

2021



INTRODUCTION

The three main objectives of the Hong Kong Observatory (the Observatory) are:

- (1) to provide weather forecasts and warnings to meet the public's demand for weather services, and to provide weather services for aviation and shipping in accordance with international standards;
- (2) to monitor local environmental radiation levels and impacts, and to advise the Government on counter-measures that may be necessary during nuclear emergencies; and
- (3) to maintain the Hong Kong time standard and to provide geophysical, oceanographic, astronomical and climatological information and consultative services to the public and business sectors.

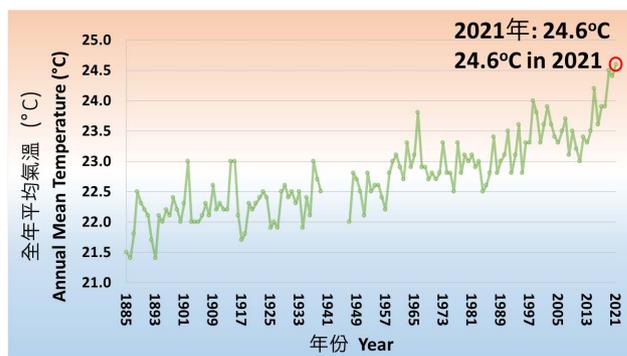
During the financial year 2021-22, the department's total expenditure was \$393.8 million and the total revenue was \$142.3 million. As at 31 March 2022, the department had an establishment of 364 posts.

The Year's Weather 2021



The year 2021 was the warmest year in Hong Kong since records began in 1884, with an annual mean temperature of 24.6 degrees Celsius, 1.1 degrees above the 1991-2020 normal (or 1.3 degrees above the 1981-2010 normal). The mean temperatures of March, May and September were 22.0 degrees, 29.0 degrees and 29.7 degrees respectively, all of which were the highest on record for the month. The total annual rainfall of 2,307.1 mm was about 5% below normal (or about 4% below the 1981-2010 normal).

The highest temperature recorded at the Observatory in the year was 36.1 degrees on 23 May, one of the third highest on record. The yearly total of 54 Very Hot Days and 61 Hot Nights were the highest on record. The lowest temperature recorded at the Observatory in the year was 7.7 degrees on 8 January. The number of Cold Days in the year was 13 days, which is 2.2 days less than the normal (or 4.1 days less than the 1981-2010 normal).



Long-term time series of annual mean temperature in Hong Kong (1885-2021)

Eight tropical cyclones affected Hong Kong in 2021. In October, the Observatory issued No. 8 Gale or Storm Signals for Tropical Storm Lionrock and Typhoon Kompasu with only 60 hours 40 minutes apart, the shortest record since 1946. Also, during the approach of Tropical Cyclone Rai, the Observatory issued No. 1 Standby Signal on 20 December, which was the latest tropical cyclone warning signal issued in a year since 1946.

WEATHER SERVICES

WEATHER SERVICES, MESSAGE DELIVERY AND SOCIAL MEDIA



Local Weather Reports Disseminated Within the First 10 Minutes of Each Hour
100%



Total No. of Page Views of the Observatory Websites and Mobile App MyObservatory
142 Billion



No. of Followers of the Observatory's Facebook Page
> 270,000



No. of Followers of the Observatory's Instagram Account
> 49,000



Forecast Accuracy as Verified by Objective Means
93%



Calls Handled by the Dial-a-Weather Service
5.1 Million



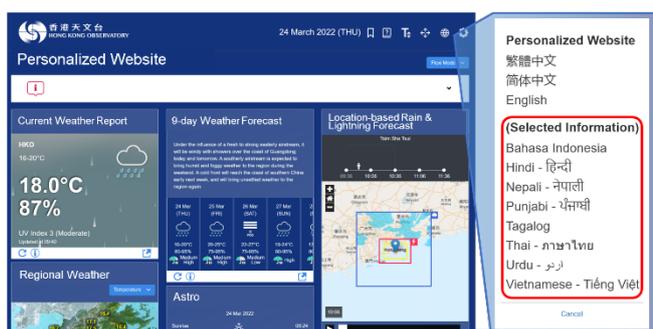
Total Accumulated Views of the Observatory's YouTube Channel
5.6 Million

The Observatory provides weather forecasts and warnings to the public, special users, the shipping and aviation communities to reduce loss of life and damage to property, and to minimise disruption to economic and social activities during hazardous weather.

In 2021, the Observatory fulfilled its performance pledge of issuing at least one weather bulletin every hour of the day, disseminating 100% of the bulletins within 10 minutes after each hour, and attained a forecast accuracy (as verified by objective means) of 93%.

Weather information was enhanced in 2021-22 to meet the needs of the public through:

- Launching a new personalised website to provide basic weather information in eight ethnic minority languages, namely Hindi, Bahasa Indonesia, Nepali, Urdu, Tagalog, Thai, Punjabi and Vietnamese;



New personalised website available in eight ethnic minority languages

- Enhancing the “Announcement on Localised Heavy Rain” service by launching the new “Localised Heavy Rain Advisory” service to provide earlier alerts of localised heavy rain to members of the public;
- Enriching the Observatory’s mobile weather application “MyObservatory” by providing more weather information including probability of significant rain and weather information for outdoor photography;

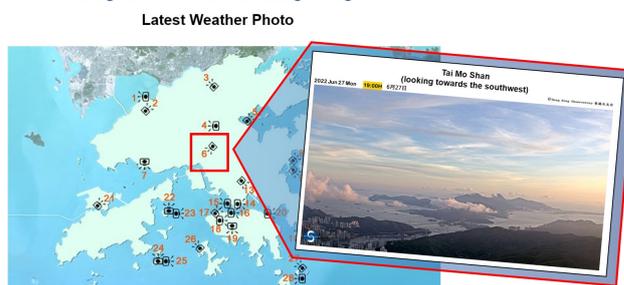
- Introducing a new crowdsourcing feature “My Weather Observation” to mobile application “MyObservatory” which enables users to report and share weather information; and



The new crowdsourcing feature “My Weather Observation” added to “MyObservatory”

- Enriching the “Regional Weather” webpage with weather photos from Tai Mo Shan and Sai Kung. The camera at Tai Mo Shan faces the southwest, overlooking the vicinity of Tsing Yi, Ma Wan and Lantau Island.

Regional Weather in Hong Kong



Weather photos can be accessed through the “Latest Weather Photo” webpage, mobile weather application “MyObservatory”, etc.

In 2021, total number of page views of the Observatory websites and mobile weather application “MyObservatory” reached about 142 billion. Users can receive weather warnings and news through the Observatory’s Facebook, Twitter, Weibo and WeChat. The Observatory’s YouTube channel accumulated a yearly total of around 5.6 million views. PC users can install the “Weather Wizard” desktop application to obtain the latest weather information. A personalised website that allows users to customise the information they receive is also available. The Dial-a-Weather service (187 8200) handled a total of around 5.1 million calls during the year. The Observatory’s internet time service drew a record high of more than 91 billion visits in 2021.

Professional meteorologists of the Observatory produced and hosted television weather programmes for broadcast through major television channels in the morning and evening. The broadcast of weather program and educational feature “Cool Met Stuff” continued on television, YouTube, Facebook and the “MyObservatory” mobile application.

During the year, the Observatory continued to enhance communication and engagement with the public through social media, including crowdsourcing materials from the public for preparing social media contents. The Observatory’s Facebook page and Instagram account attracted over 270,000 and 49,000 followers respectively by the end of 2021.

The Observatory’s internet time service **drew a record** high of more than **91 billion** visits



In 2021, a total of 64 government bureaux, departments and related organisations subscribed to the services of the Observatory through the Government Weather Information Server (GOWISE). Specialised weather services were also provided to utility companies, public transport operators, engineering contractors and information providers on a cost-recovery basis. A total of 90 clients subscribed to the Observatory’s specialised services in 2021, generating a revenue of about \$0.6 million.

The Observatory maintains a close surveillance of the weather at and around the Hong Kong International Airport (HKIA) and provides the aviation community with the weather information needed for its operations. In 2021–22, the Observatory continued to take forward the implementation of the aviation meteorological facilities in support of the Three-Runway System project. When the Main Centre of the Asian Aviation Meteorological Centre in Beijing was closed for relocation in October 2021, the Observatory, as the backup centre, took over for the first time to provide en-route hazardous weather warning services for the Asia-Pacific region for two weeks.



The forecasters at the Airport Meteorological Office oversaw relevant weather consultations and held discussions with forecasters in Beijing when the Observatory stepped in to cover the work of the Asian Aviation Meteorological Centre.

The Observatory issues forecasts of wind, weather, waves and swells for the marine community and container terminals. During the year, the Observatory launched a new service for fishermen via WeChat to provide the fishing community with more extensive weather information including wave height forecasts.

The Observatory continued to enhance the provision of weather information to the marine community and strengthen marine meteorological observations by deploying drifting buoys in the South China Sea and western North Pacific, as well as conducting a trial on the installation of anemometers on fishing vessels to measure winds in real time over local waters and the northern part of the South China Sea. The Observatory also implemented a set of Waves and Surface Currents Remote Monitoring System at Cape D’Aguiar for real-time monitoring of the sea state near Hong Kong.



The data measured by anemometers on fishing vessels are transmitted back to the Observatory Headquarters in real-time using satellite communication technology.

The Observatory took forward the trial implementation of a rented Phased Array Doppler Weather Radar, a new generation weather radar with higher scanning frequency, to assess its potential in territory-wide application for enhancing the Observatory's work in monitoring and predicting high-impact weather.

The International Organization for Standardization (ISO) 9001 certification for the provision of regional weather information was extended from automatic measurement of temperature to relative humidity and mean sea level pressure. The Observatory also received for the first time the International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) 20000 certification for the Information Technology (IT) service management system supporting the critical IT infrastructure services.

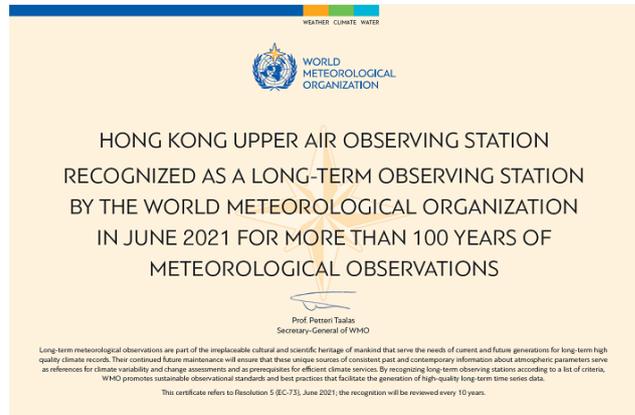


ISO/IEC 20000-1:2018 certificate for the Observatory's critical IT infrastructure services

The Observatory's upper air observing station became the world's first centennial upper air observing station accredited by the World Meteorological Organisation (WMO). The Observatory launched a thematic webpage to introduce its history.



ISO 9001:2015 certificate for the Observatory's automatic regional meteorological measurement services



The centennial observing station accreditation certificate awarded by the WMO to the upper air observing station of the Observatory

Local, Regional and International Collaborations

The Observatory established the following local, regional and international collaborations in 2021-22:

Local Collaborations



The Observatory and the Senior Citizen Home Safety Association (SCHSA) held a joint press conference in December 2021 to remind the public to prepare for changes in weather and to take care of the elderly.

The Observatory and SCHSA held a joint press conference to remind the public, especially the elderly and persons with chronic medical conditions, to pay attention to the changes in weather



The Observatory jointly organised a series of public activities with various government departments to celebrate the 15th anniversary of the “Science in the Public Service” (SIPS) Campaign, including the production of a documentary television programme showcasing the application of science and technology by various government departments.

Heads or representatives of the government departments participating in the production of SIPS TV documentary officiated at the kick-off ceremony



The Observatory, the Faculty of Engineering of the University of Hong Kong and the Hong Kong Meteorological Society jointly organised the “Total Sky Imager Design Competition” to enhance students’ knowledge and interest in science, engineering and meteorological instrumentation.

The “Total Sky Imager Design Competition” attracted more than 175 participating primary and secondary students



Through scientific analysis and partnership with the Senior Citizen Home Safety Association, Department of Health and the Labour Department in recent years, the Observatory enhanced the precautions associated with the Very Hot Weather Warning during prolonged heat, reminding members of the public to prevent discomfort related to very hot weather and pay due attention to their health conditions.

Enhanced precautions better suit the health needs of the elderly and persons with chronic medical conditions

Regional Collaborations



The weather website for Greater Bay Area was enhanced with the addition of gridded weather forecasts for more than 600 grid boxes provided by Guangdong Meteorological Service, the Observatory and Macao Meteorological and Geophysical Bureau. The real-time weather observation information was also enhanced with the provision of visibility observations.

Weather forecasts for any location of the Greater Bay Area can be viewed by clicking a grid box on the map



The Observatory participated in a joint online meeting with National Meteorological Center of the China Meteorological Administration, Guangzhou Central Meteorological Observatory of the Guangdong Meteorological Service and Macao Meteorological and Geophysical Bureau in December 2021, exchanging forecast opinions on cold weather and introducing public communication strategies of the Observatory.

Assistant Director of the Observatory made a speech during the joint meeting

International Collaborations



The Observatory participated in the “Extraordinary Session of WMO Congress in 2021” to discuss various global meteorological strategic issues and offered advice on the formulation of policy for the international exchange of earth system data.



The Observatory organised an online workshop on “Development and Use of Automated City Weather Forecast Products” under the Voluntary Cooperation Programme of the WMO, in which experts in Numerical Weather Prediction modelling and applications were invited to conduct lectures while representatives from the Observatory shared their experience and held practical sessions.

About 40 participants from different parts of the world attended the online workshop organised by the Observatory



As a Regional Specialized Meteorological Centre (RSMC) for Nowcasting designated by the WMO, the Observatory continued to step up sharing of its in-house developed severe weather nowcasting system, “SWIRLS”, with overseas weather services to help develop and enhance forecasts and warnings of high-impact weather.

Public Education

In 2021-22, the Observatory continued to promote awareness of high-impact weather, the impacts of climate change and the Observatory's services through public education. Noteworthy activities include:



The Observatory launched an e-book for children titled "A Tour of Tropical Cyclones" to promote children's understanding of tropical cyclones and raise their awareness of disaster preparedness and response.

An infographic in "A Tour of Tropical Cyclones" that introduces precautionary measures to be taken when a tropical cyclone is affecting Hong Kong



The Observatory conducted joint webcasts of the total lunar eclipse on 26 May and the partial lunar eclipse on 19 November with the Hong Kong Space Museum, the Ho Koon Nature Education cum Astronomical Centre and the Po Leung Kuk Ngan Po Ling College.

Live-broadcast of the total lunar eclipse on 26 May on the Observatory's Facebook page



The Observatory launched more panoramic virtual tours to the Observatory's facilities at outstations on its website to enhance public understanding of their functions. Facilities included the Observatory's Airport Meteorological Office and meteorological instruments that support its operation, King's Park meteorological station and radiological facilities, Tate's Cairn weather radar station, the weather station at Waglan Island, radiation-related facilities at Ping Chau, etc.

Virtual Tour of the weather station at Waglan Island



In view of the pandemic development and the good responses from the public to the "Online Video Course on Weather Observation" launched in 2020, the Observatory launched another online video series "Online Video Course on Tropical Cyclone" in early 2022, explaining in layman terms the basic scientific knowledge of tropical cyclones such as motion and tracks, formation and classification, structure and intensity, their impacts on Hong Kong, etc.

"Online Video Course on Tropical Cyclone" explaining basic knowledge of tropical cyclones

The Observatory also organised a number of educational events and outreach activities to engage the public, in particular young people and students, through the SIPS Campaign and the "Community Weather Information Network", including workshops, site visits as well as various scientific talks.

RADIATION MONITORING AND ASSESSMENT

The Observatory monitors ambient radiation levels in Hong Kong and conducts radiological measurements on air, soil, water and food samples. In the event of a nuclear emergency, the Observatory will notify and advise relevant government bureaux and departments on the possible consequences in Hong Kong and recommend protective actions. The Observatory organises training and exercises on radiation monitoring for other government departments involved in the Hong Kong contingency plan for nuclear emergencies. The work involves:

- Operating a network of radiation monitoring stations, an aerial radiation monitoring system, two radiological survey vehicles, a radiation laboratory and an emergency radiation data management system;
- Keeping abreast of the latest development on the methodology for nuclear accident consequence assessment; and
- Planning and participating in exercises and drills in response to nuclear emergencies.

In 2021-22, all radiation monitoring and assessment work in this programme was carried out satisfactorily. All equipment was maintained in a state of readiness. The Observatory continued to conduct exercises, drills and training on radiation monitoring and assessment. New model of high pressure ionization chambers of the Radiation Monitoring Network was operating smoothly. Replacement of the Liquid Scintillation Counting System was successfully completed. A unified group calling and message dissemination system was implemented to support emergency operations.

The part of the Observatory's exhibition hall on environmental radiation monitoring was renovated and the corresponding virtual exhibition hall was revamped. Outreach activities such as public and school talks were conducted to enhance public education. The Observatory continued to organize Gamma-Go workshops during the year to promote students' understanding of radiation through STEM activities, with the participation of more than 30 secondary schools.

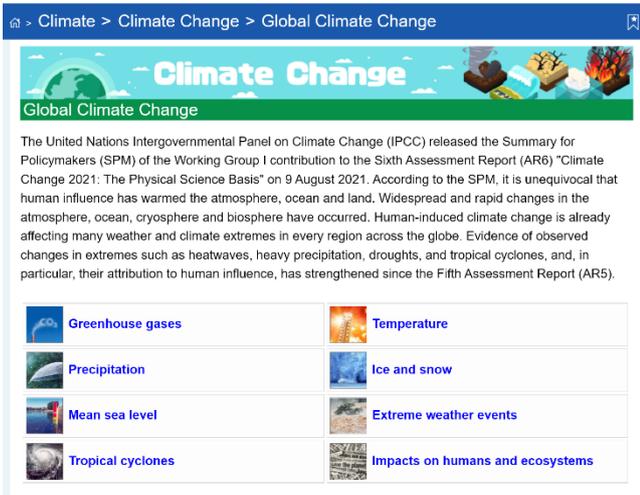
TIME STANDARD, GEOPHYSICAL AND CLIMATE SERVICES

The Observatory maintains the Hong Kong time standard, provides time signals for the public and contributes to the International Bureau of Weights and Measures for the determination of the universal standard time. It provides geophysical, oceanographic, astronomical and climatological information to meet the requirements for planning, engineering design and environmental impact assessments. It monitors earthquakes and the sea level and releases related information to the public, including the operation of the tsunami warning system. It also keeps abreast of research and development on international issues such as global climate change and advises the public and government bureaux/departments on the likely implications.

Initiatives undertaken in 2021-22 included:

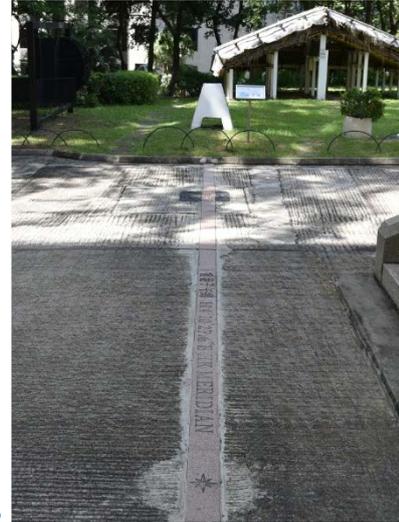
- Provided scientific support to studies by relevant government bureaux/departments on the mitigation, adaptation and resilience-building measures required in combating climate change and its impacts including extreme weather events;
- Monitored climate change-related scientific studies, and provided the latest assessment of climate change and its impacts, as well as enhanced and updated climate projections to support policy making and action planning of relevant government bureaux/departments;
- Conducted school talks on climate change, produced educational videos, and published articles and latest international research findings on global climate change on the Observatory website to promote public understanding and awareness of climate change and its impacts;

- Updated the Climate Change and Climate Projections webpages based on the Sixth Assessment Report of the United Nations Intergovernmental Panel on Climate Change;



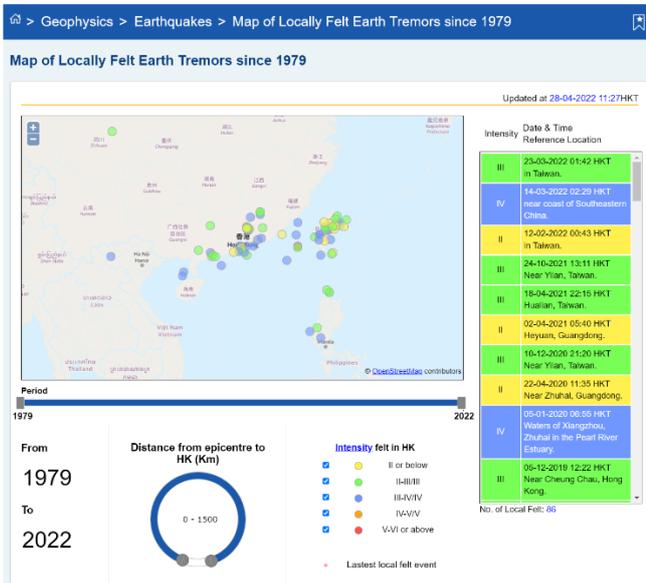
The "Global Climate Change" webpage

- Constructed the Hong Kong meridian line within the Observatory Headquarters to introduce the history of the Observatory's time service to the public; and



The Hong Kong meridian line being constructed at the Observatory Headquarters

- Launched a new geographic information system-enabled interactive webpage displaying details of locally felt earthquake tremors since 1979 on the Observatory website;



The "Map of Locally Felt Earth Tremors since 1979" webpage

- Set up a replacement caesium beam atomic clock to support the Hong Kong time service.

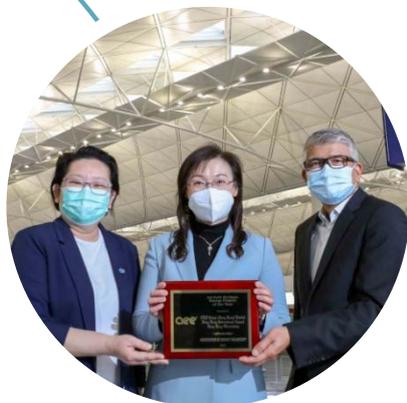
PUBLIC OPINION SURVEY

In the public opinion survey conducted in 2021, the public considered that on average 77% of the weather forecasts issued by the Observatory were accurate, and gave an average score of 7.5 (out of 10) to its overall service.

- Strengthened the resilience of the tide gauge stations through additional sensors and support facilities;

AWARDS WON BY THE OBSERVATORY

The Observatory won a number of awards in 2021-22:



The collaboration project between the Observatory, Airport Authority Hong Kong and CLP Power Hong Kong on “Big Data Analytic for Energy Management at Hong Kong International Airport” was awarded the Asia Pacific Rim Region Energy Project of the Year Award for 2021 by the Association of Energy Engineers, in recognition of the dedication and excellent performance of the project in energy efficiency and saving.



The Observatory’s staff won the Cyber Security Service Excellence Award at the Cyber Security Professional Awards 2021. The awards aimed at motivating cyber security personnel to professionalise their capabilities in preventing and detecting cyber security incidents.



The Observatory has been awarded the Certificate of Merit for the ninth time in the Hong Kong Awards for Environmental Excellence under the Public Services Sector, which recognises the Observatory’s contributions to environmental protection.

OUTLOOK

The Observatory will continue to enhance its services in the following aspects in 2022-23:

Weather Services

- Continue to provide weather forecasts, regional weather services and extended weather outlook, including multi-hazard and impact-based forecasts;
- Continue to develop and enhance nowcasting and forecasting services on high-impact weather for the public and special users;
- Continue to strengthen efforts in public communication as well as education, outreach and social media services to enhance public awareness of and preparedness for natural disasters;
- Continue to implement the aviation meteorological facilities in support of the Three-Runway System project for the HKIA;
- Launch the next generation electronic flight bag weather mobile application “MyFlightWx” to provide enhanced inflight weather information to flight crew electronically and promote its use to airlines operating from the HKIA;
- Launch new and enhanced aviation weather services in support of the operation of the new Integrated Airport Centre for the HKIA;
- Procure and install wake turbulence detection equipment at the HKIA to support its future development;
- Continue to implement the projects for replacing the Tai Mo Shan storm-detecting weather radar and procure a high performance computer in support of weather forecast operation;
- Revamp the mobile weather application “MyObservatory” to enhance user experience and continue to enrich its content;
- Continue to conduct trial to enhance observation of inclement weather and special weather phenomena (such as hail) via crowdsourcing from the public;
- Continue to improve urban-scale weather monitoring and forecasting and develop observation and forecasting products for trial in the Automatic Regional Weather Forecast web portal to support initiatives under the *Smart City Blueprint for Hong Kong 2.0*;
- Continue to enhance marine meteorological observations through the deployment of drifting buoys;
- Continue to enhance the automatic weather station network to provide more weather information;
- Continue to enhance the web portal of RSMC for nowcasting through provision of satellite nowcast products;
- Continue to enrich the “Earth Weather” webpage with more weather information including weather observations such as wind and temperature; and
- Continue to enhance the weather website for the Guangdong-Hong Kong-Macao Greater Bay Area with the addition of automatic weather forecasts.

Radiation Monitoring and Assessment

- Implement the agreed arrangements between Hong Kong and Guangdong on radiation monitoring and assessment;
- Conduct drills and exercises on emergency response in conjunction with relevant government bureaux and departments as well as the relevant Guangdong counterparts;
- Organise training on radiation monitoring and assessment;
- Take forward the enhancement of radiation monitoring and assessment facilities; and
- Further promote the Gamma-Go programme to sustain school community education on radiation.

Time Standard, Geophysical and Climate Services

- Undertake and support monitoring and assessment of earthquake, tsunami risk and sea level in the region;
- Enhance its earthquake monitoring and tsunami warning capability;
- Strengthen the tide gauge network to better cope with extreme sea level conditions;
- Monitor and study climate change issues, as well as provide relevant government bureaux/departments with latest information and assessment of climate change and its impacts to support their studies;
- Engage various stakeholders to promote the effective use of climate data in support of the emerging needs of different sectors and government bureaux/departments; and
- Conduct outreach activities to promote public understanding of measures required in combating climate change.

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