Head 168 — HONG KONG OBSERVATORY

Controlling officer: the Director of the Hong Kong Observatory will account for expenditure under this Head.

Estimate 2022–23 ..... **$418.8m**

Establishment ceiling 2022–23 (notional annual mid-point salary value) representing an estimated 359 non-directorate posts as at 31 March 2022 rising by eight posts to 367 posts as at 31 March 2023 ..... **$241.1m**

In addition, there will be an estimated five directorate posts as at 31 March 2022 and as at 31 March 2023.

Controlling Officer's Report

Programmes

Programme (1) Weather Services	This programme contributes to Policy Area 7: Public Safety (Secretary for Commerce and Economic Development).
Programme (2) Radiation Monitoring and Assessment	This programme contributes to Policy Area 9: Internal Security (Secretary for Security).
Programme (3) Time Standard and Geophysical Services	This programme contributes to Policy Area 7: Public Safety (Secretary for Commerce and Economic Development).

Detail

Programme (1): Weather Services

	2020–21 (Actual)	2021–22 (Original)	2021–22 (Revised)	**2022–23 (Estimate)**
Financial provision ($m)	345.0	349.1	349.1 (—)	**367.1** (+5.2%) (or +5.2% on 2021–22 Original)

Aim

2 The aim is to provide weather forecasts and issue warnings to the public, special users, the shipping community and aviation groups in order to reduce loss of life and damage to property, and minimise disruption to economic and social activities during hazardous weather.

Brief Description

3 The Central Forecasting Office and Airport Meteorological Office of the Hong Kong Observatory (HKO) are responsible for the preparation and issuance of weather information, forecasts and various warnings on hazardous weather to the public, special users, the shipping community and aviation groups. HKO also promotes public awareness of, and community preparedness for, natural disasters. The work involves:

- operating a network of mostly automated weather stations;
- carrying out real-time exchange of data with meteorological centres in the world;
- receiving meteorological satellite imageries, and operating weather radar systems and other meteorological instruments;
- analysing meteorological data and computing the future weather by numerical modelling;
- disseminating weather information by a diversity of means;
- issuing warnings and advisory messages on hazardous weather such as tropical cyclones, storm surges, rainstorms, landslips, flooding, thunderstorms, windshear, fire danger and extreme hot and cold conditions; and
- conducting public talks, interviews and training courses as well as producing TV weather programmes and educational materials on hazardous weather phenomena.

4 In 2021, HKO fulfilled its performance pledge of issuing at least one bulletin every hour of the day, disseminating 100 per cent of the bulletins within ten minutes after each hour, and attained a forecast accuracy (as verified by objective means) of 93 per cent. The mobile weather application "MyObservatory" and HKO website remained as popular channels for disseminating weather information to the public, recording about 142 billion total page views in the year.

5 To meet the needs of the public, HKO enhanced the provision of weather information in 2021–22 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;
- enhancing the nine-day weather forecast for Hong Kong by providing the probability of significant rain forecast;
- 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 mobile weather application "MyObservatory" by providing more weather information including probability of significant rain and weather information for outdoor photography, as well as introducing a new crowdsourcing feature "My Weather Observation" which enables users to report and share weather information;
- enriching the HKO website with weather photos from Tai Mo Shan and Sai Kung; and
- enriching the "Earth Weather" page on the HKO website and the mobile weather application "MyObservatory" with automatic weather forecasts for 100 cities in the Asia-Pacific region and computer-based forecasts of mean sea-level pressure.

6 HKO 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, HKO continued to take forward the implementation of the aviation meteorological facilities in support of the Three-Runway System project. In October 2021, the Main Centre of the Asian Aviation Meteorological Centre in Beijing underwent relocation work, and HKO took over as the Backup Centre for the first time to issue hazardous weather forecasts and warnings to aviation users in the Asian region for two weeks.

7 Other noteworthy activities for 2021–22 include:

- organising a number of educational events and outreach activities to engage the public, in particular young people and students, through the "Science in Public Service (SIPS) Campaign" and the "Community Weather Information Network", which included workshops, scientific talks, site visits and a SIPS documentary TV programme showcasing the application of science and technology by government departments;
- continuing public education efforts in relation to high-impact weather to enhance public awareness of and preparedness for natural disasters and climate change impacts;
- launching 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;
- launching more panoramic virtual tours to HKO's facilities at outstations on the HKO website to enhance public understanding of their functions;
- obtaining the accreditation from the World Meteorological Organization (WMO) for HKO's upper air observing station as the world's first accredited centennial upper air observing station, and launching a thematic webpage to introduce its history;
- enhancing the severe weather nowcasting software developed by HKO and, as a Regional Specialized Meteorological Centre (RSMC) for nowcasting designated by WMO, stepping up sharing of such software with overseas weather services;
- extending the International Organization for Standardization (ISO) 9001 certification for the provision of regional weather information from automatic measurement of temperature to relative humidity and mean sea level pressure;
- taking 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 HKO's work in monitoring and predicting high impact weather;
- launching a new service for fishermen via WeChat to provide the fishing community with more extensive weather information including wave height forecasts;
- continuously enhancing the provision of weather information to the marine community and strengthening marine meteorological observation 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;
- implementing a set of Waves and Surface Currents Remote Monitoring System at Cape D'Aguilar for real-time monitoring of the sea state near Hong Kong; and
- establishing the quality management framework for critical information technology infrastructure services.

8 The key performance measures in respect of weather services are:

Targets

	Target	2020 (Actual)	2021 (Actual)	**2022 (Plan)**
forecasts perceived as accurate by the public (%)#	78	78	77	**78**
accurate public forecasts as verified by objective means (%)	88	92	93	**90**
accurate forecasts as assessed by ship captains (%)	96	97	98	**96**
accurate forecasts as assessed by airline operators (%)	96	99	99	**96**
hourly local weather reports disseminated within the first ten minutes of each hour (%)	99	100	100	**99**

Indicators

	2020 (Actual)	2021 (Actual)	**2022 (Estimate)**
calls answered by the Dial-a-Weather system (million)#	5.4‡	5.1‡	**4.0**
telephone enquiries answered manually#	15 539‡	12 079‡	**10 000**
visits to the HKO website (billion)^	158	142	**150**
companies and organisations subscribing to special weather and warning services	99	90	**92**
total revenue from the above subscribers ($m)	0.7	0.6	**0.6**
media interviews and public lectures/talks on weather#	611Δ	650Δ	**600**
meteorological documents for flights departing Hong Kong	82 000	74 000@	**82 000**
visits to the aviation weather information system (million)	221.0	232.2	**240.0**

\# The actual figures may vary depending on whether there are more weather changes of concern to the public in that particular year.

‡ With increasing popularity of HKO's weather information services provided via new channels such as the pilot chatbot service on the HKO website, the mobile application "MyObservatory" and the Facebook page, the figures were in a downward trend as compared to previous years.

^ Figures measured in page views refer to the number of access to the HKO website which includes the mobile website, the Weather Wizard and the mobile application "MyObservatory". The actual figures may vary depending on whether there are more weather changes of concern to the public in that particular year.

Δ Some of the talks were conducted through online channels to avoid mass gatherings due to the COVID-19 pandemic.

@ Figures dropped as compared to 2020 owing to reduction in the number of flights in 2021.

Matters Requiring Special Attention in 2022–23

9 During 2022–23, HKO will:

- 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 crews 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 for providing 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;
- continue to enhance the weather website for the Guangdong-Hong Kong-Macao Greater Bay Area with the addition of automatic weather forecasts; and
- continue to strengthen the quality management of critical information technology infrastructure services as required by the ISO 20000 certification.

Programme (2): Radiation Monitoring and Assessment

	2020–21 (Actual)	2021–22 (Original)	2021–22 (Revised)	**2022–23 (Estimate)**
Financial provision ($m)	37.1	37.2	37.2 (—)	**32.1** (–13.7%) (or –13.7% on 2021–22 Original)

Aim

10 The aim is to provide information on environmental radiation levels in Hong Kong and advise government departments on the protective action that may be necessary during nuclear emergencies.

Brief Description

11 HKO 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, HKO will notify and advise government departments on the possible consequences in Hong Kong and recommend protective action. HKO 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.

12 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. Exercises, drills and training on radiation monitoring and assessment were conducted. 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 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. A School Community Ambient Radiation Measurement Pilot Programme named Gamma-Go was launched to promote students' understanding of radiation through STEM activities, with the participation of more than 30 secondary schools.

13 The key performance measures in respect of radiation monitoring and assessment are:

Target

	Target	2020 (Actual)	2021 (Actual)	**2022 (Plan)**
data availability of radiation monitoring network (%)	99.0	99.9	99.9	**99.6**

Indicators

	2020 (Actual)	2021 (Actual)	**2022 (Estimate)**
exercises and drills	21	21	**22**
visits to HKO's webpage on radiationφ	2 415 499	9 473 006	**5 000 000**

φ The actual figures may vary from year to year depending on whether there are particular issues of concern to the public.

Matters Requiring Special Attention in 2022–23

14 During 2022–23, HKO will continue to:

- implement the agreed arrangements between Hong Kong and Guangdong on radiation monitoring and assessment;
- conduct drills and exercises on emergency response in conjunction with other government 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.

Programme (3): Time Standard and Geophysical Services

	2020–21 (Actual)	2021–22 (Original)	2021–22 (Revised)	**2022–23 (Estimate)**
Financial provision ($m)	26.3	20.4	20.4 (—)	**19.6** (–3.9%) (or –3.9% on 2021–22 Original)

Aim

15 The aim is to maintain the Hong Kong time standard and provide geophysical, oceanographic, astronomical and climatological information to the public.

Brief Description

16 HKO 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. The work involves:

- maintaining a network of caesium beam atomic clocks as the Hong Kong time standard and providing time signals for radio broadcasts, automatic telephone answering service and synchronisation of clocks via the Internet;
- operating seismological, tide and sea level monitoring networks and conducting related analyses;
- carrying out real-time exchange of seismic data with overseas centres and disseminating earthquake information by various means;
- compiling climatological and other related data;

- conducting studies on climate change in Hong Kong and promoting public understanding; and
- providing updates on the effects of El Nino and other longer term atmospheric phenomena on Hong Kong.

17 In 2021–22, the objectives and targets of this programme were generally met through the following:

- providing 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;
- monitoring climate change-related scientific studies, and providing 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;
- promoting public understanding and awareness of climate change and its impacts through conducting school talks, producing educational videos, and publishing articles and latest international research findings on global climate change on the HKO website;
- updating the Climate Change and Climate Projections webpages based on the Sixth Assessment Report of the United Nations Intergovernmental Panel on Climate Change;
- launching a new geographic information system-enabled interactive map to display historical felt earth tremors in Hong Kong on the HKO website;
- conducting joint webcasts of the total lunar eclipse on 26 May 2021 and the partial lunar eclipse on 19 November 2021 with the Hong Kong Space Museum, the Ho Koon Nature Education cum Astronomical Centre and the Po Leung Kuk Ngan Po Ling College;
- strengthening the resilience of the tide gauge stations through additional sensors and support facilities;
- constructing the Hong Kong meridian line within the HKO Headquarters to introduce the history of HKO's time service to the public; and
- setting up a replacement caesium beam atomic clock to support the Hong Kong time service.

18 The key performance measures in respect of time standard and geophysical services are:

Targets

	Target	2020 (Actual)	2021 (Actual)	**2022 (Plan)**
time standard accuracy (microseconds per day)	0.01	0.01	0.01	**0.01**
geophysical, meteorological and oceanographic data capture rate (%)	99	100	100	**99**
climatological information (% of written requests responded to within ten working days)	99	100	100	**99**

Indicators

	2020 (Actual)	2021 (Actual)	**2022 (Estimate)**
visits to HKO's Internet time service (million)	43 642	91 189◊	**100 000**
requests for geophysical, climatological and oceanographic information and advice	628	642	**650**

◊ The number of visits to HKO's Internet time service increased significantly in 2021 due to the surge in number of users and their service requests.

Matters Requiring Special Attention in 2022–23

19 During 2022–23, HKO will continue to:

- 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.

ANALYSIS OF FINANCIAL PROVISION

Programme		2020–21 (Actual) ($m)	2021–22 (Original) ($m)	2021–22 (Revised) ($m)	**2022–23 (Estimate) ($m)**
(1)	Weather Services	345.0	349.1	349.1	**367.1**
(2)	Radiation Monitoring and Assessment	37.1	37.2	37.2	**32.1**
(3)	Time Standard and Geophysical Services	26.3	20.4	20.4	**19.6**
		408.4	406.7	406.7	**418.8**
				(—)	**(+3.0%)**
					(or +3.0% on 2021–22 Original)

Analysis of Financial and Staffing Provision

Programme (1)

Provision for 2022–23 is $18.0 million (5.2%) higher than the revised estimate for 2021–22. This is mainly due to the increased operating expenses and increased salary provision due to an increase of eight posts in 2022–23.

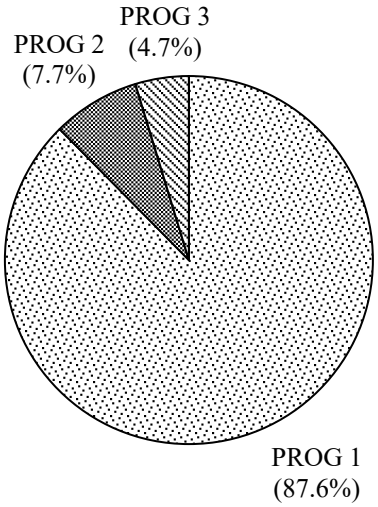
Programme (2)

Provision for 2022–23 is $5.1 million (13.7%) lower than the revised estimate for 2021–22. This is mainly due to the decreased requirement for capital expenditure.

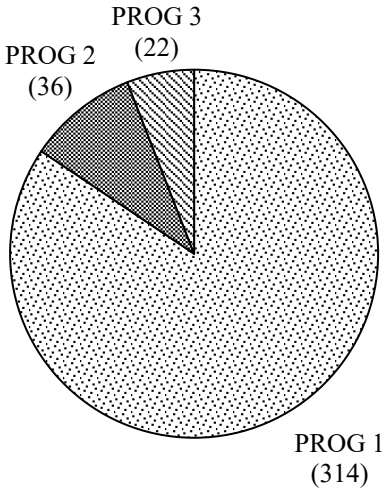
Programme (3)

Provision for 2022–23 is $0.8 million (3.9%) lower than the revised estimate for 2021–22. This is mainly due to the decreased requirement for operating expenses and capital expenditure.

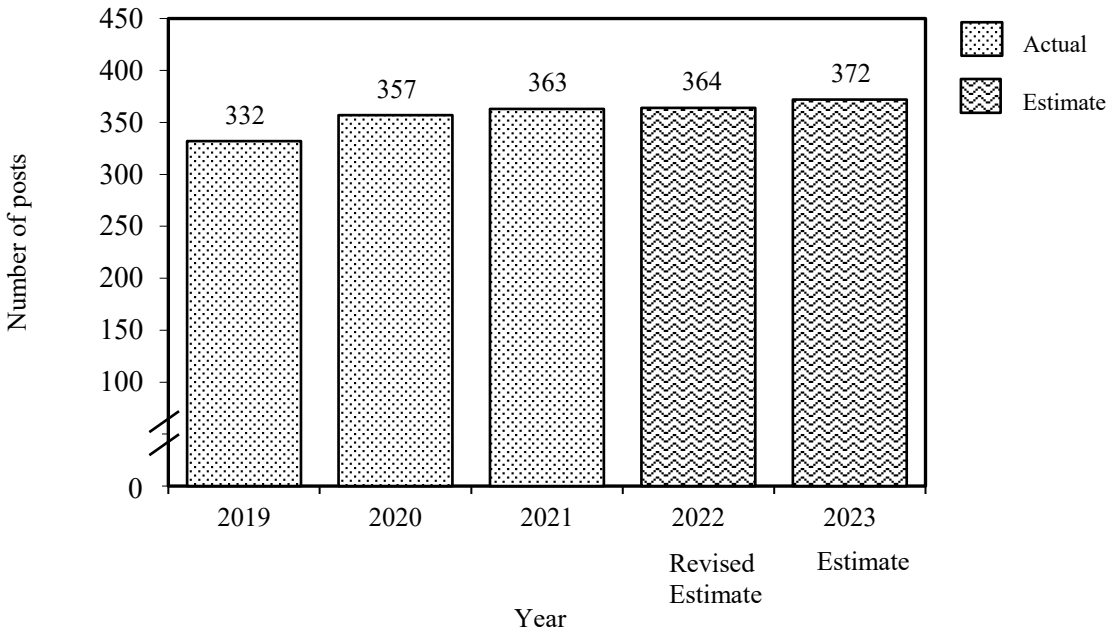
Allocation of provision to programmes (2022-23)



Staff by programme (as at 31 March 2023)



Changes in the size of the establishment (as at 31 March)



Sub-head (Code)		Actual expenditure 2020–21	Approved estimate 2021–22	Revised estimate 2021–22	**Estimate 2022–23**
		$'000	$'000	$'000	**$'000**
	Operating Account				
	Recurrent				
000	Operational expenses	370,286	385,064	385,064	**401,291**
	Total, Recurrent	370,286	385,064	385,064	**401,291**
	Total, Operating Account	370,286	385,064	385,064	**401,291**
	Capital Account				
	Plant, Equipment and Works				
661	Minor plant, vehicles and equipment (block vote)	38,132	21,642	21,642	**17,515**
	Total, Plant, Equipment and Works	38,132	21,642	21,642	**17,515**
	Total, Capital Account	38,132	21,642	21,642	**17,515**
	Total Expenditure	408,418	406,706	406,706	**418,806**

Details of Expenditure by Subhead

The estimate of the amount required in 2022–23 for the salaries and expenses of the Hong Kong Observatory is $418,806,000. This represents an increase of $12,100,000 over the revised estimate for 2021–22 and $10,388,000 over the actual expenditure in 2020–21.

Operating Account

Recurrent

2 Provision of $401,291,000 under *Subhead 000 Operational expenses* is for the salaries, allowances and other operating expenses of the Hong Kong Observatory.

3 The establishment as at 31 March 2022 will be 364 posts. It is expected that there will be an increase of eight posts in 2022–23. Subject to certain conditions, the controlling officer may under delegated power create or delete non-directorate posts during 2022–23, but the notional annual mid-point salary value of all such posts must not exceed $241,125,000.

4 An analysis of the financial provision under *Subhead 000 Operational expenses* is as follows:

	2020–21 (Actual) ($'000)	2021–22 (Original) ($'000)	2021–22 (Revised) ($'000)	**2022–23 (Estimate) ($'000)**
Personal Emoluments				
- Salaries	225,286	244,221	240,430	**257,789**
- Allowances	4,461	5,195	4,555	**4,555**
- Job-related allowances	623	652	652	**652**
Personnel Related Expenses				
- Mandatory Provident Fund contribution	1,159	1,242	1,370	**1,128**
- Civil Service Provident Fund contribution	10,090	12,353	12,008	**13,842**
Departmental Expenses				
- General departmental expenses	128,551	121,286	125,933	**123,209**
Other Charges				
- World Meteorological Organization	116	115	116	**116**
	370,286	385,064	385,064	**401,291**

Capital Account

Plant, Equipment and Works

5 Provision of $17,515,000 under *Subhead 661 Minor plant, vehicles and equipment (block vote)* represents a decrease of $4,127,000 (19.1%) against the revised estimate for 2021–22. This is mainly due to the decreased requirement for capital expenditure.