The Star

Extremities in store

By TAN CHENG LI

Get ready for a warmer Malaysia.

WHAT will a warmer world mean for Malaysia? *StarTwo* speaks to Dr Fredolin Tangang, professor and head of the Research Centre for Tropical Climate Change System (IKLIM) at Universiti Kebangsaan Malaysia. The climatology and physical oceanography specialist is a member of the Intergovernmental Panel on Climate Change (IPCC, a global group of scientists studying the global warming phenomenon), where he is a vice-chair of Working Group I (which looks into the science of climate change).

StarTwo: **Have our monthly and annual mean temperatures shown an increasing trend?**

Flood woes: Water inundated this sundry shop in Alor Star, Kedah, when the nearby Anak Bukit River broke its banks recently. Heavy rains and dry spells will characterise our weather in future.

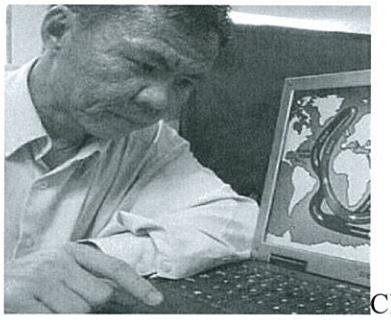
Dr Fredolin Tangang: The temperature in most regions in Malaysia has been steadily increasing for the last 40 years, consistent with the global increase. Depending on the locations, the temperature hikes range from 0.5°C to 1.5°C. In big cities like Kuala Lumpur, the rate of increase has been much higher than the global average due to factors such as the heat island effect that is caused by rapid urbanisation. For Kuala Lumpur, the temperature has risen 0.4°C each decade in the last 40 years.

What climatic changes are projected for Malaysia in the future?

By mid-21st century, the mean temperature in Malaysia is projected to be 1°C to 3°C warmer than the present and by the end of the century, 2°C to 5°C warmer, depending on the scenario.

Based on the current concentration of carbon dioxide, a 2°C warming is almost certain by the end of the century if the world is not committed to stabilise CO2 emissions. In fact the 2°C threshold might come earlier if the current rate of emission continues. This is a threshold where interactions within the climate system might accelerate the warming further and initiate a climate "tipping point" where climatic conditions become irreversible.

The IPCC projection for the region indicates that Peninsular Malaysia will see drier north-east monsoons and wetter south-west monsoons by the end of the century. These projections were based on low-resolution climate models.

 Climatology and physical oceanography specialist Dr Fredolin Tangang says that temperatures in this country will hike from 0.5°C to 1.5°C depending on location.

Our group at UKM is currently doing high-resolution projection of various models. The research will provide a better picture of how rainfall and weather patterns over Malaysia will be affected by climate change.

What kind of weather patterns are projected for Malaysia?

In general, IPCC results tend to show that extreme events such as droughts, floods and heat waves will become more frequent in future. However, these vary from region to region. The latest research (based on low-resolution global general circulation models) projected that the characteristics of droughts in the South-East Asia region in the 21st century will not change significantly compared to the 20th century, but will intensify in south-western Australia, western United States, northern Africa and the Mediterranean. However, the result of this study has yet to be assessed by the IPCC.

Is Malaysia already suffering the effects of global warming? Can the recent spate in extreme weather events be linked to global warming?

There has not been a concrete study looking at long-term changes of various weather events such as thunderstorms, strong winds and water spouts in Malaysia. This is partly due to a lack of long-term records. However, our research shows that for the last 40 years, winds over the South China Sea have strengthened. This will have an implication on Malaysia as it will mean higher waves in the sea.

The characteristics of extreme weather over the South China Sea have also changed over the last 40 years. These changes could have resulted in more flooding in the east coast of Peninsular Malaysia. Coupled with sea level rise, which is higher over this region as indicated in the IPCC Fourth Assessment Report (AR4), we might face serious erosion and loss of coastal land. In fact, serious erosion is already visible in our beaches, especially in the eastern coast of the peninsula and the west coast of Sabah and Sarawak.

In the next few decades, coastal erosion might worsen as sea level rise is expected to accelerate due to rapid melting of ice cover in the Arctic, Greenland and Antarctica. The latest scientific findings indicate that the AR4 projection of a 0.6m increase in global sea level by the end of the century was under-

estimated, due to limited understanding of ice melts in the region. The reasonable projection should be more than 1m. So, several locations in Malaysia might face serious coastal erosion and sea level rise in decades to come.

Detection and attribution of climate change signal in local impacts are not easy as the changes can be influenced by other factors, for instance, land use. Hence, investigation of the impact of climate change on local ecosystems, fauna and flora is not straightforward. In fact, there have not been much studies or long-term record of ecosystem changes that can be used to detect the impact of climate change in Malaysia.

However, temperatures in the Indian Ocean and South China Sea have been warming at a rate higher than other oceans. This could have an impact on fragile marine ecosystems like coral reefs.

How will the climatic changes affect our landscape, vegetation and ecosystems?Ecosystems, flora, fauna and hydrology might be affected by changes in temperature and rainfall pattern. More research is needed to understand how ecosystems in the tropical region can be affected by climate change.

What steps can we take to adapt to the projected climatic changes?Malaysia is a small developing country and our net emission of greenhouse gases is considered small given the large sinks in our natural forests. However, we can be badly affected by climate change if we don't strategically plan adaptation measures.

Before we identify and implement any adaptation measures, we must have thorough knowledge on the risks of climate change for various important sectors. This requires high-resolution modelling and understanding of climate systems that govern the mean and climate variability in the region. With ongoing research, we'll have better local and regional climate change projection in the next two to three years.

Impact studies can be formulated to understand the impact of climate change on various sectors including health, food, coastlines, ecosystems and water resources. Once we have identified the risks, we can plan for feasible adaptation strategies. For example, in the food sector, increasing temperature can affect our ability to grow crops such as rice and oil palm. To adapt to a warmer environment, we need to come up with new heat-tolerant varieties. If we know sea level rise and coastal erosion can be a problem in the future, we might need to have a policy that limits coastal development.