

Environmental systems and societies
Standard level
Paper 2

Friday 20 May 2016 (afternoon)

2 hours

Resource booklet

Instructions to candidates

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

Figure 1(a): World map showing the location of Zambia

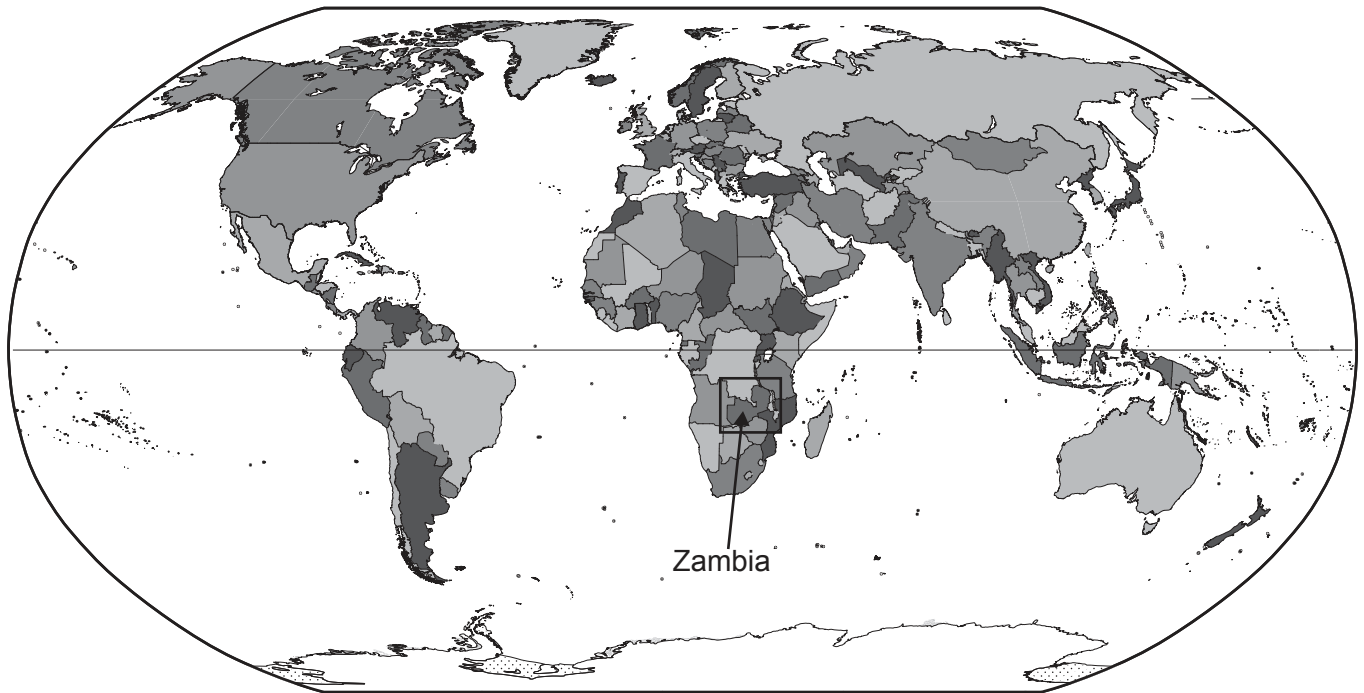


Figure 1(b): Map of Zambia showing Lusaka the capital and neighbouring countries



[Source: adapted from CIA World Factbook]

Figure 2: Fact file on Zambia

Geography

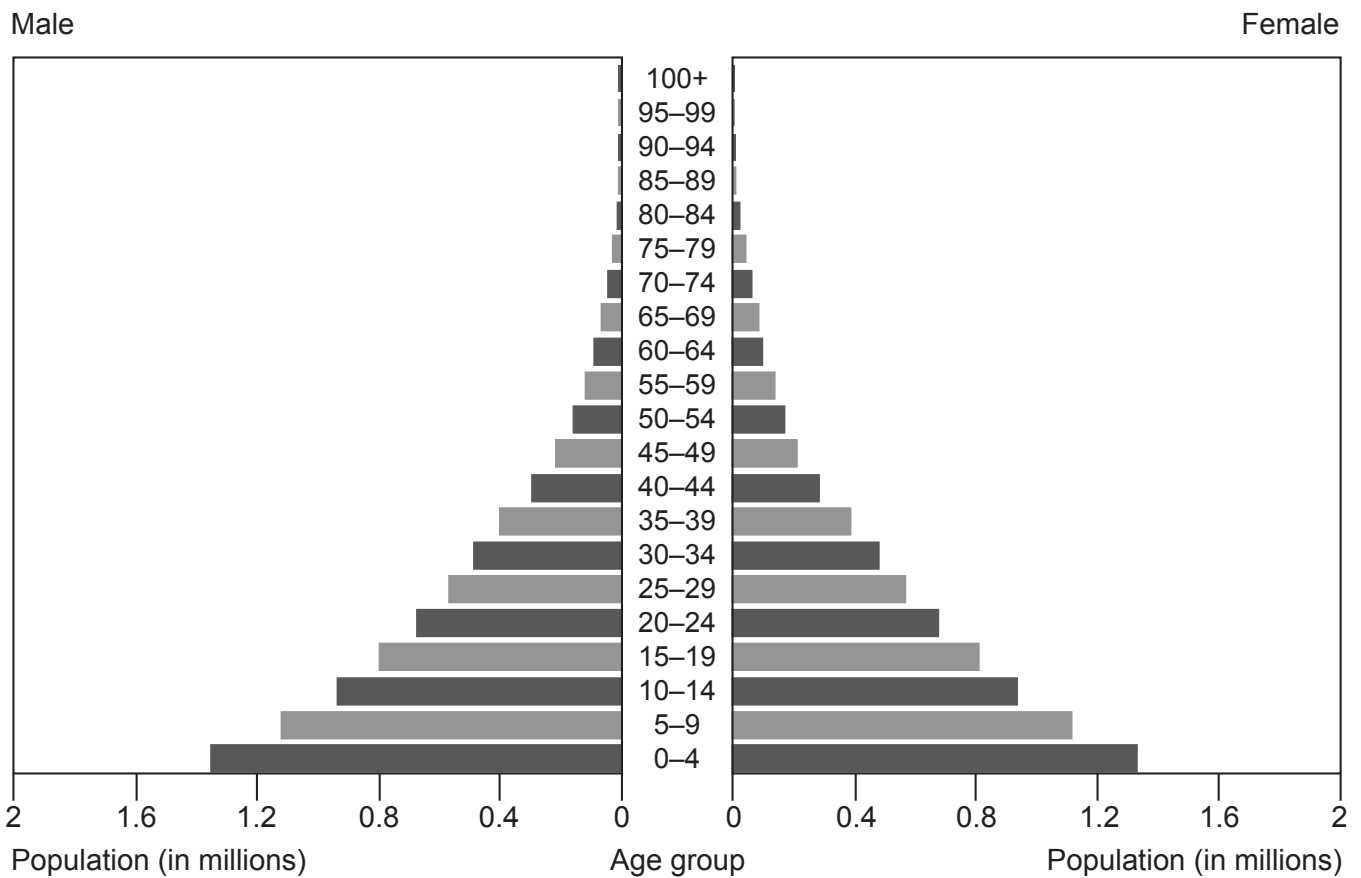
- A landlocked country in Southern Africa surrounded by eight neighbouring countries.
- Total area of 752 614 km².
- 11 890 km² is covered by lakes and rivers.
- Indigenous forest covers approximately 491 348 km².
- Main source of energy is wood fuel contributing to about 80 % of domestic energy consumption.
- Country has abundant natural resources such as wildlife, forests, water resources and mineral deposits.

Population

- Approximately 14.64 million.
- Population annual growth rate of 2.8 %.
- Approximately 2.19 million live in the capital city, Lusaka.
- Approximately 1.97 million live in the Copperbelt.
- Approximately 7.93 million live in rural areas.

[Sources: CIA World Factbook, www.fao.org, Environment Council of Zambia (ECZ) and Zambia Environmental Management Agency (ZEMA)]

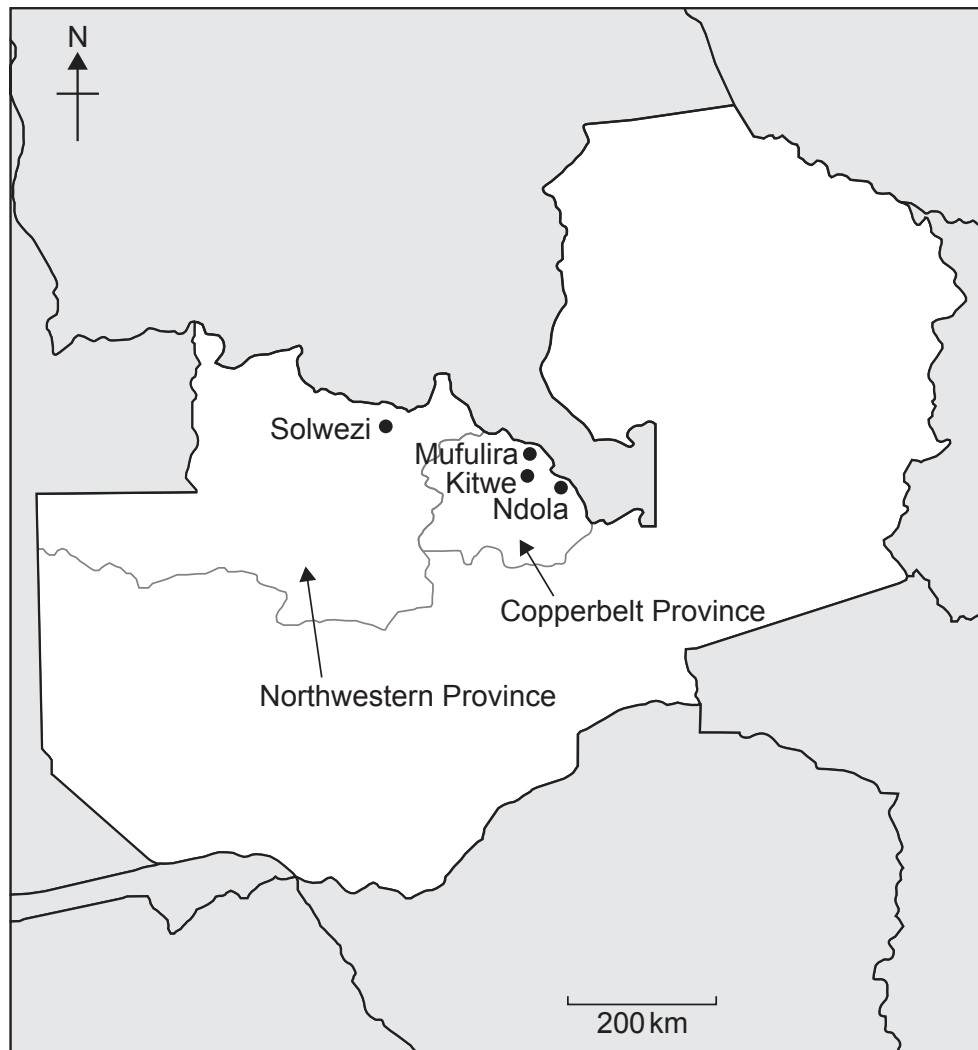
Figure 3: Population pyramid for Zambia 2014



[Source: <https://www.cia.gov/library/publications/the-world-factbook/geos/za.html>]

Turn over

Figure 4(a): Main mining regions in Zambia



[Source: adapted from CIA World Factbook and <https://commons.wikimedia.org>]

Figure 4(b): Fact file on mining

- In Zambia 84 % of income from exports comes from mining, although there are efforts to further increase income from agriculture and manufacturing.
- Most mining occurs in the Copperbelt and Northernwestern Provinces.
- Zambia is one of the largest producers of copper and cobalt in the world.
- Zambia also produces 20 % of the world’s gemstones and has other mineral deposits such as manganese, gold, silver, uranium and coal.
- From historic mining within the Copperbelt Province there are 21 waste rock dumps, 9 slag heaps and 45 tailing dams that contain toxic concentrations of metals.
- The Kafue River in the Copperbelt Province provides a water supply to local communities.
- Fish, for example young Tilapia are unable to survive near mining areas in the Kafue River.
- Mining activity in the Copperbelt Province has supported an increase in local population.

[Sources: ECZ (2001). *State of the Environment in Zambia*, (2000) Lusaka. Geological Survey of Sweden, (2014) *Environmental Impacts of Mining in Zambia*. ICMM, (2012), *The Role of Mining in National Economies*. ZEMA, GRID-Arendal. GRID-Sioux Falls, UNEP, (2013), *Zambia – Atlas of Our Changing Environment*]

Figure 4(c): Table showing the types of waste generated from mining activity

Mining activity	Waste generated
Mining / mineral extraction	Waste rock dumps (heaps).
Processing of ore	Tailings (liquid waste) containing heavy metals and fine particulates.
	Slag heaps (solid waste) containing heavy metals.
	Emissions (SO _x , NO _x).

Figure 5(a): Kansanshi mine in the Northwestern Province (10 km North of Solwezi)



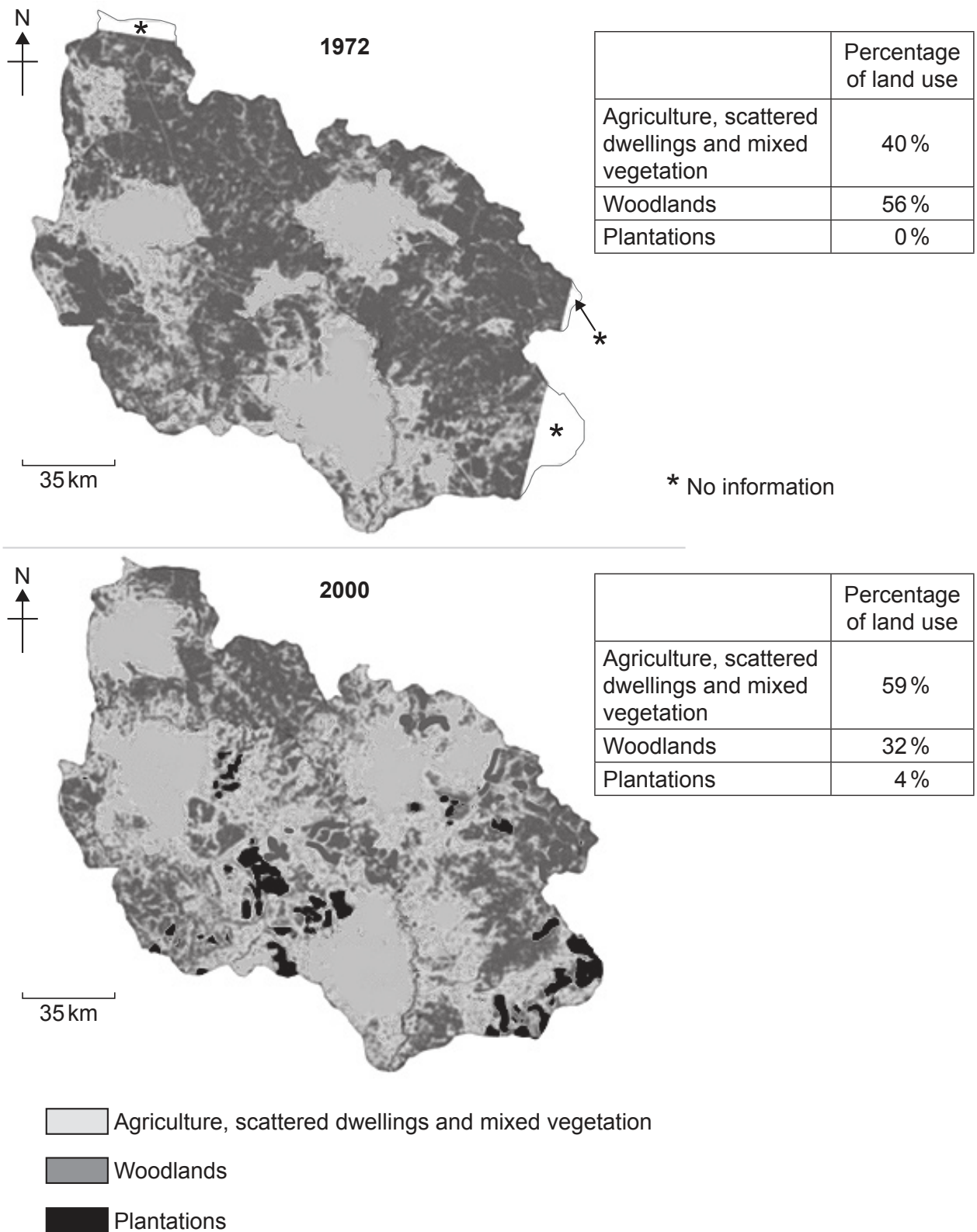
[Source: www.sulphuric-acid.com
Adapted from Google Earth]

Figure 5(b): Open cast mining at Kansanshi

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Turn over

Fig 6: Change in specified land uses within the Copperbelt Province between 1972 and 2000



[Source: adapted from D Limpitlaw & T Woldai, (2004), *Patch analysis of Landsat Datasets for Assessment of Environmental Change in the Zambian Copperbelt*, pages 2290–2293.]

Figure 7: Table of coverage of ecosystems in Zambia

Biome	Ecosystem	Approximate extent	
		Km ²	%
Forest (closed forest in which light is unable to reach the forest floor)	Dry evergreen	15 835	2.10
	Deciduous	6 735	0.90
	Thicket	1 900	0.25
	Montane	40	0.01
	Swamp	1 530	0.20
	Riparian	810	0.11
Woodland (open forest in which light can reach the forest floor)	Chipya	15 560	2.07
	Miombo	294 480	39.13
	Kalahari sand	84 260	11.20
	Mopane	37 010	4.92
	Munga	30 595	4.06
	Termitaria	24 260	3.22
Grassland	Dambo	75 760	10.07
	Floodplain/swamp	129 075	17.15
Aquatic	Lakes and rivers (15)	10 500	1.40
Anthropic	Cropland and fallows, forest plantations and built up areas	24 210	3.21
Total		752 560	100

[Source: adapted from Environment Council of Zambia, (2008), *Zambia Environment Outlook Report 3*]

Figure 8(a): Conservation in Zambia

- 225 000 Km² of the total land is designated as a protected area.
- This includes 20 national parks (8 % of land coverage) and 34 game management areas (22 % of land area (see Figure 8(c)).
- National parks are highly protected areas and game management areas are less protected.
- 224 mammal species live in these areas of which more than 20 species are listed as endangered.
- Illegal poaching is considered to be a serious problem and a threat to the protected areas.
- Growth in human settlements, land used for livestock grazing or cleared for agriculture and activities such as mining and road building have fragmented ecosystems.
- Among the protected areas, there are eight Ramsar sites in Zambia that are areas of wildlife and biodiversity conservation and include birds and aquatic life (Ramsar sites are wetlands of international significance under the Convention on Wetlands 1971).
- This range of ecosystems, wildlife and biodiversity attracts tourists and has potential to be further exploited.

[Source: adapted from Environment Council of Zambia, (2008), *Zambia Environment Outlook Report 3*, Zambia Environmental Management Agency (ZEMA) and UNEP, (2013) *Zambia – Atlas of Our Changing Environment*]

Figure 8(b): Examples of threatened species as classified by the IUCN Red List in 2014.



Black Rhinoceros
Diceros bicornis

Red list status: Critically endangered

[Source: https://en.wikipedia.org/wiki/Black_rhinoceros#/media/File:Ngorongoro_Spitzmaulnashorn_edit1.jpg by Ikiwaner, edited by jjron – tilt correction]



African Wild Dog
Lycaon pictus

Red list status: Endangered

[Source: [https://en.wikipedia.org/wiki/African_wild_dog#/media/File:African_wild_dog_\(Lycaon_pictus_pictus\).jpg](https://en.wikipedia.org/wiki/African_wild_dog#/media/File:African_wild_dog_(Lycaon_pictus_pictus).jpg), by Charlesjsharp – Own work, from Sharp Photography, sharpphotography, CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=37060053>]



Large-eared free-tailed Bat
Otomops martiensseni

Red list status: Near threatened

[Source: <http://www.inaturalist.org/photos/735498> by Paul Webala]

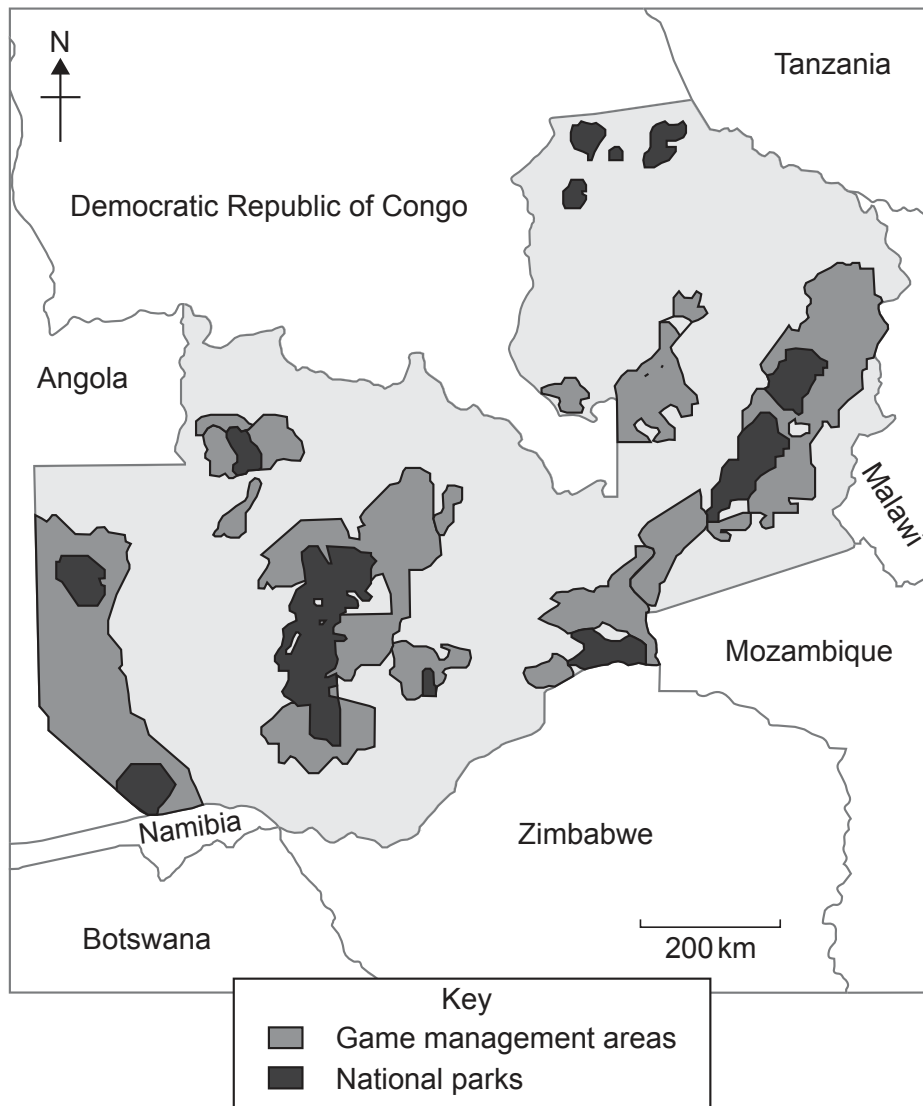


Ansell's Shrew
Crocidura ansellorum

Red list status: Endangered

[Source: <https://graduationprojectsaveanimals.wordpress.com/2011/05/18/ansells-shrew/>]

Figure 8(c): National parks and game management areas



[Source: adapted from Environment Council of Zambia, (2008), *Zambia Environment Outlook Report 3*]