

Study of Coastal Hazards under Climate Change and Extreme Weather and Formulation of Improvement Measures – Feasibility Study

PURPOSE

This paper aims to brief Members on the findings of “Study of Coastal Hazards under Climate Change and Extreme Weather and Formulation of Improvement Measures – Feasibility Study”.

INTRODUCTION

2. The geographical position of Hong Kong makes it susceptible to adverse weather-related threats such as tropical cyclones, rainstorms, storm surges¹ and overtopping waves². In particular, some coastal low-lying and windy locations are vulnerable to sea water inundation caused by extreme storm surges and overtopping waves, and have the facilities situated near the seaside damaged as a result. It is anticipated that the intensifying climate change, particularly the rising sea level, may result in stronger wave attack and more severe coastal flooding.

3. The Civil Engineering and Development Department (CEDD) engaged consultants who completed a “Study of Coastal Hazards under Climate Change and Extreme Weather and Formulation of Improvement Measures – Feasibility Study” (“the Study”) in end 2021. The Study comprehensively reviewed the situation of the coastal low-lying or windy locations, and investigated storm surges and waves in order to assess the impacts of extreme

¹ Storm surge is a rise of sea level due to combined effects of low atmospheric pressure and high wind associated with tropical cyclones.

² During the passage of tropical cyclones, waves approaching shores may surpass the coping level of seawall forming “overtopping wave”.

weather and climate change on these locations. The Executive Summary and Final Report of the Study were uploaded to CEDD's website on 7 April 2022 and 30 May 2022 respectively.

STRATEGY FOR ADAPTING TO COASTAL RISKS

4. Considering the uncertainties in the magnitude of future climate change particularly towards the end of century and global actions among nations on reducing greenhouse gas (GHG) emissions, there is insignificant difference in sea level rise projection under intermediate GHG and very high GHG concentration scenarios established in the Intergovernmental Panel on Climate Change (IPCC) in mid-century whereas the difference is increasing significantly as time towards the end of century. The Study has adopted a progressive adaptive approach to formulate climate adaptation measures for coastal low-lying and windy locations. This approach is to be flexible and adaptive enough that they can be changed or updated as conditions change or if impacts due to climate change are different from that anticipated.

5. Nations have committed to take actions to reduce GHG emissions and implement climate mitigation as pledged under the Paris Agreement and the 26th UN Climate Change Conference of the Parties meeting. Under the progressive adaptive approach, intermediate GHG concentration scenario has been adopted to focus on devising enhancement measures up to mid-century (2050), and closely monitor long-term climate change projection. Depending on the development of the long-term climate change, the Government could review in a timely manner whether modification (by means of heightening or strengthening) of the coastal structures concerned or larger-scale coastal protection measures have to be taken to deal with the coastal risks in end of century. The progressive adaptive approach is illustrated in **Annex 1**.

IDENTIFICATION OF COASTAL AREAS TO BE ENHANCED

6. The Study has analyzed the potential risks at coastal areas of Hong Kong under extreme weather up to 2050 with due consideration to coastal flooding and damage due to sea level rise, storm surges as well as overtopping waves.

7. Following risk management approach, we first deal with those locations susceptible to higher risk with greater consequence. Most people will stay at home when typhoon strikes. Also making reference to the records of coastal damage posed by super typhoon attacks in the past, we have identified 26 coastal low-lying or windy residential areas more vulnerable to higher potential risks for implementation of improvement works and management measures to safeguard public safety (See **Annex 2**). Two identified residential areas namely (i) Kennedy Town, Sai Ying Pun and Sheung Wan, and (ii) Lei Yue Mun (Ma Wan Tsuen, Sam Ka Tsuen) fall within Harbourfront Areas.

MULTI-LAYERED ENHANCEMENT MEASURES

8. The Study has taken into account factors including cost-effectiveness, site constraints, impact on navigation channels, environmental and social impact, etc., in devising suitable enhancement measures. Making reference to overseas and local experience and approaches, the Study recommends to adopt multi-layered enhancement measures to cope with extreme weather. The multi-layered enhancement comprises –

- (i) Constructing or raising wave walls along the coastline to reduce coastal hazards; and/or
- (ii) Installing fixed and/or demountable flood barriers at suitable places behind the coastline to cut off water pathway towards inland; and/or
- (iii) Installing demountable flood barriers or providing sandbags at building frontages.

Harbourfront Commission

For discussion
on 24 June 2022

HC/07/2022

9. Management measures will work with paragraphs 8(ii) and/or 8(iii) above to enhance the awareness and preparedness of the public against extreme storm events, e.g. formulation of action plans on early alert system and emergency preparedness, provision of staff gauge, placement of water pump and warning signs. **Annex 3** gives an illustration of the multi-layered enhancement.

10. The action plans will be implemented by the relevant government departments including the Home Affairs Department (HAD), CEDD, the Drainage Services Department (DSD) and the Hong Kong Observatory (HKO), etc., to trigger the implementation of the temporary measures in para. 8(ii) and 8(iii) above when specific sea water levels at individual areas are predicted. Sheltered centres at individual areas have been identified for the affected residents taking refuge. With the concerted effort made by the relevant departments, action plans for the relevant identified residential areas have been in place by May 2022.

11. As for the above-mentioned two identified areas falling within Harbourfront Areas, the Study recommended to construct fixed and demountable flood barriers at suitable places behind the coastline of Kennedy Town (near New Praya Kennedy Town), Sai Yun Pun (near Western Wholesale Food Market) and Sheung Wan (near Shun Tak Centre) to reduce overtopping waves and to block their spreading towards residential areas. As for Lei Yue Mun, the Study recommended to construct fixed and demountable flood barriers at suitable locations of Sam Ka Tsuen and Ma Wan Tsuen to prevent influx of overtopping water to low-lying area there. We will consult the stakeholders and take forward the design of enhancement measures as early as possible. The proposed measures would be considered in conjunction with the harbourfront enhancement initiatives. We will closely work together with the Harbourfront Commission to provide a resilient harbourfront area for the enjoyment of the public.

WAY FORWARD

12. The Government plans to take forward the various improvement works and implement the relevant management measures in an orderly manner, and will conduct timely consultation with the stakeholders so as to meet the locals' needs and expectations. Improvement works in form of wave wall are underway at Shap Long and Cheung Sha Lower Village, Lantau. Planning and design work for other identified areas are in progress/will commence in stages. The Government will closely monitor the progress of the improvement works and management measures, and will keep track of the climate change situation for carrying out a timely review of the measure for coping with coastal risks. We will work in partnership with the Harbourfront Commission to gain synergy in the harbourfront enhancement initiatives.

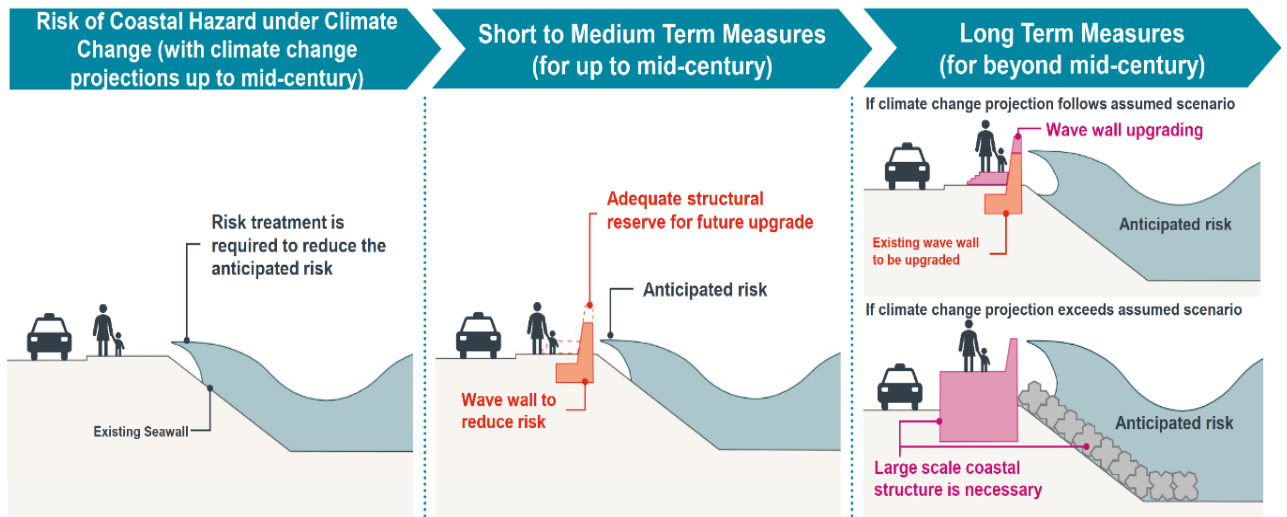
13. For long-term planning of coastal protection, we have commissioned a strategic study on shoreline management in March 2022 to analyze the impacts of climate change on the coastal development, and to provide guideline for land use and planning of coastal development. This study is scheduled to be completed in 2024.

Civil Engineering and Development Department June 2022

Annex 1	Progressive adaptive approach
Annex 2	26 coastal low-lying or windy residential areas more vulnerable to higher potential risks during extreme weather
Annex 3	Multi-layered enhancement

Annex 1

Progressive Adaptive Approach



* Remark: Drainage enhancement, such as pumping station, might be needed at the back of the wall

Annex 2

26 coastal low-lying or windy residential areas more vulnerable to higher potential risks during extreme weather



Annex 3

Multi-layered enhancement

