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**GLOBAL PERSPECTIVES AND RESEARCH**

**9239/12**

Paper 1 Written Examination

**May/June 2015**

**1 hour 30 minutes**

**RESOURCE BOOKLET**

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**READ THESE INSTRUCTIONS FIRST**

This Resource Booklet contains Documents 1 and 2 which you should use to answer the questions.

You should spend approximately 10 minutes reading the documents before attempting to answer the questions.  
This is allowed for within the time set for the examination.



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This document consists of **3** printed pages and **1** blank page.

The documents below consider the issue of biodiversity. Read them **both** in order to answer **all** the questions on the question paper.

**Document 1:** adapted from *A World without Coral Reefs*, by Professor Roger Bradbury published as an online news article in 2012. Professor Bradbury is a zoologist who leads a research programme at the Australian National University.

It's past time to tell the truth about the state of the world's coral reefs, the breeding grounds of tropical coastal fish stocks. Corals are made up of living skeletons that can only exist within a special range of temperature and acidity of the surrounding seawater. They have become zombie ecosystems, neither dead nor truly alive in any functional sense, and on the road to collapse within a human generation. Overfishing, ocean acidification and pollution are pushing coral reefs into oblivion. Each of those forces alone is fully capable of causing the global collapse of coral reefs; together, they assure it. The scientific evidence for this is compelling – there is no hope of saving the global coral reef ecosystem.

Overfishing can bring down reefs because fish are one of the key groups that hold reefs together. The University of British Columbia's detailed studies of the amount of fish caught, confirm that global fishing pressure is still accelerating even as the global fish catch is declining. Overfishing is already damaging reefs worldwide, and it is set to double and double again over the next few decades.

Ocean acidification can also bring down reefs because it affects the corals themselves. The oceans are acidifying as they absorb increasing amounts of carbon dioxide from the atmosphere.

We know less on the effects of pollution on coral reefs. We do know that nutrients, particularly nitrogenous ones, are increasing not only in coastal waters but also in the open ocean. This is accelerating. And we know that coral reefs just can't survive in nutrient-rich waters. We can say, less certainly than for overfishing or for ocean acidification, that unstoppable pollution will destroy reefs by mid-century.

This is not a story that gives me any pleasure to tell. But it needs to be told urgently and widely because it will be a disaster for the hundreds of millions of people in poor, tropical countries like Indonesia and the Philippines who depend on coral reefs for food. It will also threaten the tourism industry of rich countries with coral reefs, like the United States, Australia and Japan. Countries like Mexico and Thailand will have both their food security and tourism industries badly damaged.

We will be left with an algae-dominated, hard ocean bottom, as the remains of the limestone reefs slowly break up, with lots of microbe life soaking up the sun's energy by photosynthesis. There will be few fish but lots of jellyfish grazing on the microbes. It will be slimy and look a lot like the ecosystems of the Precambrian era, which ended more than 500 million years ago and well before fish evolved.

The scale and disastrous effects of the destruction of the coral reefs are why we need an enormous reallocation of research, government and environmental effort. This will help us to understand what has happened so we can respond the next time we face a disaster of this kind.

**Document 2:** adapted from *Scientists, diving industry to recover Republic of Indonesia (RI) coral reefs*, an article by Desi Nurhayati published in the *Jakarta Post*, Indonesia, in 2013. Desi Nurhayati is a journalist.

Marine scientists from several Non-Governmental Organisations (NGOs) are conducting joint efforts with dive operators to recover coral reefs in some areas in Indonesia affected by mass bleaching due to global warming. At a meeting they discussed the impact of coral bleaching which occurred at an alarming rate in 2009 and 2010. They attempted to learn from the episode to be ready for more bleaching in the future.

Coral bleaching occurs when coral loses its algae due to stressful conditions. The coral tissue becomes transparent, bleaching it white. Without the algae, the coral not only lose their colour, but also slowly starve to death. In 1998, the worst coral bleaching hit the Great Barrier Reef. The Caribbean area suffered a similar fate in 2005. In 2009, mass bleaching was recorded in Bali and a year later many famous dive sites in the Maldives, Thailand and Malaysia reported severe coral bleaching.

It has been predicted that future coral bleaching could be more severe and frequent as sea temperatures continue to rise significantly. A marine physicist from the National Oceanic and Atmospheric Administration said, "Ocean acidification has been more severe due to higher carbon emissions, which has weakened coral and exposed it to stressful conditions due to pollution and irresponsible human activities in the ocean."

"In some areas up to 90% of corals were reported to be bleaching and have gradually recovered," said Naneng Setiasih from the Coral Reef Alliance. She added, "This is encouraging news and means there is hope for the future."

Heidi Schuttenberg from the University of Aberdeen said bleaching had a negative impact on tourism, particularly divers' satisfaction with reef conditions and marine life. Schuttenberg said, "However, there are factors that operators can control to maintain diver satisfaction, price and information. Divers prefer operators that are engaged in reef management and who are environmentally-friendly." She explained what could be done to respond to coral bleaching and climate change, including implementing effective responses by raising awareness, supporting coral survival, collecting information to improve management, identifying naturally resilient areas and incorporating these into management priorities.

Research was conducted by Queensland University on the economic value of scuba diving and the impact of bleaching in Indonesia, Malaysia and Thailand. The research stated in 2010 that, "Diving brings substantial economic benefits to economies – as much as 14.5 billion Indonesian Rupiah (US\$ 1,276,000) a year, and the total cost of bleaching to the region is likely to have been over 1.1 billion Indonesian Rupiah (US\$ 96,800)."

It is obvious that coral reefs are facing many threats globally and locally. However, most of these problems are caused and therefore can be solved by humans. The diving industry is ready to help by recording bleaching incidents and actively reporting to the authorities and NGOs responsible for monitoring coral. In this way perhaps they can help to reverse some of the damage done through their own activities by getting specialized help to the reefs sooner.

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