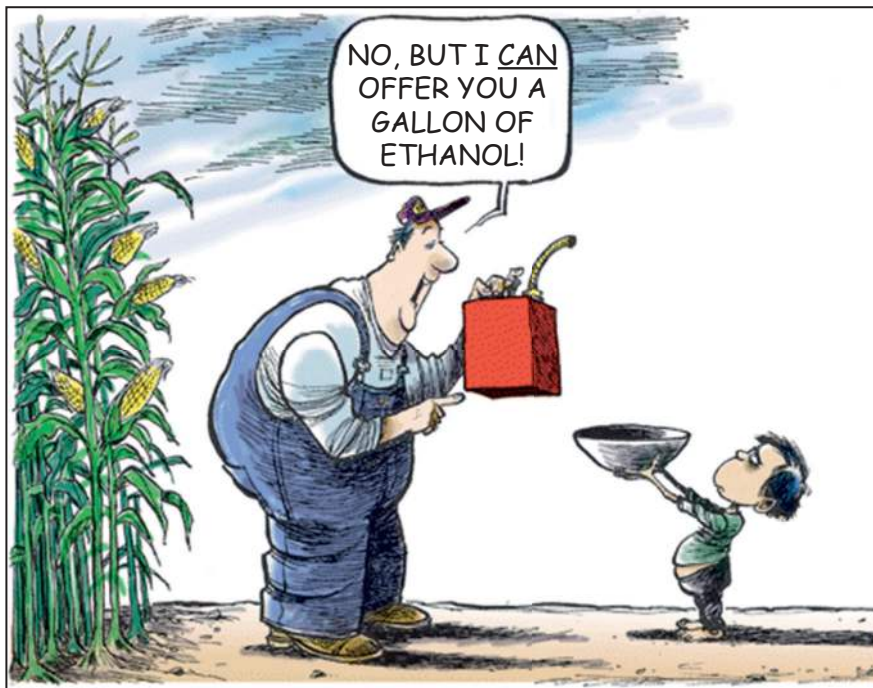
[Source: Brazilian Sugarcane Industry Association (UNICA)
<http://sugarcane.org/sustainability/producing-food-and-fuel>]

Figure 9(a): Area used for bioethanol production and quantity of bioethanol produced between 1990 and 2014



[Source: <http://sugarcane.org/sustainability/producing-food-and-fuel>
Brazilian Sugarcane Industry Association (UNICA)]

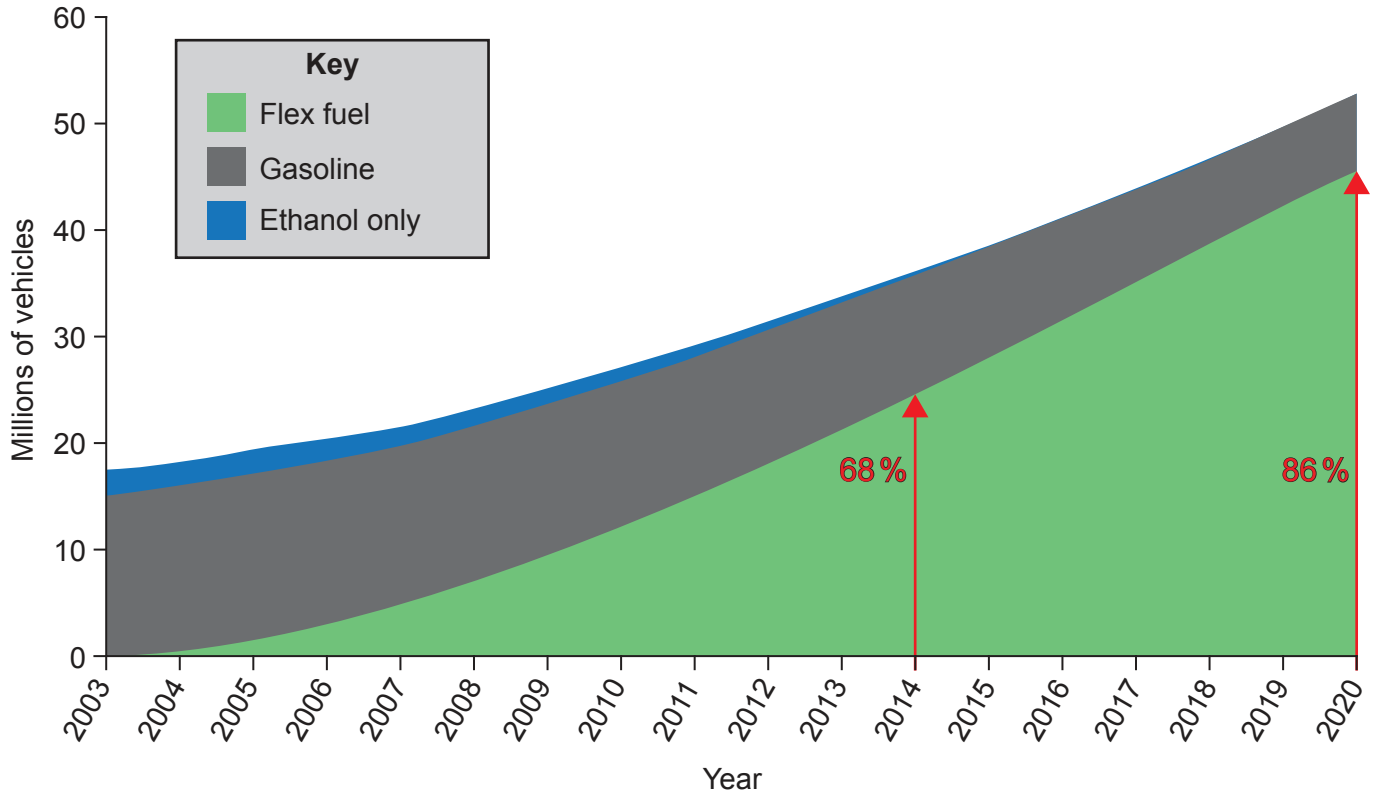
Figure 9(b): Biofuel production versus food production



[Source: CARLSON © 2008 Milwaukee Journal Sentinel. Reprinted with permission of ANDREWS MCMEEL SYNDICATION. All rights reserved.]

Figure 10: Vehicle numbers by fuel type in Brazil

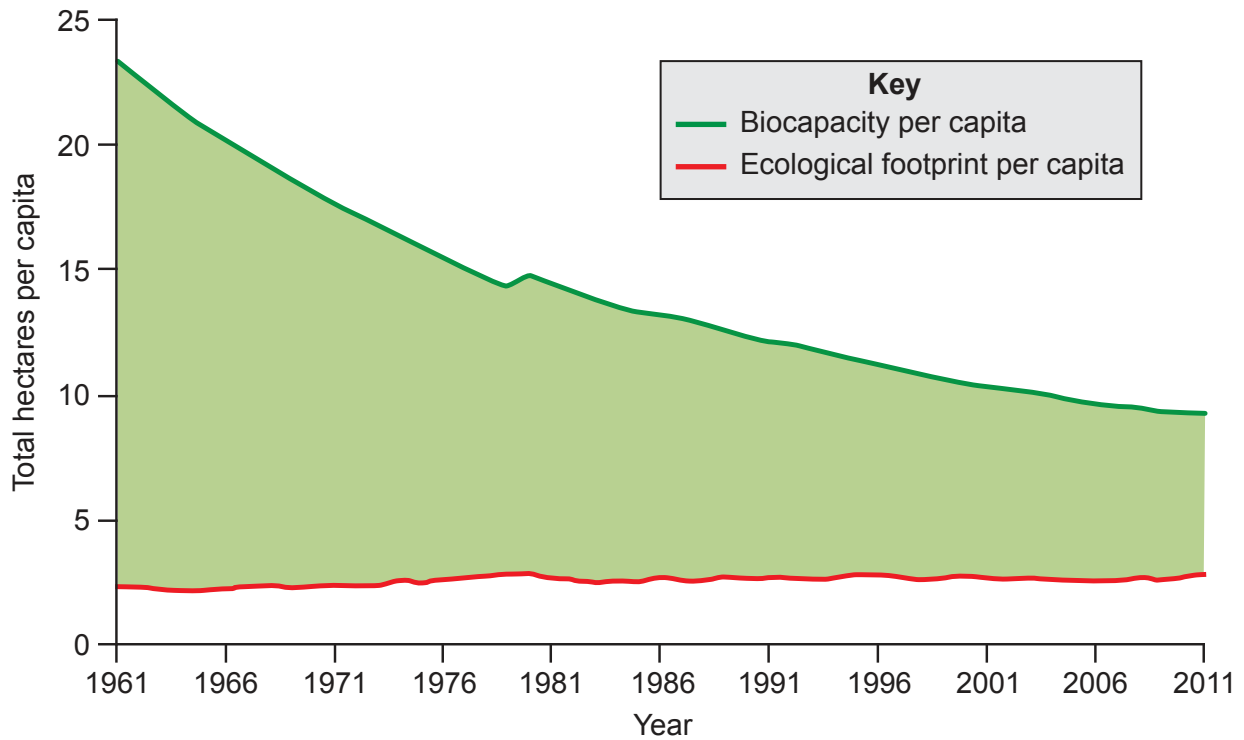
- Flex fuel vehicles use bioethanol, petrol or a mixed fuel.
- Ethanol vehicles use only biofuels.
- Gasoline vehicles use only gasoline (petrol).



[Source: <http://sugarcane.org/internal/images/national-light-duty-fleet>
Brazilian Sugarcane Industry Association (UNICA)]

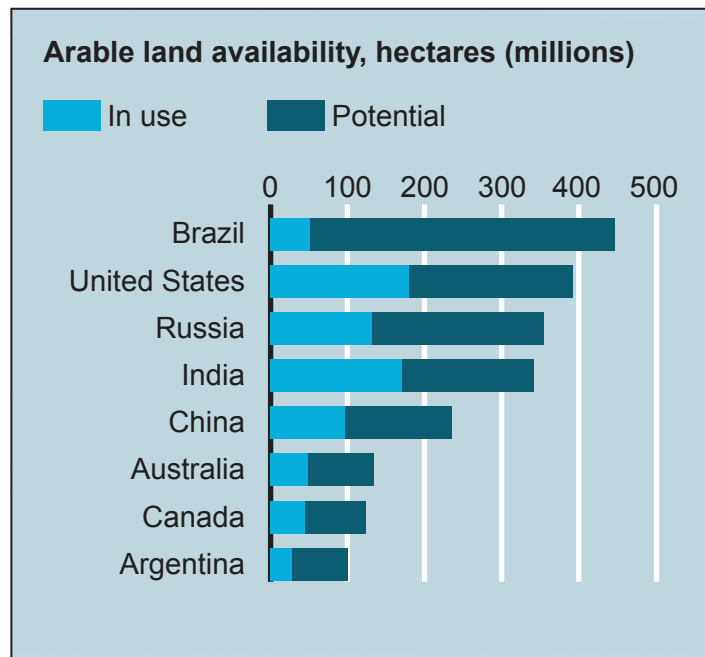
Figure 11(a): Ecological footprint and biocapacity of Brazil

(Biocapacity can be defined as the amount of biologically productive land, measured in total hectares per capita.)



[Source: © 2017 Global Footprint Network. www.footprintnetwork.org]

Figure 11(b): Estimated arable land available in selected countries



[Source: © The Economist Group Limited, London (Aug 26th 2010)]

Figure 12(a): Bar chart showing the results of a global attitudes survey in 2010. A thousand people in 22 countries were interviewed face to face

Please go to: <http://www.pewglobal.org/2010/09/22/chapter-5-environmental-issues>

Figure 12(b): Pie chart showing the proportion of the Brazilian population willing to prioritize the environment over economic growth

Please go to: <http://www.pewglobal.org/2010/09/22/chapter-5-environmental-issues>