M10/4/ENVSO/SP2/ENG/TZ0/XX/T

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ENVIRONMENTAL SYSTEMS AND SOCIETIES
STANDARD LEVEL
PAPER 2

Tuesday 18 May 2010 (morning)

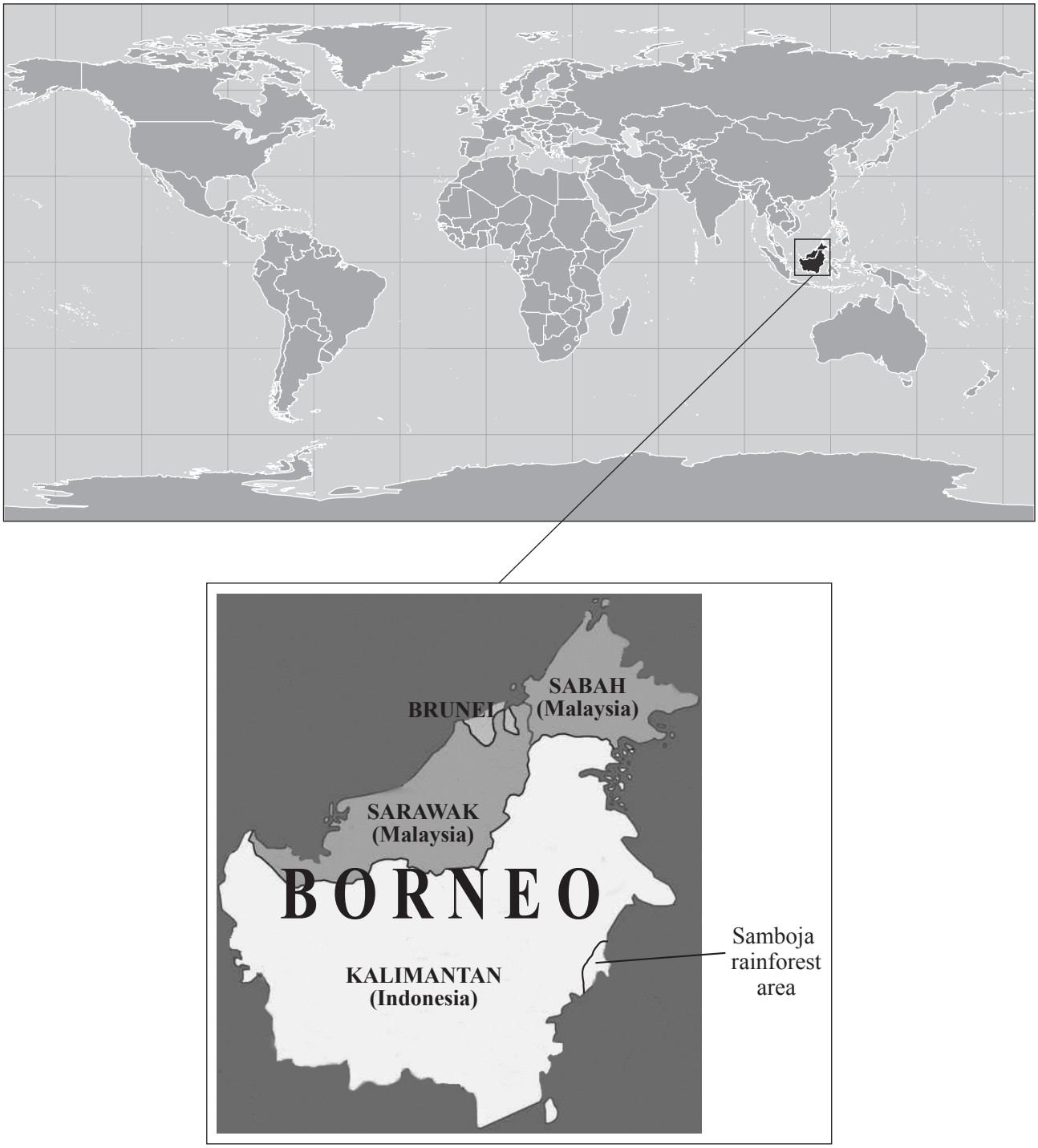
2 hours

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.

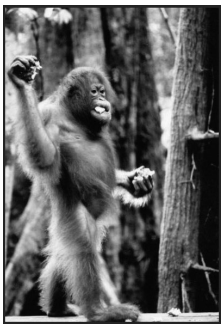
Figure 1 World map showing the location of Borneo



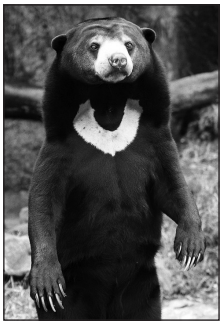
[Source: world map adapted from www.un.org/depts/cartographic/map/profile/world.pdf and Borneo map: reprinted with the permission of mongabay.com]

Figure 2 Fact file on Borneo

- third largest island on Earth
- land area of 743 000 km^2
- originally tropical rainforest with mangrove swamps and coral reefs on the coasts
- high species diversity – 15 000 plant species, 220 mammal species and 420 bird species
- many endemic species (those found nowhere else on Earth)
- rainforest commercially logged since 1980s for export markets
- current deforestation rate of 3.9 % per annum
- oil palm plantations now cover much of the island
- many species on the Red List, *e.g.* orangutan, Sun bear, Asian elephant and Sumatran rhino



Orangutan (*Pongo pygmaeus*)



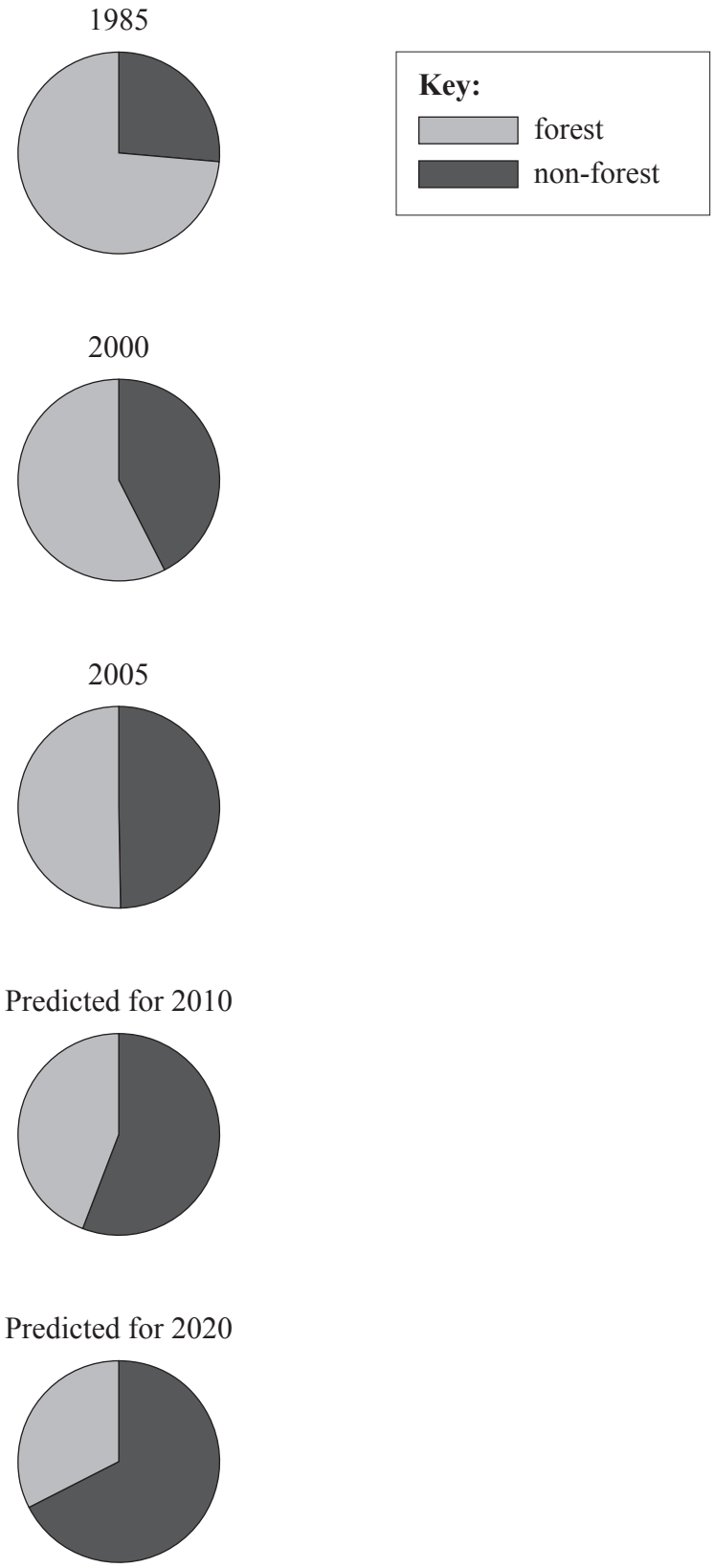
Sun bear (*Helarctos malayanus*)

Asian elephant (*Elephas maximus*)

Sumatran rhino (*Dicerorhinus sumatrensis*)

[Source: Orangutan – http://en.wikipedia.org/wiki/File:Orangutan.jpg,
Sun bear – Quantum Conservation e.V. Reprinted with permission,
Asian elephant – http://en.wikipedia.org/wiki/File:Asian_elephant_-_melbourne_zoo.jpg and
Sumatran rhino – "Emi" and 14-month-old son "Harapan" at the Cincinnati Zoo, by Charles W. Hardin.]

Figure 3 Loss of tropical rainforest in Borneo



[Source: Reprinted with the permission of mongabay.com]

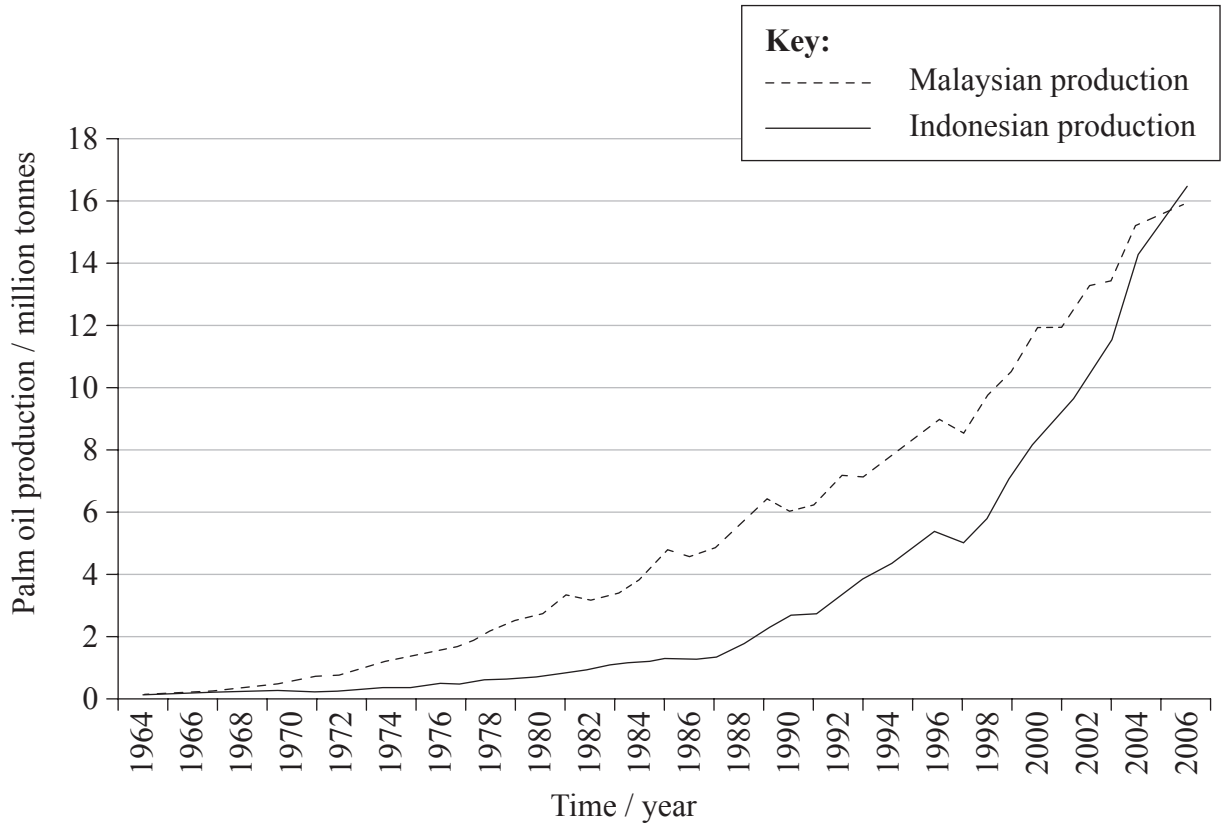
Figure 4 Deforestation and the carbon cycle

- global forest biomass contains 283 gigatonnes* of carbon (GtC)
- dead wood, litter and soil contain 520 GtC
- in the atmosphere there are approximately 750 GtC
- it is estimated that forests release 60 GtC per year into the atmosphere
- worldwide deforestation releases approximately 1.6 GtC per year (most in the tropics)
- some carbon is captured from the atmosphere when other crops are planted in the place of forests

* 1 gigatonne = 1 billion tonnes

Figure 5 Palm oil production

(a) Palm oil production in Malaysia and Indonesia



[Source: Reprinted with the permission of mongabay.com]

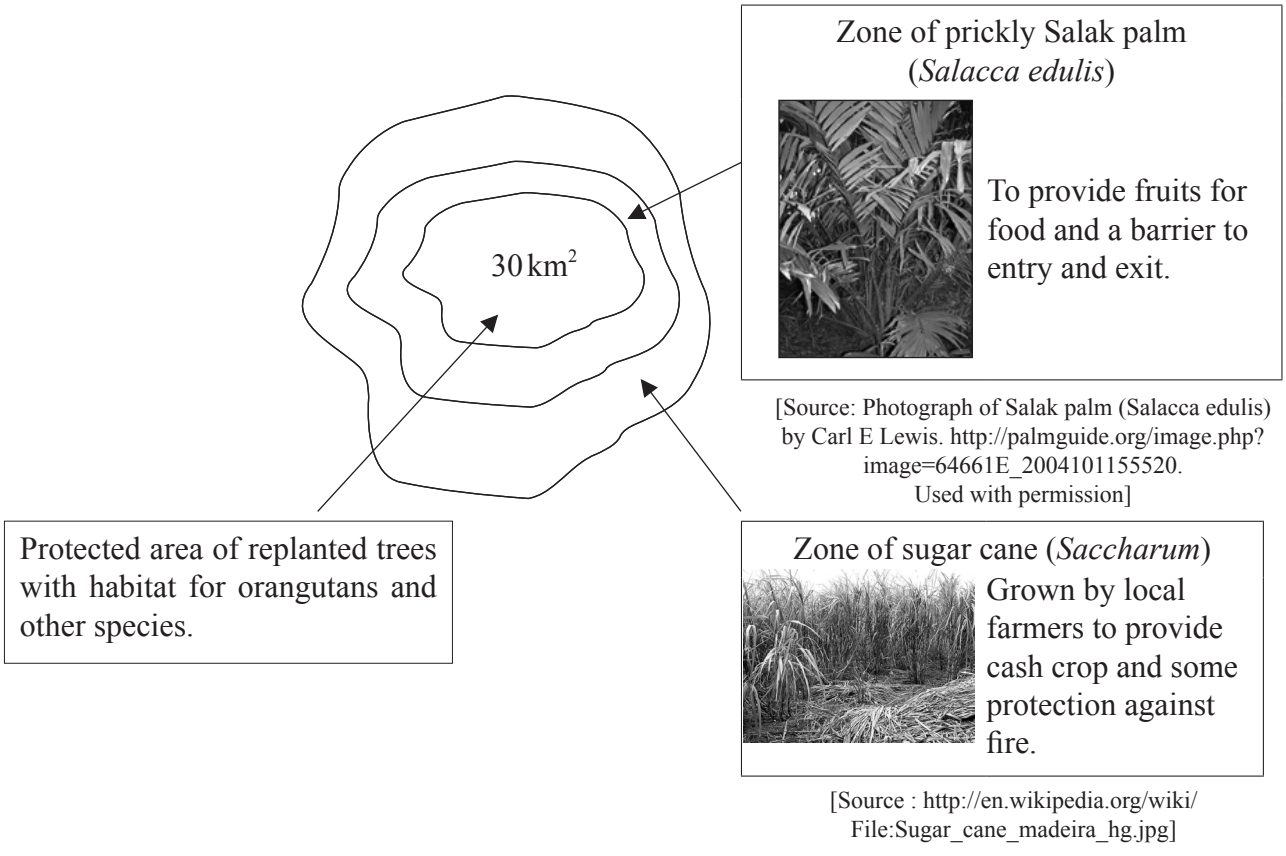
(b) Fact file on oil palms

- Oil palms are grown in plantations on land cleared of rainforest.
- One hectare of oil palm yields up to 5000 kilograms of crude palm oil.
- Palm oil is used as a food (in margarines, cooking oil, sauces, sweets (candies), ice creams, ready meals, biscuits and cakes) and is also used in the production of detergents and cosmetics. It replaces unhealthy trans fats in processed foods so its use is increasing dramatically.
- Palm oil can also be used as a biofuel.
- Most oil palm plantations are owned by the state or by transnational corporations.
- Malaysia and Indonesia produced 83 % of global palm oil in 2005.
- Oil palm plantations are monocultures which fragment the rainforest, blocking migration routes and removing habitats for animals.
- Insecticides and herbicides are used to control insect pests and weeds.
- Animals such as Asian elephants and orangutans that stray into the plantations may be illegally killed.

Figure 6 Fact file on Samboja

pre-1950s	The area around Samboja used to be primary tropical rainforest where many rare species lived, including orangutans.
1950	Deforestation began.
by 2000	The area was colonized by a tall grass called alang-alang (*Imperata cylindrica*) which outcompetes other plants and is of no benefit to the local people. Without the forest, temperatures rose, streams dried up, soil was eroded and crop harvests failed.
2001	The Borneo Orangutan Survival Foundation (BOS) cleared alang-alang and replanted trees in a special mixture made from sawdust, food waste, sugar, feces and cow urine. Local people were given land at the edge of this forest to plant crops (*e.g.* sugar cane, papaya, pineapples) for food and income, and BOS guaranteed to buy the fruit. These crops reduce competition from the alang-alang, provide shade and enrich the soil.
2009	Presence of 35 m high trees, cloud cover has increased by 12 %, rainfall has increased by 25 % and average temperatures are down by 3–5 °C. Thirty species of mammal including nine species of monkey and ape, and 116 species of birds have returned to the area.

Figure 7 Protected area at Samboja



[Source: Photograph of Salak palm (Salacca edulis) by Carl E Lewis. http://palmguide.org/image.php?image=64661E_2004101155520. Used with permission]

[Source : http://en.wikipedia.org/wiki/File:Sugar_cane_madeira_hg.jpg]

Figure 8 Umbrella species

[Source: © www.michaelpoliza.com]

Orangutans are considered an umbrella species in Borneo. The concept of umbrella species is used by conservationists. Umbrella species are selected for conservation because they are easily recognizable to the public and their survival may help the survival of other species that live in the same habitat.

Figure 9 Future developments

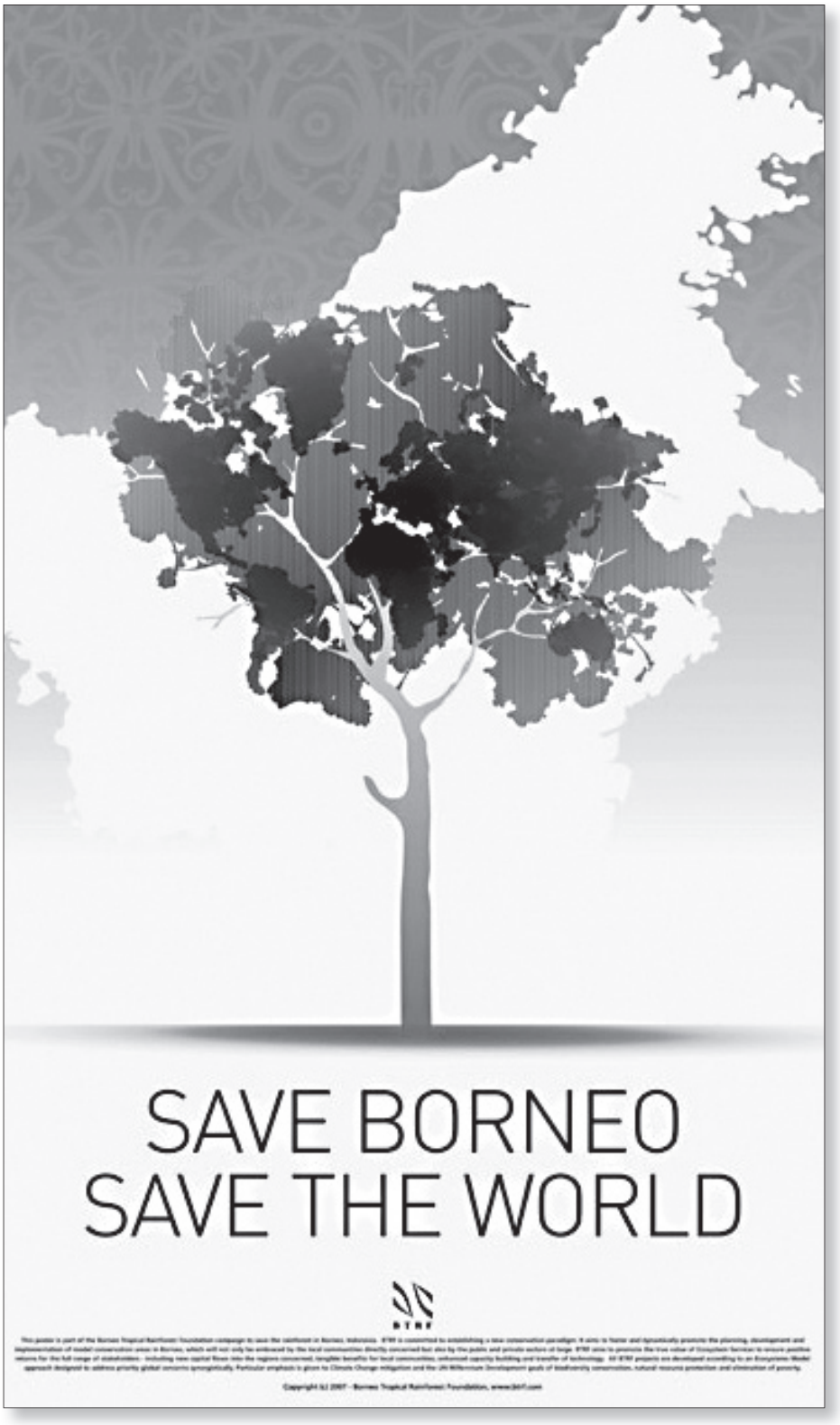
The World Wide Fund for Nature (WWF) is working with the nations of Borneo (Indonesia, Malaysia and Brunei) to conserve an area of 220 000 km^2 named the "Heart of Borneo", with protected areas, sustainably managed forests and cooperation across country borders.

Oil palm plantations could be cultivated in a way that is more sustainable, with wildlife corridors, preservation of riverbank ecosystems, using natural predators *e.g.* owls to catch rodent pests instead of chemicals and by reducing the use of herbicides.

The success of planting trees in Samboja could be repeated in other areas.

The Coalition for Rainforest Nations (ten countries led by Papua New Guinea and Costa Rica) has proposed that MEDCs should pay them to preserve their rainforests to benefit everyone.

Figure 10 Poster from the Borneo Tropical Rainforest Foundation



[Source: Courtesy of the Borneo Tropical Rainforest Foundation (BTRF)]