

Head 168 — HONG KONG OBSERVATORY

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

Estimate 2021–22 **\$406.7m**

Establishment ceiling 2021–22 (notional annual mid-point salary value) representing an estimated 358 non-directorate posts as at 31 March 2021 rising by one post to 359 posts as at 31 March 2022 **\$235.5m**

In addition, there will be an estimated five directorate posts as at 31 March 2021 and as at 31 March 2022.

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

	2019–20 (Actual)	2020–21 (Original)	2020–21 (Revised)	2021–22 (Estimate)
Financial provision (\$m)	320.3	349.6	349.6 (—)	349.1 (–0.1%)
				(or –0.1% on 2020–21 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 2020, 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 92 per cent. The mobile weather application “MyObservatory” and HKO website remained as popular channels for disseminating weather information to the public, recording about 158 billion total page views in the year. “MyObservatory” won an award and received an honourable mention at the World Meteorological Organisation (WMO) International Weather Apps Awards in December 2020.

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5 To meet the needs of the public, HKO enhanced the provision of weather information in 2020–21 through:

- alerting the public to high-impact weather such as violent gusts induced by severe thunderstorms;
- extending the Tropical Cyclone Track Probability Forecast service to include the probability forecast of tropical cyclone track in the coming nine days for tropical cyclones in the western North Pacific;
- launching a trial chatbot service “Dr. Tin” on the HKO mobile weather application “MyObservatory”, HKO website and HKO’s Facebook page to automatically answer questions about local weather, climate and tide information; Hong Kong standard time; as well as weather forecast, sunrise and sunset times of major cities in the world;
- launching the “Hong Kong Hiking Trail Weather Service” webpage to provide automatic hourly weather forecast up to seven days for main hiking trails in Hong Kong;
- enhancing the weather satellite imagery on the HKO website by updating the global mosaic infra-red satellite imageries more frequently from once every three hours to once every half-hour;
- enriching the “Regional Weather” webpage with weather photos from Kau Sai Chau and Cheung Chau; and
- enriching the HKO mobile weather application “MyObservatory” with more information on “Earth Weather”, aviation weather, tide, and storm track.

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 2020–21, HKO commenced the implementation of the aviation meteorological facilities in support of the Three-Runway System project.

7 Other noteworthy activities for 2020–21 include:

- organising a number of educational events and outreach activities engaging young people and students through the “Science in Public Service Campaign” and the “Community Weather Information Network”, including workshops, public scientific talks, online video courses, and quiz worksheets for students;
- enhancing communication with the public through social media and TV, including the addition of morning TV weather programme on Sunday;
- launching panoramic virtual tours to the Observatory’s facilities on the HKO website to enhance public understanding of their functions;
- organising an online polling campaign for significant weather and climate events during 2016–2020 to raise public awareness of climate change;
- continuing the installation of more microclimate stations for a pilot study on urban weather monitoring;
- launching automatic global city/airport forecast products for special users such as the Airport Authority Hong Kong (AAHK) and airlines;
- continuing the collaboration with a local airline for real-time downlink of turbulence data from its B777 aircrafts;
- implementing upper air measurement of water vapour profile using balloon-borne radiosonde;
- continuously enhancing marine meteorological observation by deploying drifting buoys in the South China Sea and western North Pacific;
- extending the International Organization for Standardization (ISO) 9001:2015 certification for the provision of meteorological measurement services at King’s Park to UV index, sunshine duration, heat index, soil and grass temperatures, evaporation and potential evapotranspiration;
- enhancing 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;
- enhancing a web platform for aviation users to facilitate co-ordination amongst aviation meteorological watch offices in the Asia-Pacific region to cover all en-route hazardous weather; and
- enhancing the “International Cloud Atlas” website with five more official languages of the United Nations (in addition to English) in collaboration with WMO.

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

Targets

	Target	2019 (Actual)	2020 (Actual)	2021 (Plan)
forecasts perceived as accurate by the public (%)#	78	78	78	78
accurate public forecasts as verified by objective means (%)	88	90	92	90

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	Target	2019 (Actual)	2020 (Actual)	2021 (Plan)
accurate forecasts as assessed by ship captains (%).....	96	97	97	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

	2019 (Actual)	2020 (Actual)	2021 (Estimate)
calls answered by the Dial-a-Weather system (million)#	6.3	5.4	5.0
telephone enquiries answered manually#.....	16 806	15 539	15 000
visits to the HKO website (billion)^	187	158	150
companies and organisations subscribing to special weather and warning services	109	99	99
total revenue from the above subscribers (\$m).....	0.7	0.7	0.7
media interviews and public lectures/talks on weather#.....	679	611Δ	700
meteorological documents for flights departing Hong Kong	214 000	82 000@	100 000
visits to the aviation weather information system (million)	246.3	221.0@	221.0

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

^ 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”.

Δ Due to the COVID-19 pandemic, fewer public lectures/talks on weather and media/publicity events were organised in 2020. Some of the talks were conducted through online channels.

@ Figures dropped significantly as a result of reduction in flights due to the COVID-19 pandemic.

Matters Requiring Special Attention in 2021–22

9 During 2021–22, HKO will:

- continue to provide weather forecasts, regional weather services and extended weather outlook;
- provide basic weather information on the HKO website in languages of eight ethnic minority groups;
- enhance the nine-day Weather Forecast for Hong Kong by providing the probability of significant rain;
- develop and provide new nowcasting and forecasting services on high-impact weather to the public and special users;
- continue to strengthen efforts in public communication and education, outreach and social media services in relation to high-impact weather and weather information, forecasts and warnings, so as to enhance public awareness of and preparedness for natural disasters and impacts of climate change;
- continue to improve and promote the electronic flight bag weather mobile application “MyFlightWx” in collaboration with airlines to provide latest inflight weather information to flight crew electronically;
- 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;
- continue to implement the aviation meteorological facilities in support of the Three-Runway System project for the HKIA, and develop new and enhanced aviation weather services in support of the new Integrated Airport Centre for the HKIA;
- continue to implement urban-scale weather monitoring and forecasting (including setting up microclimate stations) and develop forecasting products in support of initiatives under the *Smart City Blueprint*;
- continue to enhance marine meteorological observations and provision of weather information to the marine community;
- continue to enrich the content of the mobile weather application “MyObservatory”;
- conduct trial to enhance observation of inclement weather and special weather phenomena (such as hail) via crowdsourcing from the public;
- continue to enhance the automatic weather station network for providing more weather information;

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- enhance the weather website for the Guangdong-Hong Kong-Macao Greater Bay Area with the addition of automatic weather forecasts;
- enhance HKO's upper air measurement with a view to joining the WMO global reference measurement network; and
- strengthen the quality management of information technology services within HKO with a view to obtaining the ISO 20000 certification.

Programme (2): Radiation Monitoring and Assessment

	2019–20 (Actual)	2020–21 (Original)	2020–21 (Revised)	2021–22 (Estimate)
Financial provision (\$m)	42.6	36.8	36.8 (—)	37.2 (+1.1%)
				(or +1.1% on 2020–21 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 2020–21, 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. Implementation of new radiation monitoring and assessment facilities, in particular the high pressure ionization chambers of the Radiation Monitoring Network and the automatic gamma spectrometry system at Ping Chau were successfully completed. The Monitoring and Assessment Centre of HKO was refurbished, with a video wall presentation system installed. Outreach activities such as online public and school talks were conducted to enhance public education. A pilot programme to promote ambient radiation measurement in schools commenced.

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

Target

	Target	2019 (Actual)	2020 (Actual)	2021 (Plan)
data availability of radiation monitoring network (%)	99.0	99.8	99.9	99.6

Indicators

	2019 (Actual)	2020 (Actual)	2021 (Estimate)
exercises and drills	21	21	21
visits to HKO's webpage on radiation	3 359 910	2 415 499	2 400 000

Matters Requiring Special Attention in 2021–22

14 During 2021–22, 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;

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- take forward the enhancement of radiation monitoring and assessment facilities; and
- further promote public education on radiation by implementing school community education programme.

Programme (3): Time Standard and Geophysical Services

	2019–20 (Actual)	2020–21 (Original)	2020–21 (Revised)	2021–22 (Estimate)
Financial provision (\$m)	15.5	26.5	26.5 (—)	20.4 (–23.0%)
				(or –23.0% on 2020–21 Original)

Aim

15 The aim is to maintain the Hong Kong time standard and to 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 2020–21, 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;
- enhancing climate projections to support policy making and action planning of relevant government bureaux/departments;
- conducting online school talks on climate change, providing educational videos, and publishing articles and latest international research findings on global climate change on the HKO website to promote public understanding and awareness of climate change and its impacts;
- launching the “Climate Change Impacts” webpage to illustrate different categories of climate change impacts;
- conducting joint webcast of the partial solar eclipse on 21 June 2020 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 stations through additional sensors and support facilities;
- enriching the “Tidal Information” webpage with data from two additional tide stations at Sai Kung and Chek Lap Kok operated by the Marine Department and AAHK respectively;
- participating as a collaborating partner in the COPE project, an international collaborative effort involving the Hong Kong Jockey Club Disaster Preparedness and Response Institute, the United Nations Office for Disaster Risk Reduction and WMO, which produces a series of books on tropical cyclones and storm surges to enhance disaster resilience of children; and
- replacing an aging caesium beam atomic clock that supported the Hong Kong time service.

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

Targets

	Target	2019 (Actual)	2020 (Actual)	2021 (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	100

Indicators

	2019 (Actual)	2020 (Actual)	2021 (Estimate)
visits to HKO's Internet time service (million).....	35 248	43 642	43 000
requests for geophysical, climatological and oceanographic information and advice	621	628	650

Matters Requiring Special Attention in 2021–22

19 During 2021–22, 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 resilience of the tide stations to better cope with extreme sea level conditions;
- monitor and study climate change issues, 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 and provide improved data in support of the emerging needs of different sectors and government bureaux/departments; and
- conduct outreach activities to promote public understanding of the mitigation, adaptation and resilience-building measures required in combating climate change impacts.

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ANALYSIS OF FINANCIAL PROVISION

	2019–20 (Actual) (\$m)	2020–21 (Original) (\$m)	2020–21 (Revised) (\$m)	2021–22 (Estimate) (\$m)
Programme				
(1) Weather Services	320.3	349.6	349.6	349.1
(2) Radiation Monitoring and Assessment..	42.6	36.8	36.8	37.2
(3) Time Standard and Geophysical Services.....	15.5	26.5	26.5	20.4
	378.4	412.9	412.9 (—)	406.7 (–1.5%)
				(or –1.5% on 2020–21 Original)

Analysis of Financial and Staffing Provision

Programme (1)

Provision for 2021–22 is \$0.5 million (0.1%) lower than the revised estimate for 2020–21. This is mainly due to the decreased requirement for capital expenditure, partly offset by the increased salary provision for a net increase of one post in 2021–22.

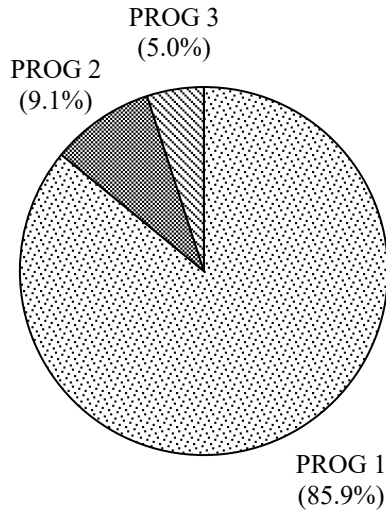
Programme (2)

Provision for 2021–22 is \$0.4 million (1.1%) higher than the revised estimate for 2020–21. This is mainly due to the increased requirement for capital expenditure.

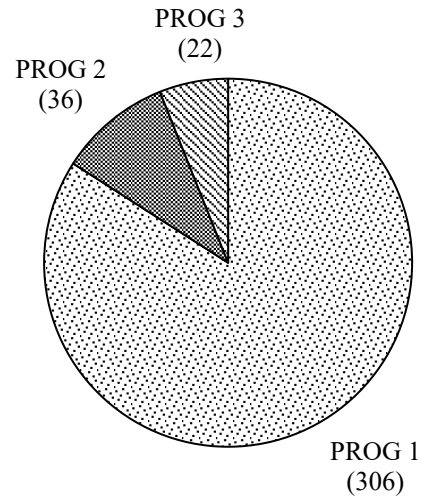
Programme (3)

Provision for 2021–22 is \$6.1 million (23.0%) lower than the revised estimate for 2020–21. This is mainly due to the decreased requirement for capital expenditure.

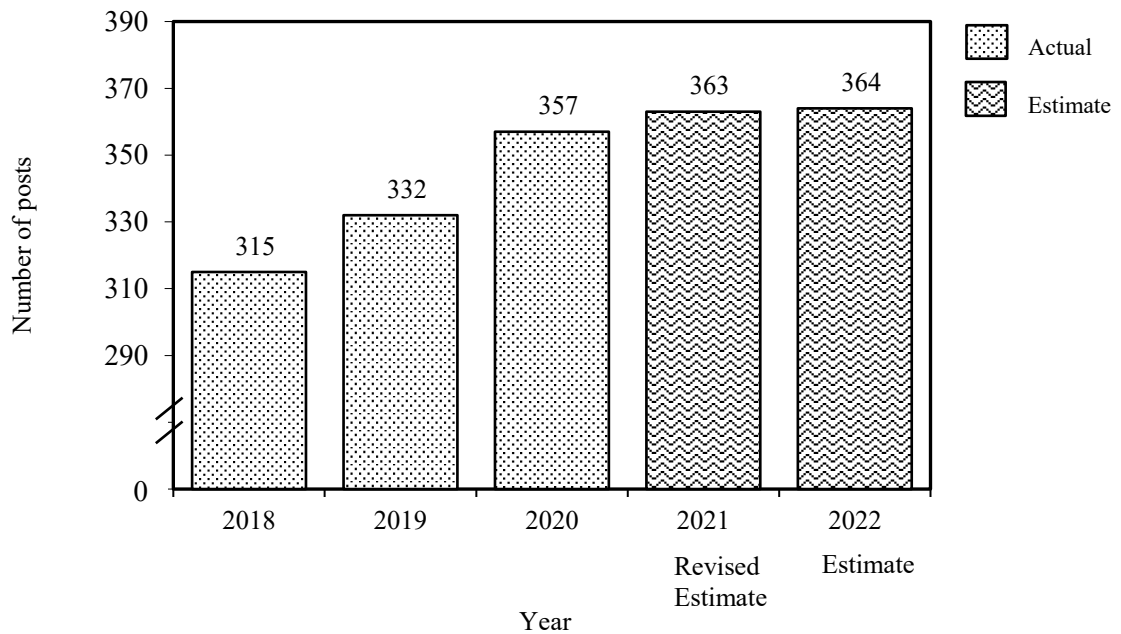
Allocation of provision to programmes (2021-22)



Staff by programme (as at 31 March 2022)



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



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Sub-head (Code)	Actual expenditure 2019–20	Approved estimate 2020–21	Revised estimate 2020–21	Estimate 2021–22	
	\$'000	\$'000	\$'000	\$'000	
Operating Account					
Recurrent					
000	Operational expenses	350,161	373,459	373,459	385,064
	Total, Recurrent.....	350,161	373,459	373,459	385,064
	Total, Operating Account	350,161	373,459	373,459	385,064
Capital Account					
Plant, Equipment and Works					
661	Minor plant, vehicles and equipment (block vote).....	28,225	39,453	39,453	21,642
	Total, Plant, Equipment and Works.....	28,225	39,453	39,453	21,642
	Total, Capital Account.....	28,225	39,453	39,453	21,642
	Total Expenditure	378,386	412,912	412,912	406,706

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Details of Expenditure by Subhead

The estimate of the amount required in 2021–22 for the salaries and expenses of the Hong Kong Observatory is \$406,706,000. This represents a decrease of \$6,206,000 against the revised estimate for 2020–21 and an increase of \$28,320,000 over the actual expenditure in 2019–20.

Operating Account

Recurrent

2 Provision of \$385,064,000 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 2021 will be 363 posts. It is expected that there will be a net increase of one post in 2021–22. Subject to certain conditions, the controlling officer may under delegated power create or delete non-directorate posts during 2021–22, but the notional annual mid-point salary value of all such posts must not exceed \$235,493,000.

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

	2019–20 (Actual) (\$'000)	2020–21 (Original) (\$'000)	2020–21 (Revised) (\$'000)	2021–22 (Estimate) (\$'000)
Personal Emoluments				
- Salaries	221,474	233,294	231,918	244,221
- Allowances	3,023	3,976	5,139	5,195
- Job-related allowances.....	298	683	632	652
Personnel Related Expenses				
- Mandatory Provident Fund contribution	850	856	1,168	1,242
- Civil Service Provident Fund contribution	8,869	10,459	10,411	12,353
Departmental Expenses				
- General departmental expenses	115,538	124,081	124,076	121,286
Other Charges				
- World Meteorological Organization.....	109	110	115	115
	350,161	373,459	373,459	385,064

Capital Account

Plant, Equipment and Works

5 Provision of \$21,642,000 under *Subhead 661 Minor plant, vehicles and equipment (block vote)* represents a decrease of \$17,811,000 (45.1%) against the revised estimate for 2020–21. This is mainly due to the decreased requirement for capital expenditure.