

# Our environment

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**TASK 1:** Read the following article carefully. As you read, complete the KWL chart.

**B**ASED on the World Meteorological Organisation annual report in 2015, the occurrences of droughts, heat waves, floods and tropical storms two years ago were caused by the change in global climate. These phenomena have resulted in the loss of human and animal lives as well as destruction of property. The report also showed an increase in atmospheric and sea temperatures, sea levels and greenhouse gases as well as extreme weather conditions.

Although there was an increase of only a 2°C in the Earth's temperature between 1950 and 2000, it was enough to adversely impact the Arctic area surrounding the North Pole and Antarctica surrounding the South Pole. Therefore, understanding and predicting how climate will change over the next century is of vital importance to both the economy and society.

Scientists know that climate varies naturally on many time scales and that people are affecting climate, particularly through emissions of greenhouse gases. According to scientific research by foreign scientists, Malaysia has a tropical rainforest climate which is the main gateway for reactive gases to get into the atmospheric layer. This will subsequently contribute to the rise of temperature in Europe, Asia and even the Antarctica. The greenhouse gases released into the troposphere and stratosphere will affect the ozone layer leading to global warming. Hence, the importance of climate change study.

Universiti Kebangsaan Malaysia's Space Science Centre (ANGKASA) head Professor Dr Mardina Abdullah said it is important for researchers and scientists to go on more scientific expeditions especially in the Antarctica for many reasons. One of them is the space weather effect which is almost similar over the equatorial and polar region.

"Atmospheric irregularities over these regions will disturb radio signals such as GPS signals. This occurs especially during night time over the polar and equatorial areas. This error should be mitigated as recently many flights that use GPS for navigation travelled over the polar region, for example, the North Pole," she said.

Another reason why the Antarctica is important is because of the global effects on sea water. Sea levels are rising and global weather patterns are all determined from the Antarctica.

This region is experiencing the fastest degree of increase in environmental temperature, and studying these effects will provide a greater understanding of how microbial ecosystems will be affected in the not too distant future.

ANGKASA fellow researcher Associate Professor Dr Wayan Suparta said many discoveries in Antarctica, especially research on climate change that correlates with the weather and climate in Malaysia, have been made by Malaysian scientists.

"That alone answers the question why we do research in Antarctica. If there are no correlations between Malaysia and the Antarctica, what is the point of researching those areas?" he asked.

Researchers from around the world travel to the Antarctica to study the effects of global climate change. Situated in the southern hemisphere, the continent is regarded as an open laboratory to all. The Antarctica is the coldest, driest and windiest continent in the world and 98 per cent covered in ice that can go as cold as -89°C.

If all the ice blocks there were to melt, it is believed that the world's sea water level would rise about 70 metres.



UKM deputy vice-chancellor (research and innovation) Professor Dr Mohd Ekhwani Tariman said that the Antarctica is a privileged position and a unique laboratory for the sciences, which provides boundary conditions for understanding changes in ocean circulation flow to the space phenomena that can affect communications systems.

"Climate change is the most daunting collective challenge that humanity has ever faced. The Antarctica is still a mystery. Many events occur suddenly and cannot be explained scientifically, such as why the collapse of a glacier causes a cloudy atmosphere.

"Our climate is the engine for life support systems that sustain and nurture us all. How do we deal with global climate change? Will limiting carbon technologies and industries, and intelligent approaches reduce global warming emissions?"

Mohd Ekhwani believes the Malaysian Antarctic Research Programme (MARP), run by the National Antarctic Research Centre (NARC), can help to formulate a strategic plan to best address the issues of climate change. The programme is also capable of explaining the benefits of doing research in the Antarctica to support the needs of the country and provide a strong motivation to the people in building scientific capacity. Nearly 5,000 researchers from all over the world go to the Antarctica every year to explore the mysteries of the continent.

Malaysia has been an active member for research in the Antarctica under the Sultan Mizan Antarctica Research Foundation (YPASM), MARP

and public universities such as UKM and Universiti Teknologi MARA. During the Eighth Malaysia Plan, 38 Malaysian scientists were sent for 18 scientific expeditions to the Antarctica.

ANGKASA, under the Institute of Climate Change at UKM, has been actively involved in the research expeditions to the Antarctica and Arctic. Three scientists conducted research in the Antarctica under MARP, YPASM and UKM research grants. They are Wayan Suparta (2003, 2008, 2009 and 2013) under MARP, Professor Dr Norbahiah Miaran (2007) under MARP and Dr Mohd Shahrul Mohd Nadzir (2016) under YPASM. In addition to the Antarctica, Mardina and Wayan conducted polar research in the Arctic, Iceland (64 degrees North) in 2008 and 2013 under a UKM research grant. Wayan successfully carried out his scientific expedition to Carlini Base, the Antarctica from Jan 12 to March 5 this year.

"I installed space meteorology sensors with the purpose of studying the coupling process between the upper and lower levels of the atmosphere through thunderstorm activity. During the expedition, lightning strikes were detected above the Earth's surface. Lightning has been detected for the first time in the Antarctic Peninsula which refutes the classic hypothesis that there is no such thing there. I was there for 10 months during summer (December, January and February) with an average temperature of -3°C. I had the most memorable experiences while conducting research there, and I almost got killed by skuas (seabirds) but I managed

to dunk my head into the ice. Due to bad weather, I also slipped and fell off a roof while installing a meteorology sensor. But my I am standing tall, full of hope and energy to continue my research," he said.

Wayan held a talk on his scientific Antarctic Expedition at The Summer Campaign 2016/2017 organised by the Institute of Climate Change in UKM recently. The expedition is supported by the Dirección del Antártico Argentino - Instituto Antártico Argentina, NARC through the Ministry of Science, Technology and Innovation, Malaysia. The Ministry through NARC has funded RM1 million for Wayan to conduct research in Antarctica.

"The purpose of the Antarctica expedition is to develop science and space-building. We have been doing research in Antarctica for years and our findings are comparable or on par with those by international scientists. Research can be done with support from the government and sustainable funding."

Since 2003, Wayan has been conducting research in Antarctica to collect data and reset the GPS equipment to improve the quality of data, assist the maintenance of an automatic weather system, and identify all the GPS sites position for installation. His first research station was at Scott Base Antarctica in December 2002 and later in the Arctic in 2008 where he installed a GPS antenna and meteorological sensors in Iceland. Wayan has been an associate professor at ANGKASA since April 2012. Prior to this, he was a senior lecturer

(July 2008 - March 2012) and post-doctoral fellow (2007-2008). His research interests include GPS Meteorology applications, aerospace sciences, communications (remote sensing), Artificial Neural Network applications and space meteorology.

ANGKASA researcher Dr Mohd Shahrul Mohd Nadzir went to the Antarctica last year to study how greenhouse gases affect global climate due to their ozone-thinning effects. He uses the portable Gas Chromatograph to obtain samples of greenhouse gases released in the Antarctica to be compared with those released in Malaysia.

The joint research between UKM and the University of Cambridge, United Kingdom saw the use of the Gas Chromatograph, specially designed by Dr Andrew Robinson of Cambridge, in greenhouse gases research in Malaysia since 2004.

The machine was placed in five locations - Kelantan, Sabah, Taiwan, Australia and New Zealand.

Mohd Shahrul, 33, said Arctic ozone holes found in 1972 made the polar region one of the most important locations for the study of the atmosphere's ozone layers.

"The thinning ozone causes ultraviolet rays to penetrate through to Earth and melt the ice in the Antarctica, eventually leading to a rise in sea levels.

"If radical climate change continues to take place for the next 10 to 20 years, the Maldives may be submerged.

"This is due to several factors such as the monsoon winds and the year-long hot and humid weather which causes the convection process of active gases to quickly reach the atmosphere," said Mohd Shahrul, who is also head of the Tropical Climate Change System Centre at the Institute of Climate Change.

Wayan said, "For research to thrive in the Antarctica, we must have a policy which includes a yearly budget and an act of parliament. Malaysia also contributes to global warming and studies need to be done to minimise the effect. I believe in the next 50 years, the Antarctica will be occupied by human beings as it has minerals, oil, stone and, of course, water."

Five years down the road, Mardina hopes that ANGKASA will be a Higher Institutions' Centre of Excellence referred to by local and international researchers.

"Advances in space science and technology are important to be a developed country. We also want more research collaborations and networking for emerging research in space science and technology, and continue frontier research for humankind in line with UKM's Guardian of the Nation spirit.

"Perhaps, in another 10 years, we will be the National Research Centre," she added.

"We also hope for continuous funding to maintain equipment at the Antarctica (Scott Base) and Iceland because we have no budget for repairs.

"Most younger local researchers do not want to research space science, especially over the polar region. It is quite difficult to establish a network with international collaborators to gain their confidence," she said, adding that the country is far behind Indonesia and India in terms of polar research.

ANGKASA hopes to continue its collaboration on Iceland research with the Science Institute University of Iceland and National Institute of Polar Research, Japan.

Source: <https://www.nst.com.my/education/2015/05/244413/call-antarctica>