



# HONG KONG METEOROLOGICAL SOCIETY

## Statement on Climate Change

(February 2023)

### 1 Scientific Evidence

1.1 The Hong Kong Meteorological Society acknowledges the overwhelming evidence that anthropogenic greenhouse gas emissions have led to warming of the earth. According to the Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC) of the United Nations, it is unequivocal that human influence has warmed the atmosphere, ocean and land. Furthermore, the Society draws the urgent attention of all that climate change has become a global crisis and emergency.

1.2 The Paris Agreement set a goal to limit global warming to well below 2°C, preferably to 1.5°C, compared to pre-industrial levels. Yet, the global mean temperature in 2022 has risen to about 1.15°C above the pre-industrial level. The World Meteorological Organization indicated in 2022 that there is a 50:50 chance of the annual average global temperature temporarily reaching 1.5°C above the pre-industrial level for at least one of the five years between 2022 and 2026. Given the current policies of parties to the Paris Agreement, the annual average global temperature is currently heading towards a rise of 2.5 to 3°C by the end of this century.

1.3 Based on AR6, the globally averaged precipitation over land has likely increased since 1950, with a faster rate of increase since the 1980s. Human influence is also very likely the main driver of the global retreat of glaciers and the decrease in Arctic sea ice area. The rate of rise of global mean sea level has also almost tripled, from 1.3 mm/yr during 1901-1971 to 3.7 mm/yr during 2006-2018. Extreme weather events have become more frequent around the world.

## 2 Climate Change Impacts

2.1 **Hot extremes:** It is virtually certain that hot extremes (including heatwaves) have become more frequent and more intense across most land regions since 1950s. The world has seen record high temperatures in many places in recent years. For instance, in January 2022, the Australian town, Onslow, registered 50.7°C, matching the highest figure on record in Australia. In July 2022, the temperature in Portugal hit 47°C. In June 2020, the Siberian town of Verkhoyansk also registered a high of 38°C, which was unprecedented in the Arctic region. In Hong Kong, the monthly mean temperature at the Hong Kong Observatory headquarters of 30.3°C in July 2022 became the highest ever on record for any month since record began in 1884. There were 10 days in that month with a maximum temperature at the Hong Kong Observatory headquarters exceeding 35.0°C, while the normal figure is only 0.8 day/yr for the period 1991-2020. The increase in the number of hot nights (days with a minimum temperature of 28°C or above) and very hot days (days with a maximum temperature of 33°C or above) in Hong Kong in the past century or so is equally alarming. In 1885-1914, the average number of hot nights and very hot days in Hong Kong were 0.6 days/yr and 2.2 days/yr respectively. The figures soared to 52 days and 52 days respectively in 2022.

2.2 **Heavy precipitation:** Global warming increases the frequency and intensity of heavy precipitation events, bringing more flooding, landslides as well as other severe weather phenomena such as hailstorm, tornado and waterspout. A recent heavy precipitation case occurred in Pakistan in the summer of 2022, during which one third of its land was inundated, causing tens of millions of people homeless and claiming thousands of lives. In Hong Kong, October 2021 was unseasonably wetter than usual with the monthly rainfall amounted to 631.1 mm, more than five times of the normal figure of 120.2 mm. During the passage of late-season Tropical Cyclone Lionrock on 8 October 2021, the Hong Kong Observatory registered 329.7 mm of rain, more than twice of the October's monthly total normal figure of 120.3 mm and the highest daily rainfall on record for October. The heavy downpour on that day caused serious flooding to some places in Hong Kong.

2.3 **Drought:** Climate change alters water availability, exacerbating the spatial and temporal imbalance of water distribution and making it scarcer in some areas, which will also be exacerbated by population growth. Water shortage leads to an increased risk of agricultural droughts affecting crops and increased vulnerability of ecosystems. Drought can also increase the occurrence of destructive sand and dust storms. The drought in Europe in August 2022 caused severe impacts on the energy sector for both

hydropower generation and cooling systems of other power plants. The low river flow in German's Rhine has affected commercial navigation and transport of coal and oil. Hong Kong is not immune from drought. According to climate projection, the possibility of extremely dry years still exists for the rest of the century.

**2.4 Sea level rise:** Another notable impact of the warming earth is the rise of global mean sea level, which is caused by thermal expansion of the oceans by warming, retreat of glaciers and collapse of ice sheets in Antarctica and Greenland. In Hong Kong, tide gauge records in the Victoria Harbour show considerable rise in the mean sea level at an average rate of 31 mm per decade during 1954-2021. According to AR6, it is virtually certain the global mean sea level will continue to rise over the 21st century. In the long term, sea level is committed to rise for centuries to millennia due to continuing deep-ocean warming and ice-sheet melting. Rising sea level poses increasing threat of flooding to low-lying coastal areas, particularly at time with storm surges brought by tropical cyclones. The collapse of ice sheets in Antarctica is subject to close monitoring and active researches as this could lead to much larger sea level rise than currently projected.

**2.5 More intense tropical cyclones:** With global warming, the proportion of intense tropical cyclones is projected to increase, which will lead to increasing threats from storm surges. In 2013, Super Typhoon Haiyan slashed across central Philippines, causing widespread flooding and bringing huge waves to coastal regions, resulting in landslides, collapsing of houses, uprooting of trees, power failure and disruption in sea and air traffic. Over 6,000 people were killed, around 1,800 people were reported missing, with 28,000 people injured. Here in Hong Kong, the storm surge brought by Super Typhoon Mangkhut in 2018 caused the water level in the Victoria Harbour to peak at 3.88 m above Chart Datum, the return period of which is about 50-100 years at the present day. Under the very high emissions scenario in AR6, the return period of such an extreme sea level brought about by a typhoon of similar intensity to Mangkhut is expected to be greatly shortened to less than 5 years by the end of this century.

**2.6** Other than the above impacts on physical environment, climate change will also impact on human society and ecosystem. Here are some examples of secondary or tertiary impacts of climate change:

2.7 **Health risk:** Extreme heat conditions compromise human body's ability to regulate temperature and can also result in a cascade of illnesses, including heat cramps, heat exhaustion, heatstroke and hyperthermia, and increased death rates associated with respiratory and cardiovascular diseases while overall hotter conditions lead to higher incidences of food poisoning, diarrhea, cholera etc. and the spread of vector-borne diseases.

2.8 **Wildfire:** High temperature exacerbates wildfires. The Australia Black Summer fires (2019–20) have burnt almost 19 million hectares of land, causing massive devastation to human settlements, wildlife, ecosystems and the environment.

2.9 **Loss of species:** Climate change poses risks to the survival of species on land and in the ocean. One million species out of 1.2 million known species are at risk of becoming extinct within the next few decades. Projected climate change, combined with non-climatic drivers, will cause loss and degradation of much of the world's forest, coral reefs and low-lying coastal wetlands.

2.10 **Food shortage:** Climate change and increases in extreme weather events cause a global rise in hunger and poor nutrition. Fisheries, crops and livestock may be destroyed or become less productive. As the ocean becomes more acidic owing to higher concentration of carbon dioxide, marine resources that feed billions of people are at risk. Heat stress can diminish water and grasslands for grazing, hunting and fishing, causing declining crop yields and affecting livestock.

2.11 **Poverty and displacement:** Floods may sweep away urban slums, destroying homes and livelihoods. Water scarcity may affect crops. Climate change increases the factors that put and keep people in poverty and force people to leave their homeland.

### 3 Need for urgent global response and local action

3.1 At COP27, the Secretary-General of the United Nations highlighted that *“Human activity is the cause of the climate problem. So human action must be the solution. ... The science is clear: any hope of limiting temperature rise to 1.5 degrees means achieving global net zero emissions by 2050.”*

3.2 The World Economic Forum 2023 ranked “Failure to mitigate climate change”, “Failure of climate-change adaptation” and “Natural disasters and extreme weather events” as the top three most severe global risks in the next ten years.

3.3 To reverse the course of global warming, we need urgent globally coordinated mitigation efforts to substantially reduce greenhouse gas emissions, achieving net negative carbon emissions in the latter half of this Century. Hong Kong must endeavour to achieve carbon neutrality by mid-century and furthermore to achieve negative carbon emission thereafter according to the Climate Action Plan 2050. All members of the public must join efforts now to achieve energy saving, green transport and waste reduction. Further efforts must be devoted to raising the public’s awareness and understanding on climate change and its impacts, and preparedness for disasters brought by extreme weather. Even after achieving carbon neutrality, the impacts of climate change may likely last for centuries or even millennia. Public education for all generations must continue to ensure sustainable development in many decades to come in spite of climate change.

3.4 Governments, businesses and communities around the world should immediately put in place adaptation and resilience measures to alleviate the negative impacts of the climate change that has occurred and further climate change projected to happen on our livelihood and health, our infrastructure, our ecosystem, our food system of this generation and the next and further on the survival of the human race. Scientific institutions should continue efforts to enhance our understanding on climate change and to research into measures to effectively address the climate crisis. In Hong Kong, a coherent disaster preparedness strategy should be developed, covering physical infrastructures, food, water and energy security, health and social welfare aspects, the transition risks involved as fossil fuel is decommissioned and replaced by innovative energy sources, and any other climate risks to be identified.

## **4 Pledge of the Hong Kong Meteorological Society**

4.1 The Hong Kong Meteorological Society will spare no efforts to inform the society on the climate science supporting the mitigation, adaptation and resilience actions, in particular, to promote awareness and understanding on climate change and its impacts among the public, particularly the younger generation. These efforts include:

- offering professional advice to the government, stakeholders and the community;
- organising climate change dialogues, public educational talks, seminars and outreach activities;
- publishing articles on climate change in its monthly newsletters and yearly bulletin “Converging Divergence”;
- promoting climate change among young scientists and students through awards of the Society.

4.2 The Hong Kong Meteorological Society welcomes opportunities to join force with other institutions and stakeholders on local and regional collaborative efforts related to climate change.

## References

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- [2] WMO, 2022: WMO update: [50:50 chance of global temperature temporarily reaching 1.5°C threshold in next five years.](#)
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- [4] United Nations: [Causes and Effects of Climate Change.](#)
- [5] [Secretary-General’s remarks to High-Level opening of COP27.](#)
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- [9] HKO, 2022, [Climate Change in Hong Kong.](#)
- [10] World Economic Forum, 2023, [“Global Risks Report 2023”](#).