立法會
Legislative Council

LC Paper No. CB(1)321/2024(06)

Ref.: CB1/PL/EA

Panel on Environmental Affairs

Meeting on 25 March 2024

Background brief on forecasting and coping with extreme weather

Purpose

This paper provides background information on forecasting and coping with extreme weather in Hong Kong. It also summarizes the major views and concerns expressed by Members when related issues were discussed by the relevant committees of the Legislative Council ("LegCo") in recent years.

Background

Weather monitoring

2. As the meteorological authority in Hong Kong, the Hong Kong Observatory ("HKO") is 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. Such work involves:

(a) operating a network of mostly automated weather stations;

(b) carrying out real-time exchange of data with meteorological centres in the world;

(c) receiving meteorological satellite imageries, and operating weather radar systems and other meteorological instruments;

(d) analysing meteorological data and computing the future weather by numerical modelling, and application of artificial intelligence and big data;

(e) disseminating weather information by a diversity of means;

(f) 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

(g) conducting public talks, interviews and training courses as well as producing TV weather programmes and educational materials on hazardous weather phenomena.

Supersite for Greater Bay Area air quality laboratory and meteorology monitoring

3. As announced in the 2022 Policy Address, to strengthen collaboration among Guangdong, Hong Kong and Macao in the Greater Bay Area ("GBA") in combating climate change as well as joint prevention and control of air pollution, the Administration is preparing to set up a supersite for GBA air quality laboratory and meteorology monitoring ("the Supersite") in Hong Kong to provide regional air pollution and meteorological monitoring and forecasting services. [1]

4. Equipped with international state-of-the-art equipment, the Supersite is aimed to enhance Hong Kong's capability in, among others, forecasting extreme weather and related risks exacerbated by climate change. At the same time, the Supersite will be the site of "Guangdong-Hong Kong-Macao Greater Bay Area Meteorological Monitoring and Warning Centre (HK)" to enhance the meteorological services to GBA in implementing Hong Kong's work under the Meteorological Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area (2020-2035).[2]

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[1] The Administration sought funding for the procurement of equipment and computers of the Supersite through the Appropriation Bill 2023. Funding approval for the construction of the Supersite has not yet been sought.

[2] The China Meteorological Administration promulgated the Meteorological Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area (2020-2035) on 29 April 2020 to further strengthen meteorological co-operation among Guangdong, Hong Kong and Macao, involving areas such as meteorological data sharing, meteorological scientific research and innovation, and training of meteorological personnel.

Dissemination of weather information

5. HKO disseminates weather information, forecasts and warnings on hazardous weather to the public through various channels, including HKO's website (https://www.hko.gov.hk), mobile app "MyObservatory", the 187 8200 Dial-a-Weather service, press, radio, TV, as well as social-networking platforms such as Weibo, WeChat, YouTube, X, Facebook and Instagram.

6. To meet the needs of the public, HKO has been enhancing the provision of weather information through:

(a) enhancing the Very Hot Weather Warning service with a revised set of precautionary actions and a new Special Weather Tips message to alert the general public of extremely hot weather through various channels;

(b) enriching the "MyObservatory" with forecast traffic conditions of strategic/major roads in Hong Kong;

(c) enriching the "Earth Weather" on HKO website and "MyObservatory" by adding weather forecast products based on artificial intelligence-based prediction models and sea current forecasts, as well as extending forecast range up to 15 days;

(d) further enhancing the "Automatic Regional Weather Forecast in Hong Kong & Pearl River Delta Region" service with observations and automatic weather forecasts at newly added urban-scale meteorological monitoring stations; and

(e) exploring better utilization of technologies such as big data and artificial intelligence to further enhance the risk assessment capability of government departments on hazards such as flooding in the event of extreme weather conditions.

Emergency response to super typhoons

7. After the onslaught of Super Typhoon Mangkhut in Hong Kong in September 2018, the Administration had conducted an inter-departmental review of the handling mechanism to improve Hong Kong's preparedness for, emergency response to, and recovery from future super typhoons or other natural disasters of a substantial scale. One of the new measures requires that a high-level inter-departmental Steering Committee chaired by the Chief Secretary for

Administration ("the Steering Committee") will be set up, as and when necessary, to oversee the work of relevant bureaux and departments ("B/Ds") and to set priorities in a coordinated manner. Should a super typhoon or other natural disasters of a substantial scale cause damages that paralyse the city and seriously affect the working public to resume work, the Chief Secretary for Administration, having regard to the views of the Steering Committee, may make a territory-wide "Extreme Conditions" announcement to extend the time for resumption of work so as to minimize possible injuries to members of the public.

Hong Kong's Climate Action Plan 2050

8. Like other coastal cities, Hong Kong is prone to the impacts of climate change. The mean sea level in Victoria Harbour went up at a rate of 31 mm per decade from 1954 to 2020 on average. Over the past century or so, the number of very hot days in Hong Kong increased by more than 7 times, and the number of hot nights increased by more than 38 times. Hong Kong is also facing more severe tropical cyclone threats caused by extreme weather. The Administration considers it necessary to adopt a comprehensive strategy to protect the life, health and property of the people from extreme weather and strengthen the resilience of the community.

9. The Administration published Hong Kong's Climate Action Plan 2050 in October 2021, which set out four major decarbonization strategies, namely "net-zero electricity generation", "energy saving and green buildings", "green transport" and "waste reduction", as well as specific targets and implementation timetables and roadmaps. According to this Action Plan, the Administration will undertake measures to enhance Hong Kong's adaptation and resilience to climate change, including strengthening coastal defences, stabilizing slopes and conducting drainage improvement works, etc.[3]

10. To effectively implement various carbon reduction measures and climate actions, the Environment and Ecology Bureau set up a new Office of Climate Change and Carbon Neutrality in January 2023 to strengthen co-ordination and promote deep decarbonization.

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[3] For details, please refer to Chapter 5 "Climate Change Adaption and Resilience" of the Hong Kong's Climate Action Plan 2050.

Major views and concerns expressed by Members

11. Issues relating to forecasting and coping with extreme weather were brought up at the meetings of the Panel on Environmental Affairs ("EA Panel"),[4] and during examination of the Estimates of Expenditure in recent years. Emergency responses to typhoons and natural disasters had been discussed by other committees/Panels in recent years.[5] Members' major views and concerns are summarized in the ensuing paragraphs.

Forecasting and coping with extreme weather conditions

12. Referring to the underestimation of the severity of the cold weather in HKO's forecast in late January 2016 when Hong Kong experienced the coldest day in the then past 59 years, the extensive damage caused by Super Typhoon Mangkhut to Hong Kong in September 2018, and the severe impact of the once-in-500-years event of torrential rain and flooding in September 2023, Members expressed concerns about the challenges posed by extreme weather conditions due to climate change and urged the Administration to:

(a) enhance the accuracy of weather forecasts, with a view to reducing loss of life and damage to property, and minimizing disruption to economic and social activities during hazardous weather;

(b) enhance the timeliness of dissemination of weather information and related messages;

(c) scale up Hong Kong's capability in coping with extreme weather conditions;

(d) increase public awareness of extreme weather risks; and

(e) review and improve the relevant designs of government buildings and public infrastructure facilities (e.g. drainage systems).

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[4] Issues relating to weather information services, which were formerly within the purview of the Panel on Economic Development of LegCo, are now under the purview of EA Panel after the terms of reference of the two Panels were amended in October 2022.

[5] For instance, the Panel on Security discussed "Government's preparedness for the approach of typhoon season and related natural disasters and emergency response" at the meeting on 5 June 2018. On 4 October 2018, the House Committee discussed "The Government's preparations, emergency response and recovery efforts arising from Super Typhoon Mangkhut". Issues arising from the torrential rain and flooding in September 2023 were brought up at the meeting of the Panel on Development during discussion of "Capital Works Reserve Fund block allocations for 2024-2025" on 13 December 2023.

13. The Administration advised that extreme weather events, which had become more frequent due to global climate change, could result in deviations of the weather forecasts from the actual outturns. HKO had drawn experience from the cold weather event in January 2016, with a view to enhancing its forecasting techniques to meet the challenges of more extreme weather conditions brought by climate change, such as by including more specific contents and wording in its Cold Weather Warnings, and providing more detailed information on regional temperatures. The Administration would also strengthen analysis on climate change and promotion of disaster preparedness to enhance the city's resilience against climate change.

14. The Administration further advised that HKO would explore the use of new weather prediction models to enhance the accuracy and/or frequency of weather forecasts, and continue to enhance the dissemination of information on adverse weather conditions to the public. In collaboration with the Drainage Services Department, HKO was also studying the use of meteorological forecasts and big data to predict flooding risks in the territory, so as to facilitate flood warning and manpower deployment. The Administration's plan was to complete the first phase of the study in 2024 and put into place trial measures by the next rainy season.

15. As regards how far the Supersite would enhance HKO's weather forecasting capability, the Administration pointed out that HKO endeavoured to advance the time of issuing warnings, and reduce the false alarm rate of warnings for severe weather such as thunderstorm and rainstorm. As weather forecast accuracy was affected by many factors and extreme weather events had become more frequent due to climate change, it was difficult to quantify how the Supersite would enhance HKO's weather forecasting capability.

Dissemination of information on extreme conditions

16. Members enquired about the Administration's mechanism to make an "Extreme Conditions" announcement and disseminate alerts about natural disasters to members of the public through the Emergency Alert System ("EAS").[6]

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[6] The Government launched EAS in November 2020 to enable B/Ds to disseminate time-critical public announcements and messages to mobile service users during unforeseen emergency situations that might cause territory-wide/large-scale outage of critical infrastructure or extensively endanger lives and properties.

17. The Administration advised that:

(a) it had developed a dynamic and proactive disaster management strategy to address actions required before, during and after a disaster as well as post-disaster review, and had also set out the duties of all relevant B/Ds so that they could work in close partnership according to the contingency plan. Every year before the typhoon season, the Security Bureau organized an interdepartmental exercise to enhance the collaboration of B/Ds and other parties concerned in handling possible emergency situations if Hong Kong was struck by a typhoon;

(b) in the event of super typhoons or other natural disasters of a substantial scale, the Emergency Monitoring and Support Centre of the Security Bureau, together with relevant B/Ds, would assist the Steering Committee in assessing the impact the natural disasters might have on Hong Kong. In the event of extreme and widespread impact, such as large-scale power outage, extensive flooding, major landslides and serious obstruction of public transport services, the Steering Committee would consider making the "Extreme Conditions" announcement. Furthermore, following the passage of a typhoon, if there were factors that would seriously affect the working public to resume work effectively for a prolonged period, "Extreme Conditions" announcement might be made to advise the public to remain at safe places; and

(c) according to the established mechanism, under truly justified emergency situations, B/Ds might, after obtaining the approval of the relevant Director of Bureau (and also the Chief Secretary for Administration in the case of "Extreme Emergency Alert"), disseminate EAS Messages through the EAS terminals as far as practicable so as to facilitate members of the public to take immediate responsive actions.

18. In view of the extensive flooding taken place in September 2023 due to severe rainstorm, Members enquired about the progress of implementing the village sewerage programme in the New Territories; and whether short-term measures would be taken to alleviate the flooding problem in Wong Tai Sin, a district that experienced multiple floods due to the said rainstorm and bursting of drainage pipes.

19. The Administration advised that the village sewerage programme in the New Territories covered about 580 villages, of which the sewerage systems for about 270 villages had been completed and that for the remaining villages were under construction. As at June 2023, the sewerage systems in Sha Tin, Tai Po, Sai Kung, Tsuen Wan, Islands, North and most of Yuen Long (about 96%) districts had been completed. For rural areas which were not covered by the village sewerage programme in the New Territories, the Administration would consult local residents and other stakeholders on proposals for improving the sewerage service in due time. The Administration would review afresh the priority of drainage works in Wong Tai Sin and submit to LegCo the funding proposals for larger drainage improvement projects as soon as possible. Smaller drainage projects would also be implemented as soon as possible to address localized flooding problems.

Council questions

20. Members raised questions related to forecasting and coping with extreme weather in recent years. The questions and the Administration's replies are hyperlinked in the **Appendix**.

Latest development

21. At the meeting of EA Panel on 25 March 2024, the Administration will report the latest measures to enhance its capability of forecasting and coping with extreme weather.

Relevant papers

22. A list of relevant papers is set out in the **Appendix.**

Council Business Division 1 and Public Complaints Office
Legislative Council Secretariat
21 March 2024

Appendix

Forecasting and coping with extreme weather

List of relevant papers

Committee	Date of Meeting	Paper
Panel on Environmental Affairs	30 January 2023	Agenda Item IV: Establishing a Guangdong-Hong Kong-Macao Greater Bay Area air quality laboratory and meteorological monitoring supersite in Hong Kong Minutes
	30 October 2023	Agenda III: Briefing by the Secretary for Environment and Ecology on the Chief Executive's 2023 Policy Address Minutes
Panel on Security	5 June 2018	Agenda Item VI: Government's preparedness for the approach of typhoon season and related natural disasters and emergency response Minutes
Panel on Development	13 December 2023	Agenda Item II: Capital Works Reserve Fund block allocations for 2024-2025 Minutes
House Committee	4 October 2018	Agenda Item I: The Government's preparations, emergency response and recovery efforts arising from Super Typhoon Mangkhut Minutes
Finance Committee	14 April 2021	Administration's written replies to Members' initial questions on the Estimates of Expenditure 2021-2022 (Reply serial numbers: CEDB(CIT)223, 224, 225, 226 and 227)
	13 April 2023	Administration's written replies to Members' initial questions on the Estimates of Expenditure 2023-2024 (Reply serial numbers: EEB(E)186, 187, 188, 189 and 190)

Government bureau	Document
Environment and Ecology Bureau	Hong Kong's Climate Action Plan 2050

Council meeting	Paper
18 October 2023	Council question 10: Measures to cope with extreme conditions
1 November 2023	Council question 11: Public transport services under adverse weather conditions