

Head 168 — HONG KONG OBSERVATORY

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

Estimate 2018–19 **\$338.5m**

Establishment ceiling 2018–19 (notional annual mid-point salary value) representing an estimated 310 non-directorate posts as at 31 March 2018 rising by 17 posts to 327 posts as at 31 March 2019..... **\$189.9m**

In addition, there will be an estimated five directorate posts as at 31 March 2018 and as at 31 March 2019.

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

| | 2016–17 (Actual) | 2017–18 (Original) | 2017–18 (Revised) | 2018–19 (Estimate) |
|---------------------------|---------------------|-----------------------|----------------------|------------------------------------|
| Financial provision (\$m) | 255.1 | 258.9 | 258.9 (—) | 290.3 (+12.1%) |
| | | | | (or +12.1% on 2017–18 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, 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 2017–18, HKO fulfilled its performance pledge of issuing at least one bulletin every hour of the day, disseminating 99 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 total number of page views of the HKO website and mobile weather application “MyObservatory” continued to rise and reached a record high of 167 billion in 2017.

5 The provision of weather information was enhanced in 2017–18 to meet the needs of the public through:

- launching a trial version of “extended outlook” forecast service to provide: (i) probability forecast of daily minimum and maximum temperatures for the next 14 days and (ii) “Tropical Cyclone Track Probability Forecast” up to nine days ahead on the HKO website and the “MyObservatory” application;
- enhancing the lightning location information system and launching the “Hong Kong lightning nowcast” service on the HKO website;
- enhancing the Hong Kong Heat Index (HKHI) information service by providing real-time data collected at Beas River in Sheung Shui, in addition to the data collected at King’s Park;
- enriching regional weather information on the HKO website to provide additional data from a new wind station at Tap Mun and weather photos taken at Clear Water Bay;
- revamping the “Aviation Sports” webpage with additional forecast and enhanced presentation for aviation sport users;
- enriching the mobile version of the HKO website and the “MyObservatory” application with more varieties of higher-resolution satellite imageries and enhancing readability of the mobile website;
- enriching the “Met on Map” service, a one-stop service hub powered by a Geographic Information System platform, with new weather information including HKHI and higher-resolution satellite imageries; and
- revamping the “World Weather Information Service” website and its application “MyWorldWeather” to include more content such as current weather, times of sunrise/sunset and global satellite imageries.

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 2017–18, the Airport Meteorological Office was relocated to the North Tower to make way for the renovation and installation of new/upgraded meteorological facilities in the South Tower. Special briefing service was provided to the Airport Authority Hong Kong for the evacuation of construction vessels from the Three-Runway System (3RS) project work area during the approach of tropical cyclones. Hong Kong’s fleet of automatic aircraft observation further expanded to 38 aircraft.

7 Other noteworthy activities for 2017–18 include:

- conducting studies on topics related to tropical cyclone activities and extreme weather events, including the storm surge brought by Super Typhoon Hato;
- developing a new generation of urban weather station “Community Weather Information Network” (Co-WIN) 2.0 and launching it for trial at the Zero Carbon Building;
- obtaining the International Organization for Standardization (ISO) 9001:2015 accreditation for the provision of automatic wind measurement services of the tropical cyclone signal reference stations and the provision of upper-air observation services;
- enhancing the provision of flight-specific meteorological information to pilots through the soft-launch of the “Electronic Flight Bag” application on iOS platform;
- enhancing marine meteorological observations over the South China Sea by deploying drifting buoys and upgraded equipment on board Hong Kong Voluntary Observing Ships (VOS), and developing a new webpage for the sharing of weather photos taken by crew members on board Hong Kong VOS;
- signing an agreement to strengthen co-operation in aviation meteorological services and meteorological data exchange with Thai Meteorological Department;
- launching the online version of the updated “International Cloud Atlas” of the World Meteorological Organization (WMO) for use by the general public and the media worldwide;
- launching the first e-book of HKO, “Cloud Appreciation by Dr Tin”, for public education on clouds and special optical phenomena;
- launching a crowdsourcing campaign “Cloud-sourcing 2018” through the Co-WIN “Community Weather Observing Scheme” platform for the collection and sharing of weather photos from members of the public, aviation and marine communities;
- jointly organising with the Senior Citizen Home Safety Association two Cloud Appreciation Workshops in May 2017 to promote cloud observation knowledge;
- organising public education and outreach events for the 100th anniversary of the numbered tropical cyclone signal system, including producing a special series of educational videos on typhoon hazards and offering public guided tours to the refurbished Cheung Chau meteorological station; and
- organising a number of educational events and outreach activities engaging young people and students through the Science in Public Service Campaign and Co-WIN, including the “Weather Observation and Weather Photos Competition”, workshops on building community weather station as well as various scientific and public talks.

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

Targets

| | Target | 2016 (Actual) | 2017 (Actual) | 2018 (Plan) |
|---|--------|------------------|------------------|----------------|
| forecasts perceived as accurate by the public (%)# | 78 | 74 | 77 | 78 |
| accurate public forecasts as verified by objective means (%) | 88 | 89 | 92 | 90 |
| accurate forecasts as assessed by ship captains (%) | 96 | 98 | 98 | 96 |
| accurate forecasts as assessed by airline operators (%) | 96 | 100 | 99 | 98 |
| hourly local weather reports disseminated within the first ten minutes of each hour (%) | 99 | 99 | 99 | 99 |

Indicators

| | 2016 (Actual) | 2017 (Actual) | 2018 (Estimate) |
|---|------------------|------------------|--------------------|
| calls answered by the Dial-a-Weather system (million)# | 10.2 | 8.4 | 8.0 |
| telephone enquiries answered manually# | 20 563 | 21 169 | 19 000 |
| visits to the HKO website (billion)^ | 105 | 167 | 160 |
| companies and organisations subscribing to special weather and warning services | 107 | 106 | 106 |
| total revenue from the above subscribers (\$m) | 0.7 | 0.7 | 0.7 |
| media interviews and public lectures/talks on weather# | 2 023 | 1 653 | 1 400 |
| meteorological documents for flights departing Hong Kong | 209 000 | 213 000 | 215 000 |
| visits to the aviation weather information system (million)..... | 147.4 | 183.2 | 200.0 |

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.

Matters Requiring Special Attention in 2018–19

9 During 2018–19, HKO will:

- continue to provide weather forecasts, regional weather services and extended weather outlook, and conduct research and enhance forecasting and warning services on high-impact weather;
- update the precautionary announcements in tropical cyclone warning bulletins to strengthen public awareness of and preparedness for the impact of tropical cyclones;
- strengthen efforts in outreach and public educational activities to enhance public awareness of and preparedness for natural disasters and impact of climate change;
- commission the “Asian Aviation Meteorological Centre” jointly established with the Civil Aviation Administration of China and the China Meteorological Administration, with a view to providing the Asian region with high-quality enroute hazardous weather information;
- continue to take forward the implementation of meteorological facilities in support of the 3RS project;
- conduct a wake vortex measurement study at HKIA with a view to collecting meteorological information to support the airport in increasing runway capacity;
- continue to enhance marine meteorological observations and the provision of weather information to the marine community;
- acquire a satellite data reception and processing system to receive satellite data from the new generation of Chinese “Feng Yun Satellites”;
- continue to develop social media services for the communication of weather information, forecasts and warnings;
- continue to enrich the content of the “MyObservatory” application;
- continue to enhance the “Met on Map” service with more weather and geophysical information;
- continue to enhance the automatic weather station network for the provision of more weather information;

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- develop a one-stop-shop webpage for WMO to aggregate global official and authoritative alerts of hazards to aid global decision makers in disaster risk reduction; and
- further promote the public awareness of HKO's weather services and the relevant latest developments by making use of outreach events and activities celebrating the 135th anniversary of HKO.

Programme (2): Radiation Monitoring and Assessment

| | 2016–17 (Actual) | 2017–18 (Original) | 2017–18 (Revised) | 2018–19 (Estimate) |
|---------------------------|---------------------|-----------------------|----------------------|------------------------------------|
| Financial provision (\$m) | 30.1 | 32.1 | 32.1 (—) | 35.3 (+10.0%) |
| | | | | (or +10.0% on 2017–18 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 2017–18, all radiation monitoring and assessment work in this programme was carried out satisfactorily. All equipment was maintained in a state of readiness, highlighted by the successful certification and annual surveillance audits under ISO 9001 framework for the radiation laboratory and the ambient gamma radiation level measurement service. Inter-comparisons between Hong Kong and Guangdong on radiological measurements continued. Exercises, drills and training on radiation monitoring and assessment were conducted. HKO also participated in the government-wide Daya Bay Contingency Plan exercise in December 2017. New radiation monitoring and assessment facilities, in particular the second radiological survey vehicle, an online gamma spectroscopic analyser network and a mobile version of the emergency radiation data management system, were put into use for enhancing emergency preparedness and response capability. In-house produced video clips on radiation and nuclear emergency preparedness were launched on “Cool Met Stuff” channel on the HKO website. Outreach activities such as public and school talks and exhibitions were also conducted to promote public education.

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

Target

| | Target | 2016 (Actual) | 2017 (Actual) | 2018 (Plan) |
|--|--------|------------------|------------------|------------------------|
| data availability of radiation monitoring network (%)..... | 99.0 | 99.7 | 99.8 | 99.5 |

Indicators

| | 2016 (Actual) | 2017 (Actual) | 2018 (Estimate) |
|---|------------------|------------------|----------------------------|
| exercises and drills..... | 20 | 22 | 20 |
| visits to HKO's webpage on radiation..... | 1 906 176 | 2 280 794 | 1 900 000 |

Matters Requiring Special Attention in 2018–19

14 During 2018–19, 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, and
- take forward the enhancement of radiation monitoring and assessment facilities.

Programme (3): Time Standard and Geophysical Services

| | 2016–17 (Actual) | 2017–18 (Original) | 2017–18 (Revised) | 2018–19 (Estimate) |
|---------------------------|---------------------|-----------------------|----------------------|-----------------------------------|
| Financial provision (\$m) | 12.8 | 12.1 | 12.1 (—) | 12.9 (+6.6%) |
| | | | | (or +6.6% on 2017–18 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 departments on the likely implications. The work involves:

- maintaining a caesium beam atomic clock 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 2017–18, the objectives and targets of this programme were generally met through the following achievements and activities:

- conducting school talks on climate change and producing education videos to promote public understanding and awareness of climate change and its impacts;
- collaborating with the Radio Television Hong Kong to produce and broadcast a 13-episode series of live radio programme “Climate Watcher”;
- enhancing the international recognition of HKO’s work by securing WMO’s recognition of HKO headquarters as a “Centennial Observing Station” for long-term climate monitoring;
- enhancing climate projections for Hong Kong by publishing the wet-bulb temperature projection for the 21st century;
- presenting the science of climate change at the “Climate Change and My Smart City” Experience Centre and the “Zero Carbon Fun Fair” in support of the World Environment Day;
- increasing the resilience of the tide stations through addition of new sensors and enhancing station facilities;
- enhancing the monitoring of crustal movement by making use of data obtained from a “Global Navigation Satellite System” jointly set up by HKO and Lands Department at the Tai Po Kau Tide Station;
- participating in the Pacific-wide Tsunami Exercise “PacWave17” organised by the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization;

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- organising an earthquake detector design competition with the University of Hong Kong and the Hong Kong Meteorological Society;
- replacing the caesium beam atomic clock for maintaining the Hong Kong time standard;
- launching a mobile webpage on “Astronomy & Calendar” to provide quick access to coming major astronomical events, latest sky image and dates and times for the 24 Solar Terms;
- conducting a joint webcast of the partial lunar eclipse on 7 to 8 August 2017 with the Hong Kong Space Museum, the Ho Koon Nature Education cum Astronomical Centre, the Po Leung Kuk Ngan Po Ling College and the Hong Kong Sheng Kung Hui Solar Tower, attracting more than 80 000 page views; and
- enhancing public education on geophysical and climatological information through an exhibition on the historical archived records of HKO held jointly with the Government Records Service.

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

Targets

| | Target | 2016 (Actual) | 2017 (Actual) | 2018 (Plan) |
|---|--------|------------------|------------------|------------------------|
| time standard accuracy (microseconds per day) | 0.1 | 0.1 | 0.1 | 0.1 |
| geophysical, meteorological and oceanographic data capture rate (%) | 99 | 99 | 100 | 99 |
| climatological information (% of written requests responded to within ten working days) | 99 | 100 | 100 | 100 |

Indicators

| | 2016 (Actual) | 2017 (Actual) | 2018 (Estimate) |
|---|------------------|------------------|----------------------------|
| visits to HKO’s Internet time service (million)..... | 25 041 | 25 634 | 26 000 |
| requests for geophysical, climatological and oceanographic information and advice | 774 | 802 | 800 |

Matters Requiring Special Attention in 2018–19

19 During 2018–19, HKO will continue to:

- undertake and support monitoring and assessment of earthquake, tsunami risk and sea level in the region;
- continue to increase the resilience of the tide stations to better cope with extreme sea level conditions;
- engage various stakeholders in promoting the effective use of climate information and in developing climate-related services in support of the emerging needs of different sectors and government bureaux/departments;
- monitor and study climate change issues, provide the latest climate change information and assessment, and develop new methodology for the projection of likely impacts on Hong Kong; and
- develop educational initiatives and support outreach activities to promote the understanding of the mitigation, adaptation and resilience-building measures required in combating climate change impacts.

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ANALYSIS OF FINANCIAL PROVISION

| | 2016–17 (Actual) (\$m) | 2017–18 (Original) (\$m) | 2017–18 (Revised) (\$m) | 2018–19 (Estimate) (\$m) |
|---|------------------------------|--------------------------------|-------------------------------|--|
| Programme | | | | |
| (1) Weather Services..... | 255.1 | 258.9 | 258.9 | 290.3 |
| (2) Radiation Monitoring and Assessment..... | 30.1 | 32.1 | 32.1 | 35.3 |
| (3) Time Standard and Geophysical Services | 12.8 | 12.1 | 12.1 | 12.9 |
| | 298.0 | 303.1 | 303.1 (—) | 338.5 (+11.7%) |
| | | | | (or +11.7% on 2017–18 Original) |

Analysis of Financial and Staffing Provision

Programme (1)

Provision for 2018–19 is \$31.4 million (12.1%) higher than the revised estimate for 2017–18. This is mainly due to the net increase of 17 posts in 2018–19, increased operating expenses and increased requirement for capital expenditure.

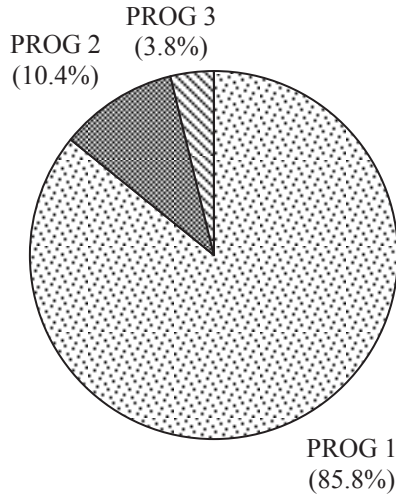
Programme (2)

Provision for 2018–19 is \$3.2 million (10.0%) higher than the revised estimate for 2017–18. This is mainly due to increased operating expenses and increased requirement for capital expenditure.

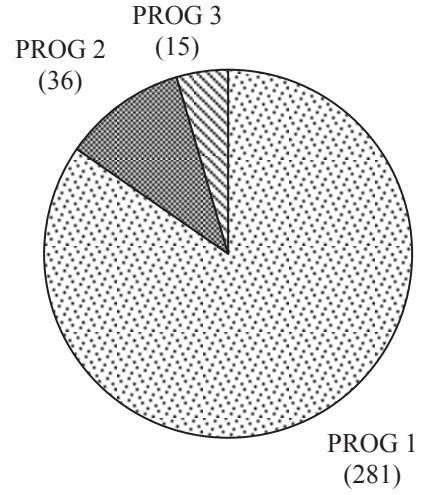
Programme (3)

Provision for 2018–19 is \$0.8 million (6.6%) higher than the revised estimate for 2017–18. This is mainly due to increased operating expenses.

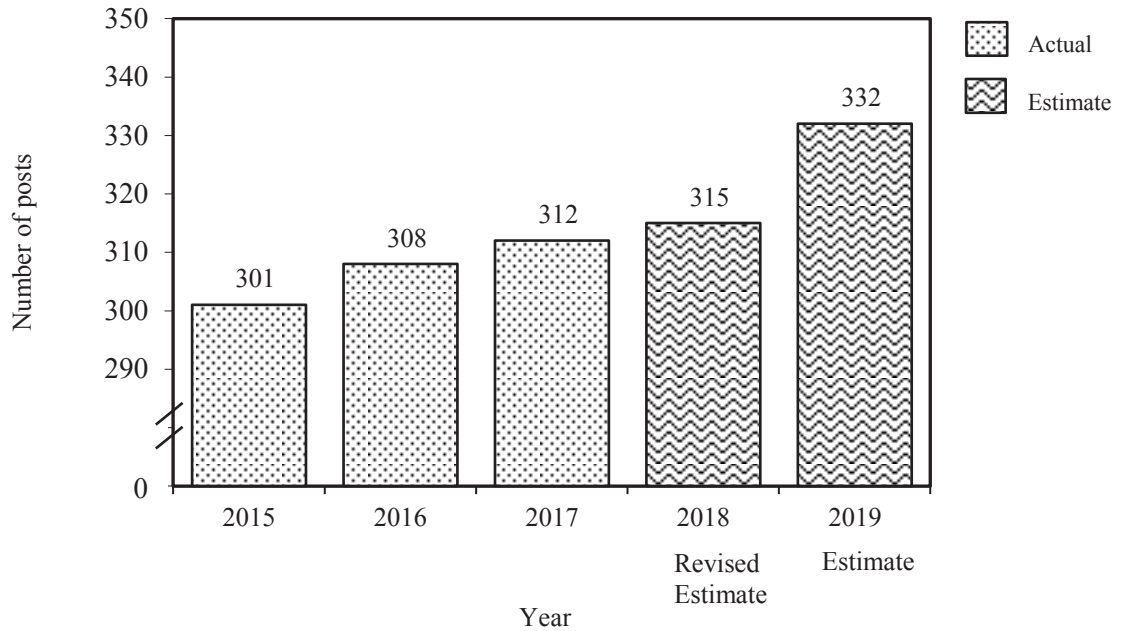
Allocation of provision to programmes (2018-19)



Staff by programme (as at 31 March 2019)



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



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| Sub-head (Code) | Actual expenditure 2016–17 | Approved estimate 2017–18 | Revised estimate 2017–18 | Estimate 2018–19 | |
|----------------------------|--|---------------------------------|--------------------------------|---------------------|----------------|
| | \$'000 | \$'000 | \$'000 | \$'000 | |
| Operating Account | | | | | |
| Recurrent | | | | | |
| 000 | Operational expenses | 286,806 | 291,762 | 291,762 | 318,188 |
| | Total, Recurrent..... | 286,806 | 291,762 | 291,762 | 318,188 |
| | Total, Operating Account | 286,806 | 291,762 | 291,762 | 318,188 |
| Capital Account | | | | | |
| Plant, Equipment and Works | | | | | |
| 661 | Minor plant, vehicles and equipment (block vote)..... | 11,238 | 11,321 | 11,321 | 20,351 |
| | Total, Plant, Equipment and Works..... | 11,238 | 11,321 | 11,321 | 20,351 |
| | Total, Capital Account..... | 11,238 | 11,321 | 11,321 | 20,351 |
| | Total Expenditure | 298,044 | 303,083 | 303,083 | 338,539 |

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Details of Expenditure by Subhead

The estimate of the amount required in 2018–19 for the salaries and expenses of the Hong Kong Observatory is \$338,539,000. This represents an increase of \$35,456,000 over the revised estimate for 2017–18 and \$40,495,000 over the actual expenditure in 2016–17.

Operating Account

Recurrent

2 Provision of \$318,188,000 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 2018 will be 315 posts. It is expected that there will be a net increase of 17 posts in 2018–19. Subject to certain conditions, the controlling officer may under delegated power create or delete non-directorate posts during 2018–19, but the notional annual mid-point salary value of all such posts must not exceed \$189,926,000.

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

| | 2016–17 (Actual) (\$'000) | 2017–18 (Original) (\$'000) | 2017–18 (Revised) (\$'000) | 2018–19 (Estimate) (\$'000) |
|---|---------------------------------|-----------------------------------|----------------------------------|--|
| Personal Emoluments | | | | |
| - Salaries..... | 191,771 | 198,566 | 196,519 | 208,405 |
| - Allowances..... | 1,649 | 1,874 | 1,748 | 2,048 |
| - Job-related allowances..... | 452 | 488 | 787 | 655 |
| Personnel Related Expenses | | | | |
| - Mandatory Provident Fund contribution..... | 545 | 398 | 619 | 788 |
| - Civil Service Provident Fund contribution..... | 5,082 | 6,478 | 6,125 | 7,414 |
| Departmental Expenses | | | | |
| - General departmental expenses | 87,197 | 83,848 | 85,857 | 98,768 |
| Other Charges | | | | |
| - World Meteorological Organization..... | 110 | 110 | 107 | 110 |
| | 286,806 | 291,762 | 291,762 | 318,188 |

Capital Account

Plant, Equipment and Works

5 Provision of \$20,351,000 under *Subhead 661 Minor plant, vehicles and equipment (block vote)* represents an increase of \$9,030,000 (79.8%) over the revised estimate for 2017–18. This is mainly due to the increased requirement for new and replacement equipment.