Paper No. 11/2017

LOCAL VESSELS ADVISORY COMMITTEE

Assessment of Typhoon Shelter Space Requirements

Purpose

Members are briefed on the results of the draft Report on "Assessment of Typhoon Shelter Space Requirements 2015 – 2030" (the "draft Report"), the findings of a Review on Berthing and Sheltered Space for Local Vessels in Hong Kong ("the Review"), and the measures recommended for enhancing the utilisation of existing sheltered space.

Background

2. Marine Department ("MD") periodically conducts assessment on the existing and projected situations of demand and supply of sheltered space for local vessels to take refuge during the passage of typhoons on a territory-wide basis. A report on the previous assessment covering the period 2009 to 2025 was released in January 2010. This draft Report covering the period up to 2030 provides statistical information for conducting the Review.

The Draft Report

3. A copy of the draft Report on "Assessment of Typhoon Shelter Space Requirements 2015 – 2030" is attached at ***Annex***. It comprises an Executive Summary, the main report body and nine Appendices providing numerical information to enable readers to obtain a more in-depth understanding on the issue.

4. Salient points of the draft Report are briefly set out below:

(i) Sheltered space is provided for all local vessels in need. The requirement includes all locally licensed vessels with Operating Licences expired within 12 months, but excludes vessels usually not taking up sheltered space in Hong Kong waters. (Paragraph 11(d))

(ii) Three commonly used projection techniques, namely time series model, regression model and growth rate method, are employed to project the

number of vessels. The demand for sheltered space also takes into account the change in size of vessels. (Paragraphs 12 and 13)

(iii) The supply of sheltered space includes gazetted typhoon shelters, sheltered anchorages and marinas with berthing facilities in their own premises. The supply of sheltered space up to 2030 is affected by some development projects and establishment of sheltered anchorages and marina. The water space in marinas is allocated by private clubs to designated Class IV vessels. Sheltered anchorages are generally used by Class IV vessels while typhoon shelters are generally used by vessels of other classes. (Paragraphs 18 to 26)

(iv) The demand of sheltered space from Classes I to III and Mainland visiting vessels is projected to increase from 319.5 hectares in 2014 to 323.3 hectares in 2030, or at an average rate of 0.2 hectare per year. The supply of sheltered space for Classes I to III and Mainland visiting vessels in 2014 is 402.4 hectares. Due to reinstatement of sheltered space from some development projects, the supply would increase to 405.5 hectares in 2030. When comparing the demand and supply of sheltered space for Classes I to III and Mainland visiting vessels, there would be a surplus of over 80 hectares throughout the period from 2014 to 2030. (Paragraphs 28 to 29)

(v) The demand of sheltered space from Class IV vessels (i.e. pleasure vessels) is projected to increase from 195.5 hectares in 2014 to 306.4 hectares in 2030, or at an average of 6.9 hectares per year. The supply would increase from 186.9 hectares in 2014 to 230.9 hectares in 2030, mainly attributable to the inclusion of sheltered space available in Shuen Wan Hoi, Cheung Sha Lan and Nim Shue Wan, and a proposed marina facility in Tung Chung. When comparing the demand and supply of sheltered space for Class IV vessels, there would be a shortfall throughout the period. The projected shortfall would increase significantly from 8.6 hectares in 2014 to 75.5 hectares in 2030. (Paragraphs 30 to 31)

(vi) The surge in demand of sheltered space from local vessels is mainly attributable to the large increase brought about by Class IV vessels. (Paragraph 33)

(vii) As typhoon shelters and sheltered anchorages are open to all classes of local vessels on a first-come-first-served basis, the shortfall of sheltered space for Class IV vessels could be absorbed by the surplus of sheltered space for Classes I to III and Mainland visiting vessels throughout the period up to 2030. On a territory-wide basis, the projected supply of

sheltered space can adequately meet the projected demand up to 2030. (Paragraph 35)

Findings of the Review

5. A consultant was engaged to conduct a large-scale survey to find out the berthing pattern of local vessels on normal days and under inclement weather, as well as the factors affecting the berthing arrangements. The survey revealed that 85% of locally licensed vessels were satisfied with the berthing arrangement during normal weather, and 7% were not satisfied. The remaining was neither satisfied nor dissatisfied, or did not provide information. Regarding the sheltered arrangement during inclement weather, 78% were satisfied and 10% were not satisfied.

6. According to the survey, major factors affecting the choice of berthing location were ranked in order of importance as follows: "Ease of mooring vessel safely", "Availability of berthing space", "Accessibility to land transport" and "Availability of support facilities such as waste disposal, fuel and water supply".

7. Suggestions for improving the berthing and sheltered arrangements were also collected in the survey. The majority of locally licensed vessels were in favour of the suggestions of "Efforts should be made to ensure berthing locations have adequate support facilities", "There should be designated zones in typhoon shelters for different classes of vessels" and "Efforts should be made to improve road access to remote berthing locations".

8. The Review revealed that during normal weather, there is and will continue to be sufficient berthing space for local vessels, considering that local vessels can station, moor or anchor in the Hong Kong waters except those prohibited or restricted areas. However, there will be increasing competition among different classes of local vessels for typhoon shelter space, particularly due to the anticipated large demand from Class IV vessels.

9. The Review has looked into regional situation, and studied the past occupancy rates of various typhoon shelters. It is noted that the single mooring method currently adopted in Sai Kung has prevented the sheltered space thereat from being fully utilized and resulted in comparatively low berthing capacity. In addition, Hei Ling Chau Typhoon Shelter ("HLCTS") and Yim Tin Tsai Typhoon Shelter ("YTTTS") are located in remote areas and lack of transportation support. As a result, utilization of the two typhoon shelters is rather low.

10. In overall term, the regional demand of sheltered space from local vessels would exceed the regional supply in Hong Kong Island South, Hong Kong Island West and Lantau Island North. Indeed, the regional demands would fluctuate overtime when major infrastructure projects are underway, such as the Tuen Mun-Chek Lap Kok Link and the Three-runway System project of the Hong Kong International Airport. Such a hike in demand is largely transient in nature and geographically bound to the locations of the infrastructure projects, it would be neither practicable nor cost-effective to plan for the provision of sheltered space based on short-term changes in regional demands.

Measures Recommended by the Review

11. Taking into consideration of the above findings, the Review has recommended four measures to enhance the utilization of the existing sheltered space. These measures are briefly set out below:

(a) *Enhancing the Utilisation of Typhoon Shelters*

Occupancy rates of HLCTS and YTTTS were found to be low during the passage of typhoons. It is suggested to enhance the utilisation of these typhoon shelters by allowing laying of private moorings and provision of supporting services. In this regard, MD can speed up the processing of the survey and licensing of water boats for providing berthing vessels with water supply services, allow licensed stationary vessels to provide within the two typhoon shelters other supporting services, such as minor repairs, and study the necessity and feasibility of establishing a Designated Bunkering Area in the vicinity of HLCTS. In view of the East Lantau Metropolis ("ELM") development, this enhancement measure is intended to be temporary in nature. Once there is a clearer picture on the planning directions and development timeline of ELM as well as the need for the re-provisioning of HLCTS, MD would adjust the temporary measures as appropriate.

(b) *Increasing Berthing Capacity in Pak Sha Wan (Hebe Haven) Sheltered Anchorage ("PSWSA")*

PSWSA has a low berthing capacity due to the extensive use of the single-buoy mooring method there. While some of these single-buoy moorings are under MD's management, most are under the management of marinas. Two marinas in PSWSA (namely, the Hebe Haven Yacht Club and the Royal Hong Kong Yacht Club) plan to conduct a trial to

replace some of the single-buoy moorings with double-berth pontoon moorings[1] in 2017 in order to increase the berthing capacity of the sheltered space under their management. Subject to the outcome of this trial, MD would encourage the users of the 120 single-buoy moorings under MD's management at PSWSA to replace the single-buoy moorings with double-berth pontoon moorings likewise by administrative measures.

(c) *Designation of Mooring Area within Kwun Tong Typhoon Shelter ("KTTS")*

The Review noted the trade's concern that different classes of vessels berthed in close proximity could lead to minor collision and compensation claim, particularly for pleasure vessels and non-pleasure vessels ("Non-PVs"). As a trial arrangement, MD would designate and reserve a specific area of roughly 15 ha in size within KTTS for exclusive mooring of non-PVs through administrative means, with a view to achieving better mooring management and minimising conflicts amongst different classes of vessels. If necessary, and subject to further consultation with the trade, MD may seek legal advice and consider the feasibility of making relevant legislative amendments in future to enable MD to designate specified locations within typhoon shelters for mooring of a particular class or type of local vessels. MD will also consider the feasibility of applying similar arrangements in other typhoon shelters as appropriate.

(d) *Expansion of Private Mooring Areas ("PMAs")*

Existing PMAs in Sai Kung and Tai Po, such as Tso Wo Hang, Tai Mei Tuk and Shuen Wan Hoi, have room for expansion. Subject to consultation with local stakeholders, MD would provide roughly 330 additional designated private moorings for use under normal weather in the above water areas. These private moorings will generally be allocated to pleasure vessels, but other classes of vessels may also apply to use these moorings if their sizes meet the allocation criteria. This would however help reduce the pressure on typhoon shelter space for use by non-PVs.

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[1] A "double-berth pontoon mooring" refers to a mooring arrangement by which a vessel is secured to one side of a double-berth pontoon attached to an anchor, a pile or a sinker at seabed to provide the required holding power. As two vessels can be secured to the pontoon, the berthing capacity of the mooring arrangement is increased even though the two vessels and the pontoon will still swing around.

Advice Sought

12. Members are invited to note the draft Report, and the findings of and measures recommended by the Review. They are welcome to provide their views on them to facilitate MD to formulate its consultation work to take forward the measures recommended by the Review.

Way Forward

13. MD will brief the Port Operations Committee of the draft Report, and consult relevant stakeholders of the recommended measures. With the support of the trade and relevant Government departments, MD will formulate an implementation plan for the recommended measures, which will be reported back to LVAC as appropriate.

Planning and Services Division
Marine Department
June 2017

Annex

ASSESSMENT OF TYPHOON SHELTER SPACE REQUIREMENTS 2015 – 2030

Marine Department

Hong Kong Special Administrative Region

People's Republic of China

We are One in Promoting Excellence in Marine Services

Contents

Foreword

All vessels in Hong Kong waters have to take suitable precautions during typhoons. In this regard, the Government of the Hong Kong Special Administrative Region has to ensure that there is sufficient space within Hong Kong waters suitable for local vessels and small visiting vessels to take refuge during the passage of typhoons.

Marine Department periodically conducts assessment on the latest and projected situations of demand and supply of sheltered space on a territory-wide basis. Upon endorsement by the relevant Government departments and committees comprising of stakeholders from the relevant industry sectors, the results of the assessment will form a basis for planning the future provision of typhoon shelters.

In each round of assessment, the findings of the previous assessment are updated and revised based on the latest available information. Also, the forecasting methodology and assumptions are reviewed and refined where appropriate.

Marine Department
June 2017

Executive Summary

Demand and Supply of Sheltered Space for Classes I to III and Mainland Visiting Vessels

1. The demand of sheltered space from Classes I to III and Mainland visiting vessels[1] is projected to increase from 319.5 hectares in 2014 to 323.3 hectares in 2030, or at an average increase of 0.2 hectare (simple average basis) or 0.1% (compound rate basis) per year.

2. The supply of sheltered space for Classes I to III and Mainland visiting vessels including gazetted typhoon shelters[2] and five sheltered anchorages[3] in 2014 is 402.4 hectares. Due to reinstatement of sheltered space from some development projects, the supply would increase to 405.5 hectares in 2025 and remain at this level up to 2030.

3. The matching of demand and supply of sheltered space for Classes I to III and Mainland visiting vessels indicates that the supply of sheltered space could adequately meet the projected demand on a territory-wide basis with a surplus of over 80 hectares throughout the period from 2014 to 2030. The results are shown in Table 1 below:

Table 1: Balance of Demand and Supply of Sheltered Space for Classes I to III and Mainland Visiting Vessels

Hectares

	Actual	**Projection**		
	2014	**2020**	**2025**	**2030**
Supply	402.4	405.4	405.5	405.5
Demand	319.5	318.4	319.6	323.3
Variance	+82.9	+87.0	+85.9	+82.2

Note: Figures refer to year-end positions.

[1] They include river trade vessels and coastal vessels registered in the Mainland.

[2] The typhoon shelters do not include Aberdeen South Typhoon Shelter and part of Causeway Bay Typhoon Shelter, which are commonly used by Class IV vessels.

[3] The sheltered anchorages include Chai Wan Cargo Basin, Kat O, Sha Tau Kok, Tai O, Tsuen Wan, and Wan Chai Cargo Basin when it is not affected by development project.

Demand and Supply of Sheltered Space for Class IV Vessels

4. The demand of sheltered space from Class IV vessels (or pleasure vessels) is projected to increase from 195.5 hectares in 2014 to 306.4 hectares in 2030, or at an average increase of 6.9 hectares (simple average basis) or 2.8% (compound rate basis) per year.

5. The supply of sheltered space for Class IV vessels includes sheltered anchorages[4], marinas, as well as typhoon shelters[5]. The supply would increase from 186.9 hectares in 2014 to 230.9 hectares in 2030, mainly attributable to the inclusion of sheltered space available in Shuen Wan Hoi, Cheung Sha Lan and Nim Shue Wan, and a proposed marina facility in Tung Chung.

6. The matching of demand and supply of sheltered space for Class IV vessels indicates that there would be shortfall of sheltered space for Class IV vessels up to 2030. The shortfall would increase significantly from 8.6 hectares in 2014 to 75.5 hectares in 2030. The results are shown in Table 2 below.

Table 2: Balance of Demand and Supply of Sheltered Space for Class IV Vessels

Hectares

	Actual	**Projection**		
	2014	**2020**	**2025**	**2030**
Supply	186.9	224.1	227.6	230.9
Demand	195.5	250.3	282.7	306.4
Variance	-8.6	-26.2	-55.1	-75.5

Note: Figures refer to year-end positions.

[4] The sheltered anchorages include Cheung Sha Lan, Middle Island, Nim Shue Wan, Pak Sha Wan, Sai Kung, Shuen Wan Hoi, St. Stephen's Bay, Tai Mei Tuk, Tai Tam Harbour, Ting Kau and Tsam Chuk Wan. Sheltered anchorages in Cheung Sha Lan, Nim Shue Wan and Shuen Wan Hoi are included in the supply of sheltered space in this assessment, taking into account these water space have been extensively used by local vessels during inclement weather for many years.

[5] Aberdeen South Typhoon Shelter and part of Causeway Bay Typhoon Shelter.

Overall Balance of Demand and Supply of Sheltered Space for Local Vessels

7. Although there would be shortfall in sheltered space for Class IV vessels up to 2030, the shortfall could be absorbed by the surplus with respect to Classes I to III and Mainland visiting vessels throughout the period up to 2030. On a territory-wide basis, the supply of sheltered space for local vessels can adequately meet the demand throughout the period up to 2030. As shown in Table 3 below, the surplus in sheltered space for local vessels would reduce significantly from 74.4 hectares in 2014 to 6.7 hectares in 2030.

Table 3: Overall Balance of Demand and Supply of Sheltered Space for Local Vessels

Hectares

	Actual	**Projection**		
	2014	**2020**	**2025**	**2030**
Classes I to III and Mainland visiting vessels	+82.9	+87.0	+85.9	+82.2
Class IV vessels	-8.6	-26.2	-55.1	-75.5
Total	**+74.4**	**+60.8**	**+30.7**	**+6.7**

Note: Figures refer to year-end positions.

Conclusions

8. The surge in demand from local vessels for sheltered space at an average of 7.2 hectares (simple average basis) per year during 2014 to 2030 is largely attributable to the large increase in demand from Class IV vessels, which is projected to increase at an average of 6.9 hectares (simple average basis) per year.

9. As both typhoon shelters and sheltered anchorages are open to all classes of local vessels on a first-come-first-served basis, the shortfall of sheltered space for Class IV vessels could be absorbed by the surplus with respect to Classes I to III and Mainland visiting vessels throughout the period up to 2030. Hence, the supply of sheltered space for local vessels could adequately meet the demand throughout the period up to 2030.

Way Forward

10. To cope with the surge in demand of sheltered space from Class IV vessels, Marine Department will continue to identify suitable sheltered anchorage(s) and suitable water space for laying private moorings for use by Class IV vessels. Marine Department will consider practicable measures to enhance the utilisation of the existing sheltered space, and to consult the trade of the measures prior to implementation.

11. Marine Department will maintain the adopted practice of periodically carrying out assessment of sheltered space for local vessels.

Assessment of Typhoon Shelter Space Requirements 2015 – 2030

Purpose

1. This report is to present the findings of assessment on existing demand and supply of sheltered space in Hong Kong waters suitable for local vessels[1] to take refuge during the passage of typhoons, as well as projected situations up to 2030. The assessment is made on an overall territory-wide basis.

Background

2. Marine Department has been periodically conducting assessment on the projected situation of demand and supply of sheltered space in order to provide the necessary input for the Government to plan the provision of typhoon shelters. This assessment provides statistical information for the "Review on berthing and sheltered space for local vessels in Hong Kong".

3. At the 27th meeting of the Port Progress Committee on 15 February 1996, the then Secretary for Planning, Environment and Lands decided that assessment of sheltered space requirement for pleasure vessels should be treated as a separate category from the other vessels. This policy directive has been adopted in the subsequent rounds of assessments.

4. At the request of the then Secretary for Economic Services, an Inter-departmental Working Group has been set up since March 1998 to formulate the methodology for forecasting the future demand of sheltered space, to review the programmes for development of new typhoon shelter, and to develop strategies for public consultation. The Working Group consists of representatives of Transport and Housing Bureau, Development Bureau, Civil Engineering and Development Department, Lands Department, Planning Department and Marine Department.

[1] They include vessels licensed in Hong Kong (including Class IV vessels), and river trade vessels and coastal vessels registered in the Mainland. The latter is regarded as local vessels according to paragraph (e) of section 2 of the Merchant Shipping (Local Vessels) Ordinance (Cap. 548).

5. The projection horizon for this round of assessment is extended to Year 2030 in order to provide input for long-term planning.

Coverage of Demand and Supply

6. Local vessels refer to vessels with valid Operating Licences in Hong Kong (locally licensed vessels), and river trade vessels and coastal vessels registered in the Mainland (Mainland visiting vessels). There are four classes of locally licensed vessels.

7. On the demand side, space requirements of locally licensed vessels that usually not taking up sheltered space in Hong Kong waters are not included in the assessment. For instance, dangerous goods carriers are excluded as they are required to make their mooring arrangements or to take shelter in Dangerous Goods Anchorages. Vessels exceeding 75 metres in length are excluded as appropriate typhoon arrangements for these relatively long vessels are required to be made by owners as a licensing condition.

8. On the supply side, sheltered space includes 14 typhoon shelters as specified in the Schedule of the Merchant Shipping (Local Vessels) (Typhoon Shelters) Regulations (Cap. 548E), sheltered anchorages, and marinas. The Government Dockyard and the water areas occupied by Government buoys in typhoon shelters are not included[2]. In addition, the sheltered space of the basin within the River Trade Terminal at Tuen Mun (about 25 hectares) is not included in the supply side of the assessment.

Data Sources

9. The number of locally licensed vessels is based on the licensing records maintained by Marine Department. A large-scale survey on berthing arrangements of locally licensed vessels[3] was conducted after the typhoon season in 2014. Information on usual locations of locally licensed vessels during inclement weather[4], and information

[2] Government vessels are excluded in the scope of assessment as they moor at Government Dockyard or dedicated moorings in typhoon shelters. Hence, the Government Dockyard and the water areas occupied by these buoys in typhoon shelters are not counted in the supply of sheltered space.

[3] The survey enumerated a total of 5 194 locally licensed vessels with a response rate of 73%.

[4] Inclement weather refers to the weather condition when Tropical Cyclone Warning Signal No. 8 or higher was issued.

on locally licensed vessels usually not taking up sheltered space[5] in Hong Kong waters were collected in the survey and adopted in the assessment. As for Mainland visiting vessels, the highest number of such vessels took refuge in Hong Kong waters during the passage of typhoons within a two-year period as recorded in the Typhoon Reports of Marine Department is adopted.

Classification of Vessels

10. With the enactment of the Merchant Shipping (Local Vessels) Ordinance (Cap. 548) and its subsidiary legislation in 2007, locally licensed vessels are categorised into four classes. Class I vessels include launches and ferries; Class II vessels include dry cargo vessels, dumb lighters, dredgers, barges, pilot boats, tugs, etc.; Class III vessels include fishing vessels; and Class IV vessels include pleasure vessels. Projection of Class I vessels is carried out in one vessel group. Classes II to IV vessels are further split into relatively homogenous vessel groups with regard to the vessel size, usage and number. There are two vessel groups in Class II vessels and three vessel groups each in Class III and Class IV vessels. Projection is carried out for each of these vessel groups. The time series are dated back to 1995 in order to have sufficient historical data for the projection. A total of 10 vessel groups, including a group for Mainland visiting vessels, as shown in **Appendix 1** are arrived, and appropriate projection model is adopted in each vessel group.

Methodology

11. The following basis is adopted in the calculation of demand for sheltered space:

(a) Space requirement for Classes I to III vessels is computed by the formula:

Area required = vessel length x vessel breadth x 2 x 4/3

The occupancy factor "2" includes allowance for safe separation, fenders, scope for anchor chain and stern moorings, and the occupancy factor "4/3" is for provisions of passage areas and fire-lanes.

[5] During inclement weather, 10.7% of all locally licensed vessels usually not taking up sheltered space in Hong Kong waters, i.e. outside Hong Kong, stowed in dry berths or mother boats. Another 4.5% usually took refuge in fish culture zones and shipyards.

(b) Space requirement for Class IV vessels is based on average space occupied by pleasure vessels in marinas at full capacity.

(c) Space requirement for Mainland visiting vessels is based on the average size of river trade vessels as the vast majority of them are river trade vessels. The occupancy factors of "2" and "4/3" adopted for Classes I to III vessels also apply to Mainland visiting vessels.

(d) Sheltered space is provided for all local vessels in need. Moreover, locally licensed vessels with Operating Licences expired within 12 months[6] are included in the demand for assessment. In addition, vessels usually not taking up sheltered space in Hong Kong waters are excluded, viz. vessels usually staying outside Hong Kong, stowed in dry berths or mother boats, and staying inside fish culture zones or shipyards.

12. Three commonly used projection techniques, namely time series model, regression model, and growth rate method, are employed to project the number of vessels. In the time series models, the number of vessels is related to its past values, and such dependence is employed to project the number of vessels. In the regression models, the relation between the number of vessels and economic variables are established in form of a mathematical equation. If this relationship will persist into the future, official forecasts on economic variables can be fed into the equation to project the number of vessels. Both time series model and regression model are established for each vessel group, and appropriate model is employed in the projection. If both models are considered inappropriate, the number of vessels is projected based on average annual growth rate. The model chosen for each vessel group is shown in Appendix 1. The past and projected average annual rates of change in number of local vessels by class are given in **Appendix 2**.

13. Adjustment for vessels usually not taking up sheltered space in Hong Kong waters is applied to the projected number of vessels. The projected demand for sheltered space also takes into account the projected change in size of vessels. Demands from different vessel groups for sheltered space are shown in **Appendix 3**.

[6] According to the Merchant Shipping (Local Vessels) Ordinance, a locally licensed vessel shall have a valid Operating Licence to operate within Hong Kong waters. While some vessels may renew their licences with time lag, inclusion of vessels with licences expired within 12 months should be sufficiently prudent.

14. The regression model was the only model employed in the last assessment of typhoon shelter space requirements. Modelling changes in the past by relating to other independent variables was based on the assumption that such observed relationship would continue into the future. In the current assessment, the time series of locally licensed vessels are based on new classification of Merchant Shipping (Local Vessels) Ordinance (Cap. 548) enacted in 2007. Upon the availability of the new classification and updated figures, the time series model is also considered as an effective tool, and employed in the projection as appropriate.

Limitation

15. Projection is inevitably subject to margin of error. It can only capture the past trend over a considerably long period of time, but cannot cater for relatively short-term fluctuations or unexpected shocks in the economy. In addition, the adjustments for vessels usually not taking up sheltered space in Hong Kong waters are based on the survey on berthing arrangements of locally licensed vessels, and are assumed to remain the same up to 2030. These factors have to be updated to reflect changes in the floating communities in the next assessment.

Demand for Sheltered Space

16. As shown in Table 1 below, the demand for sheltered space from Classes I to III and Mainland visiting vessels is projected to increase from 319.5 hectares in 2014 to 323.3 hectares in 2030, or at an average increase of 0.2 hectare (simple average basis) or 0.1% (compound rate basis) per year. On the other hand, the demand of sheltered space from Class IV vessels is projected to increase at a faster rate of 6.9 hectares (simple average basis) or 2.8% (compound rate basis) per year. Its demand would increase from 195.5 hectares in 2014 to 306.4 hectares in 2030. Demands from different classes of local vessels for sheltered space are shown in **Appendix 4**.

Table 1: Demand from Local Vessels for Sheltered Space by Class

Hectares

	Actual	Projection			Average annual change
	2014	**2020**	**2025**	**2030**	**2014-30**
Classes I to III and Mainland visiting vessels	**319.5**	**318.4**	**319.6**	**323.3**	**+0.2**
Class I vessels	*13.6*	*11.8*	*10.3*	*9.0*	*-0.3*
Class II vessels	*160.3*	*153.9*	*151.6*	*151.2*	*-0.6*
Class III vessels	*93.3*	*98.9*	*103.8*	*109.2*	*+1.0*
Mainland visiting vessels	*52.3*	*53.8*	*53.9*	*53.9*	*+0.1*
Class IV vessels	**195.5**	**250.3**	**282.7**	**306.4**	**+6.9**

Notes: Figures may not add up to totals due to rounding.
Figures refer to year-end position.

17. Taking all these vessels together, the demand from local vessels for sheltered space would increase at an average rate of 7.2 hectares (simple average basis), or 1.3% (compound rate basis), per year during the period from 2014 to 2030. The surge in demand for sheltered space from local vessels is mainly attributable to the large increase brought about by Class IV vessels.

Supply of Sheltered Space

18. The total supply of sheltered space in Hong Kong waters includes (a) gazetted typhoon shelters, (b) sheltered anchorages and (c) marinas with berthing facilities in their own premises. Administrative records maintained by the Government were referred to. Known development projects affecting the supply of sheltered space were also taken into account in the assessment. Marinas were approached for updated information on water space and their development plans through a stocktaking exercise. One of them indicated that it had such plan but did not provide further information. Hence, the supply of sheltered space by existing marinas is assumed to remain unchanged up to 2030.

19. In 2014, the total supply of sheltered space in 14 gazetted typhoon shelters and 13 sheltered anchorages are 419.0 hectares and 143.8 hectares respectively. The method for calculating the effective area of sheltered space can be found in **Appendix 5**. As for the four marinas with berthing facilities in their own premises, the total supply of sheltered space is 30.7 hectares. Excluding 4.2 hectares of water areas occupied by Government buoys in typhoon shelters, the total supply of sheltered space for local vessels in 2014 is 589.3 hectares. A map showing the locations of typhoon shelters, sheltered anchorages and marinas is at **Appendix 6**.

20. Sheltered anchorages are areas usually protected from weather by natural topography with relatively few man-made features. They resemble typhoon shelters to provide sheltered space for local vessels to take refuge during inclement weather. Since the last assessment of typhoon shelter space requirements conducted in 2009, clusters of private moorings are laid in Shuen Wan Hoi in Tai Po, as well as Cheung Sha Lan and Nim Shue Wan in Lantau Island. These water areas have been used by local vessels, particularly Class IV vessels, to take refuge there during the passage of typhoons. Therefore, it is considered appropriate to include these water areas as sheltered anchorages, and to add those space in the supply of sheltered space in this assessment.

21. The *Central-Wanchai Bypass and Island Eastern Corridor Link* project has some effects on the Causeway Bay Typhoon Shelter and the Wan Chai Cargo Basin. Upon completion of the project in around 2018, 3.2 hectares in the Causeway Bay Typhoon Shelter and 2.0 hectares in the Wan Chai Cargo Basin will be reinstated in 2019. It should be noted that the general public gave their support to make use of the Wan Chai Cargo Basin[7] for water sports and recreation precinct in Stage 1 Public Engagement carried out in 2015 under the on-going *Urban Design Study for the Wan Chai North and North Point Harbourfront Areas*. The urban design study is still on-going at the time of the assessment. Hence, the supply of sheltered space in the Wan Chai Cargo Basin may be subject to change.

[7] The function of the basin was reviewed under the study of the *Wan Chai Development Phase II Planning and Engineering Review* with a comprehensive and extensive three-stage public engagement exercise (i.e. *Harbour-front Enhancement Review – Wan Chai, Causeway Bay and Adjoining Areas*) carried out between 2004 and 2007, in which a Water Recreation Precinct covering the Wan Chai Cargo Basin site was proposed in the Recommended Outline Development Plan (RODP). The proposals of the RODP were translated into the statutory outline zoning plan, i.e. the Wan Chai North Outline Zoning Plan and gazetted in 2007, under which the area surrounding the basin is zoned for "OU(Public Waterfront Promenade and Water Recreation Related Uses" with the planning intention to provide water recreational uses to serve the public.

22. A small reclaimed corner of size of 0.4 hectare at the south-western corner of the Causeway Bay Typhoon Shelter will be temporarily retained after the completion of *Central-Wanchai Bypass and Island Eastern Corridor Link* project to facilitate construction works of the *Shatin Central Link* (SCL). The temporary reclamation at the corner will be removed upon completion of the SCL project scheduled in 2021.

23. The *Preliminary Integrated Development Study on Reclamation in Association with Relocation of Sai Kung Sewage Treatment Works* aims at establishing the feasibility of carrying out proposed construction of breakwater(s) in the Sai Kung Sheltered Anchorage. Depending on the outcome of any related feasibility studies and the final design of the new breakwater(s), it is assumed that the Sai Kung Sheltered Anchorage could be enlarged by about 3.2 hectares in 2025 the earliest.

24. The *Tung Chung New Town Extension* has included a proposed marina located at the northeast of the proposed reclamation area. The proposed marina with water space of 3.3 hectares is anticipated to be in operation by 2030.

25. Typhoon shelters and sheltered anchorages are open to all classes of vessels on a first-come-first-served basis. The water space in marinas is allocated by private clubs to designated Class IV vessels. For the purpose of matching of demand and supply of sheltered space, typhoon shelters are generally put under the supply of Classes I to III and Mainland visiting vessels because traditionally, typhoon shelters are used by these vessels as their operational bases. Sheltered anchorages other than those with cargo operation therein are generally put under the supply of Class IV vessels.

26. The supply of sheltered space for Classes I to III and Mainland visiting vessels including typhoon shelters and five sheltered anchorages in 2014 is 402.4 hectares. Due to reinstatement of sheltered space from some development projects in Causeway Bay Typhoon Shelter and Wan Chai Cargo Basin, the supply of sheltered space for Classes I to III and Mainland visiting vessels would increase from 402.4 hectares in 2014 to 405.5 hectares in 2025, and remain at this level up to 2030 as shown in Table 2 below. Details of the supply of sheltered space for Classes I to III and Mainland visiting vessels can be found in **Appendix 7**.

Table 2: Supply of Sheltered Space for Classes I to III and Mainland Visiting Vessels

Hectares

	Actual	Projection		
	2014	**2020**	**2025**	**2030**
Typhoon shelters	381.3	382.3	382.4	382.4
Sheltered anchorages	21.1	23.1	23.1	23.1
Total	**402.4**	**405.4**	**405.5**	**405.5**

Notes: Figures may not add up to totals due to rounding.
Figures refer to year-end position.

27. The supply of sheltered space for Class IV vessels includes sheltered anchorages, marinas as well as typhoon shelters. The supply would increase from 186.9 hectares in 2014 to 230.9 hectares in 2030, mainly attributable to the inclusion of sheltered space available in Shuen Wan Hoi, Cheung Sha Lan and Num Shue Wan, and a proposed marina facility in Tung Chung. The supply of sheltered space for Class IV vessels up to 2030 is shown in Table 3 below. Details of the supply of sheltered space for Class IV vessels can be found in **Appendix 8**.

Table 3: Supply of Sheltered Space for Class IV vessels

Hectares

	Actual	Projection		
	2014	**2020**	**2025**	**2030**
Typhoon shelters	33.5	35.7	36.0	36.0
Sheltered anchorages	122.7	157.7	160.9	160.9
Marina	30.7	30.7	30.7	34.0
Total	**186.9**	**224.1**	**227.6**	**230.9**

Notes: Figures may not add up to totals due to rounding.
Figures refer to year-end position.

Balance of Demand and Supply of Sheltered Space for Classes I to III and Mainland Visiting Vessels

28. The demand of sheltered space from Classes I to III and Mainland visiting vessels would increase from 319.5 hectares in 2014 to 323.3 hectares in 2030, or at an average rate of 0.2 hectare (simple average basis) per year. Due to reinstatement of sheltered space from some development projects, the supply of sheltered space for Classes I to III and Mainland visiting vessels would increase from 402.4 hectares in 2014 to 405.5 hectares in 2025, and remain at this level up to 2030.

29. When comparing the demand and supply of sheltered space for Classes I to III and Mainland visiting vessels, there would be a surplus of over 80 hectares throughout the period from 2014 to 2030. In 2030, the surplus in sheltered space for Classes I to III and Mainland visiting vessels would be 82.2 hectares. Balance of the demand and supply of sheltered space for Classes I to III and Mainland visiting vessels are shown in Table 4 below.

Table 4: Balance of Demand and Supply of Sheltered Space for Classes I to III and Mainland Visiting Vessels

Hectares

	Actual	Projection		
	2014	**2020**	**2025**	**2030**
Supply	402.4	405.4	405.5	405.5
Demand	319.5	318.4	319.6	323.3
Variance	+82.9	+87.0	+85.9	+82.2

Note: Figures refer to year-end position.

Balance of Demand and Supply of Sheltered Space for Class IV Vessels

30. The demand of sheltered space from Class IV vessels is projected to increase from 195.5 hectares in 2014 to 306.4 hectares in 2030, or at an average rate of 6.9 hectares (simple average basis) per year. The supply of sheltered space would increase from 186.9 hectares in 2014 to 230.9 hectares in 2030, mainly attributable to the inclusion of sheltered space available in Shuen Wan Hoi, Cheung Sha Lan and Nim Shue Wan, and a proposed marina facility in Tung Chung.

31. When comparing the supply with the demand of sheltered space from Class IV vessels, there would be a territory-wide shortfall throughout the period from 2014 to 2030. The projected shortfall would increase significantly from 8.6 hectares in 2014 to 75.5 hectares in 2030 as shown in Table 5 below.

Table 5: Balance of Demand and Supply of Sheltered Space for Class IV Vessels

Hectares

	Actual	**Projection**		
	2014	**2020**	**2025**	**2030**
Supply	186.9	224.1	227.6	230.9
Demand	195.5	250.3	282.7	306.4
Variance	-8.6	-26.2	-55.1	-75.5

Note: Figures refer to year-end position.

Overall Balance of Demand and Supply of Sheltered Space for Local Vessels

32. The shortfall in sheltered space for Class IV vessels would increase from 8.6 hectares in 2014 to 75.5 hectares in 2030. However, there would be surplus in sheltered space for Classes I to III and Mainland visiting vessels, and the surplus would be over 80 hectares throughout the period from 2014 to 2030. As typhoon shelters and sheltered anchorages are on a first-come-first-served basis, the shortfall in sheltered space for Class IV vessels could be absorbed by the surplus with respect to Classes I to III and Mainland visiting vessels throughout the period up to 2030. On a territory-wide basis, the supply of sheltered space for local vessels can adequately meet the demand throughout the period up to 2030. The surplus in sheltered space for local vessels would reduce from 74.4 hectares in 2014 to 6.7 hectares in 2030 as shown in Table 6 below.

Table 6: Overall Balance of Demand and Supply of Sheltered Space for Local Vessels

Hectares

	Actual	Projection		
	2014	**2020**	**2025**	**2030**
Classes I to III and Mainland visiting vessels	+82.9	+87.0	+85.9	+82.2
Class IV vessels	-8.6	-26.2	-55.1	-75.5
Total	**+74.4**	**+60.8**	**+30.7**	**+6.7**

Note: Figures refer to year-end positions.

Conclusions

33. The demand of sheltered space from local vessels, including Class IV vessels, is projected to increase at an average of 7.2 hectares (simple average basis) per year from 2014 to 2030. The surge in demand for sheltered space is mainly attributable to the large increase brought about by Class IV vessels, whose demand is projected to increase at an average of 6.9 hectares (simple average basis) per year.

34. The large increase projected for Class IV vessels would result in shortfall in sheltered space for Class IV vessels. Despite the establishment of three additional sheltered anchorages and a proposed marina facility in Tung Chung during the period, the shortfall in sheltered space for Class IV vessels would increase from 8.6 hectares in 2014 to 75.5 hectares in 2030.

35. There would be a surplus in sheltered space of over 80 hectares for Classes I to III and Mainland visiting vessels throughout the period from 2014 to 2030. As typhoon shelters and sheltered anchorages are open to all classes of local vessels on a first-come-first-served basis, the shortfall of sheltered space for Class IV vessels could be absorbed by the surplus with respect to Classes I to III and Mainland visiting vessels throughout the period up to 2030. As shown in **Appendix 9**, the supply of sheltered space for local vessels can adequately meet the projected demand on a territory-wide basis up to 2030 should there be no major reduction of existing typhoon shelter space. The surplus in sheltered space for local vessels would diminish to 6.7 hectares in 2030.

Way Forward

36. The surge in demand from local vessels for sheltered space up to 2030 is largely attributable to the significant increase in demand from Class IV vessels in the coming years. Marine Department will continue to identify suitable sheltered anchorage(s) and suitable water space for laying private moorings to cope with the increasing demand from Class IV vessels. Marine Department will also propose practicable measures to enhance the utilisation of the existing sheltered space, and the trade will be consulted of the measures prior to implementation.

37. Marine Department will maintain the hitherto adopted practice of periodically carrying out assessment of sheltered space for local vessels.

Appendix 1

List of Vessel Groups and Projection Models

Type of vessels	Class of vessels	Vessel group	Description	Model
Locally licensed vessels[(1)(2)]	I	1	Class I vessels	Regression model on GDP growth rate in real terms (Rate of change = -0.0395 + 0.4216* GDP growth rate)
	II[(2)]	2	Class II vessels except dangerous goods carriers and dumb lighters	Autoregressive integrated moving average model (ARIMA (3,1,0))
		3	Dumb lighters (Sub-Class E)	Average growth rate method
	III	4	Fish carriers and fishing sampans (Sub-Classes A and B)	Average growth rate method
		5	Fishing vessels (Sub-Class C)	Autoregressive integrated moving average model (ARIMA (1,1,1))
		6	Outboard open sampans (Sub-Class D)	Autoregressive integrated moving average model (ARIMA (2,1,0))
	IV	7	Auxiliary powered yachts (Sub-Class A)	Autoregressive integrated moving average model (ARIMA (1,1,1))
		8	Cruisers (Sub-Class B)	Autoregressive integrated moving average model (ARIMA (1,1,1))
		9	Open cruisers (Sub-Class C)	Autoregressive integrated moving average model (ARIMA (1,1,2))
Mainland visiting vessels	NA	10	-	3-year simple moving average

Notes: A Sub-Class of vessels refers to the vessel types stipulated in Schedule 1 of the Merchant Shipping (Local Vessels) (Certification and Licensing) Regulation (Cap. 548D).

NA denotes “Not applicable”.

(1) Excluding vessels with length overall exceeding 75 metres.

(2) Excluding dangerous goods carriers (i.e. Sub-Classes B, M and N of Class II vessels).

Average Annual Rate of Change in Number of Local Vessels by Class

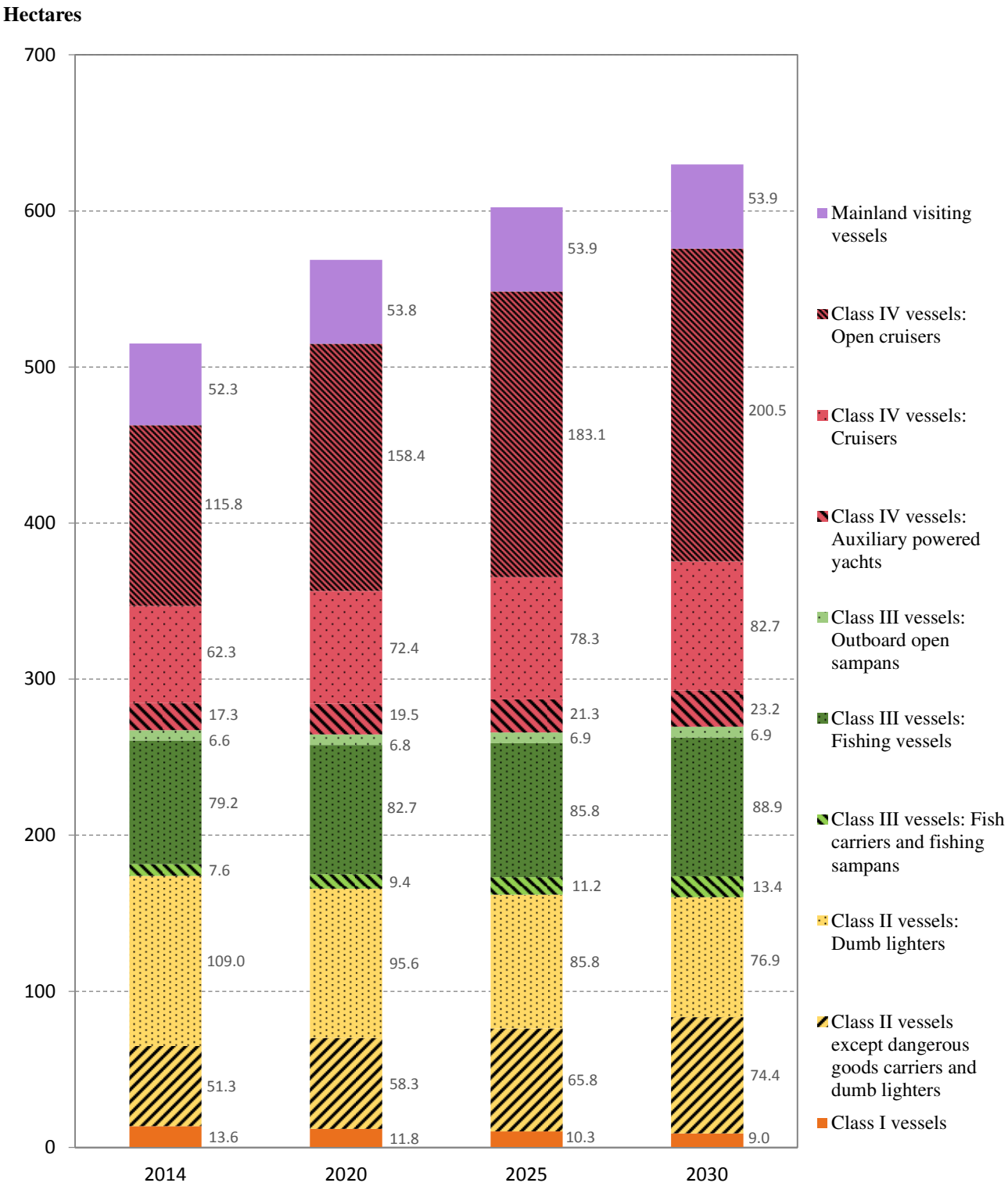
	Locally Licensed Vessels[1][2]				Mainland visiting vessels	Total
	Class I	**Class II[2]**	**Class III**	**Class IV**		
Actual						
1995 to 2007[3]	[-3.4%]	[-3.3%]	[-1.5%]	+1.7%	+1.9%	**-0.6%**
2007 to 2014	-1.0%	-0.9%	+2.7%	+6.6%	-3.8%	**+3.8%**
Projection						
2014 to 2030	-2.7%	-0.8%	+0.7%	+2.9%	+0.2%	**+1.7%**

Notes: (1) Excluding vessels with length overall exceeding 75 metres. Adjustment has not been made to include vessels with operating licence expired within 12 months, and to exclude vessels usually not taking up sheltered space in Hong Kong waters.

(2) Excluding dangerous goods carriers.

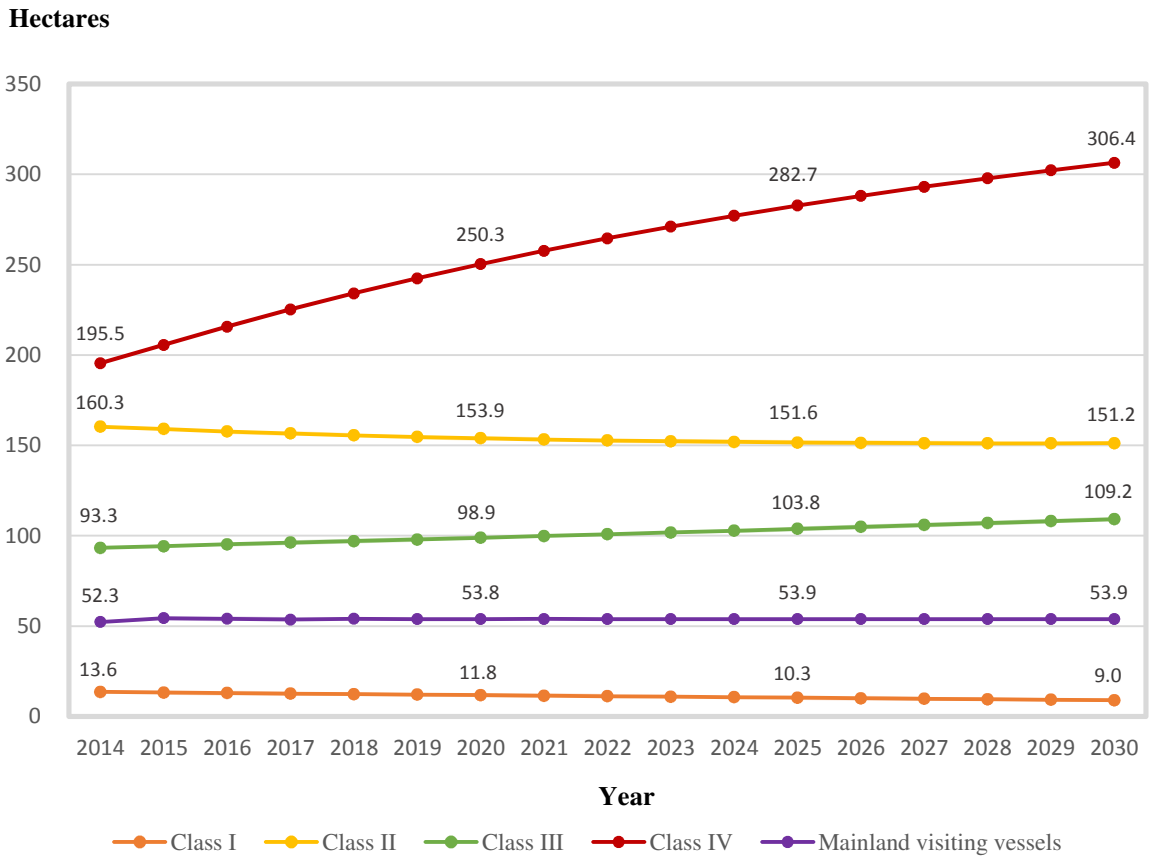
(3) Figures in square brackets are based on backcast series.

Demands from Different Vessel Groups for Sheltered Space



Appendix 4

Demands from Different Classes of Local Vessels for Sheltered Space



Method for Calculating the Effective Area of Sheltered Space

1. The physical sheltered area is the area measured to the High Water Mark at the location.

2. The physical effective area is that expanse of water enclosed by a line, which follows:-

   (a) The 0.0 metre Chart Datum (C.D.) contour at any 'beach-type' coastline and/or

   (b) 9.15 metres off the junction of any breakwater, pitched slope seawall construction or rocky coastline with the seabed and/or

   (c) The cope line of a vertical face seawall construction where such seawall founds below -1.52 metres C.D. or 9.15 metres off the cope line where such seawall founds above -1.52 metres C.D. and/or

   (d) 9.15 metres off any other obstruction such as piers, refuse tips, slipways, etc.

3. The area calculated from the principles in item 2 above is subject to deductions based on one or more of the exceptions set out below:-

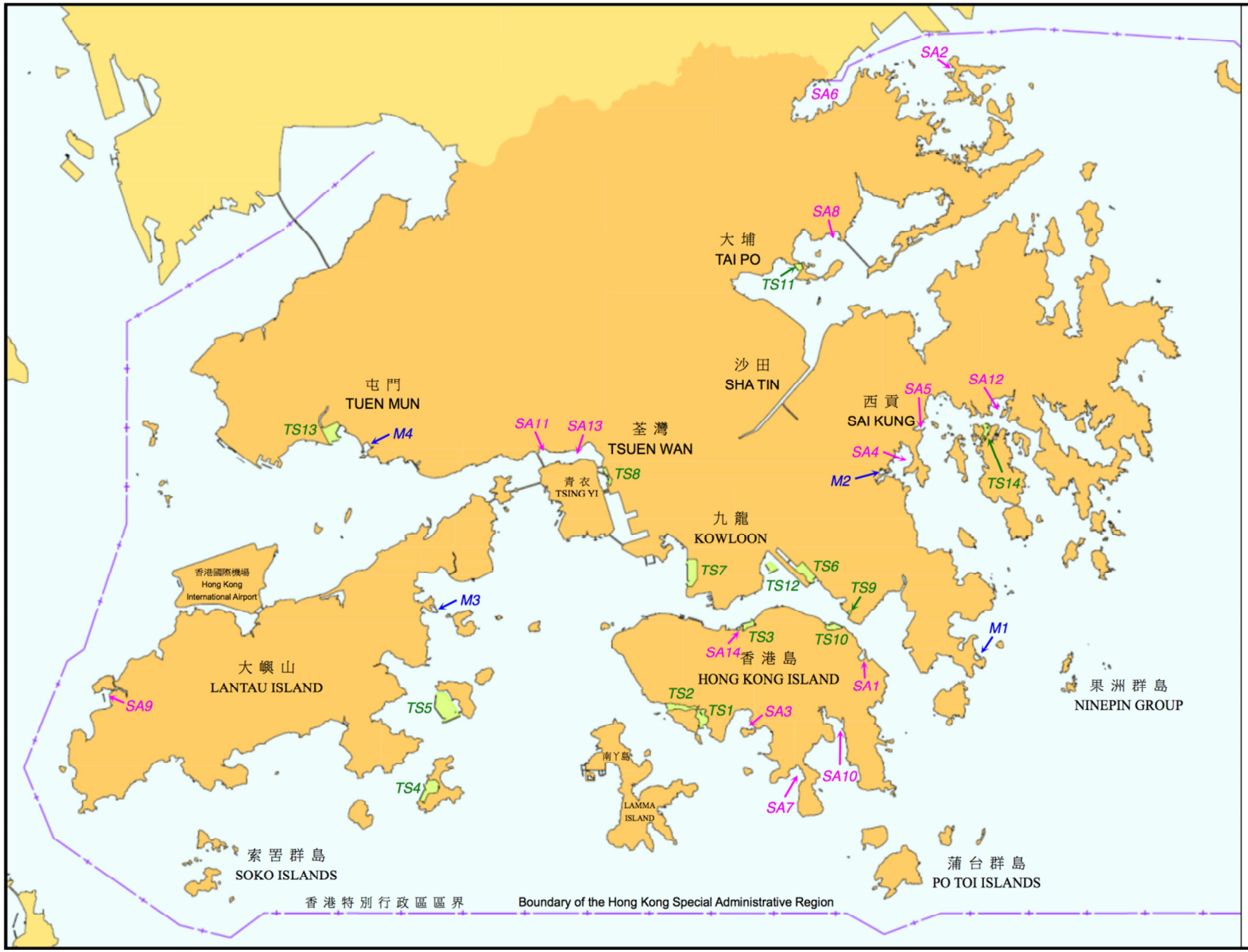
   (a) An area of water, which is directly exposed to severe sea and wind conditions near the entrances to the sheltered space.

   (b) An area of water near to or affected by the probable flood discharge from any nullah or stream.

   (c) An area of water, which overlies a seabed or is adjacent to a seawall where safe mooring of vessels is unsuitable.

   (d) An area of water within the sheltered space subject to unusually fierce wind strengths because of its location in respect to local terrain.

Location Plan of Typhoon Shelters, Sheltered Anchorages and Marinas in 2014



	避風塘	Typhoon Shelters
TS1	香港仔南	Aberdeen South
TS2	香港仔西	Aberdeen West
TS3	銅鑼灣	Causeway Bay
TS4	長洲	Cheung Chau
TS5	喜靈洲	Hei Ling Chau
TS6	觀塘	Kwun Tong
TS7	新油麻地	New Yau Ma Tei
TS8	藍巴勒海峽	Rambler Channel
TS9	三家村	Sam Ka Tsuen
TS10	筲箕灣	Shau Kei Wan
TS11	船灣	Shuen Wan
TS12	土瓜灣	To Kwa Wan
TS13	屯門	Tuen Mun
TS14	鹽田仔	Yim Tin Tsai

	遮蔽碇泊處	Sheltered Anchorages
SA1	柴灣貨物裝卸灣	Chai Wan Cargo Basin
SA2	古澳	Kat O
SA3	熨波洲	Middle Island
SA4	白沙灣	Pak Sha Wan (Hebe Haven)
SA5	西貢	Sai Kung
SA6	沙頭角	Sha Tau Kok
SA7	聖士提反灣	St. Stephen's Bay
SA8	大美督	Tai Mei Tuk
SA9	大澳	Tai O
SA10	大潭港	Tai Tam Harbour
SA11	汀九	Ting Kau
SA12	斬竹灣	Tsam Chuk Wan (Jade Bay)
SA13	荃灣	Tsuen Wan
SA14	灣仔貨物裝卸灣	Wan Chai Cargo Basin

	遊艇會	Marinas
M1	清水灣高爾夫鄉村俱樂部遊艇會	Clearwater Bay Golf and Country Club Marina
M2	匡湖遊艇會	Club Marina Cove
M3	愉景灣遊艇會	Discovery Bay Marina Club
M4	黃金海岸鄉村俱樂部遊艇會	Gold Coast Yacht and Country Club

Supply of Sheltered Space for Classes I to III and Mainland Visiting Vessels

	Actual (Hectares)	Projection (Hectares)		
	2014	2020	2025	2030
I. Typhoon Shelter				
Aberdeen West	34.2	34.2	34.2	34.2
Causeway Bay[(1)]	3.2	4.2	4.3	4.3
Cheung Chau	50.0	50.0	50.0	50.0
Hei Ling Chau	76.6	76.6	76.6	76.6
Kwun Tong	33.8	33.8	33.8	33.8
New Yau Ma Tei	64.6	64.6	64.6	64.6
Rambler Channel	12.9	12.9	12.9	12.9
Sam Ka Tsuen	1.9	1.9	1.9	1.9
Shau Kei Wan	17.2	17.2	17.2	17.2
Shuen Wan	10.3	10.3	10.3	10.3
To Kwa Wan	14.8	14.8	14.8	14.8
Tuen Mun	56.8	56.8	56.8	56.8
Yim Tin Tsai	9.2	9.2	9.2	9.2
Sub-total[(2)]	381.3	382.3	382.4	382.4
II. Sheltered Anchorage				
Chai Wan Cargo Basin	11.2	11.2	11.2	11.2
Kat O	1.6	1.6	1.6	1.6
Sha Tau Kok	0.6	0.6	0.6	0.6
Tai O	4.0	4.0	4.0	4.0
Tsuen Wan	3.7	3.7	3.7	3.7
Wan Chai Cargo Basin[(1)(3)]	-	2.0	2.0	2.0
Sub-total	21.1	23.1	23.1	23.1
Total [(2)]	**402.4**	**405.4**	**405.5**	**405.5**

Notes : (1) Variations are due to the Central – Wanchai Bypass & Island Eastern Corridor Link project and Shatin Central Link project.

(2) Excluding 4.2 hectares occupied by Government buoys in typhoon shelters.

(3) With the general public's support, the Wan Chai Cargo Basin is proposed to be used for public water sports and recreational uses under the Urban Design Study for the Wan Chai North and North Point Harbourfront Areas. However, the urban design study is still on-going at the time of the assessment. Hence, the supply of sheltered space in the Wan Chai Cargo Basin may be subject to change.

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Supply of Sheltered Space for Class IV Vessels

	Actual (Hectares) 2014	Projection (Hectares) 2020	2025	2030
I. Typhoon Shelter				
Causeway Bay[(1)]	7.4	9.6	9.9	9.9
Aberdeen South	26.1	26.1	26.1	26.1
Sub-total	33.5	35.7	36.0	36.0
II. Sheltered Anchorage				
Cheung Sha Lan[(2)]	-	6.7	6.7	6.7
Middle Island	6.9	6.9	6.9	6.9
Nim Shue Wan[(2)]	-	2.3	2.3	2.3
Pak Sha Wan (Hebe Haven)	84.0	84.0	84.0	84.0
Sai Kung[(3)]	4.3	4.3	7.5	7.5
Shuen Wan Hoi[(2)]	-	26.0	26.0	26.0
St. Stephen's Bay	1.3	1.3	1.3	1.3
Tai Mei Tuk	12.3	12.3	12.3	12.3
Tai Tam Harbour	5.7	5.7	5.7	5.7
Ting Kau	0.7	0.7	0.7	0.7
Tsam Chuk Wan	7.5	7.5	7.5	7.5
Sub-total	122.7	157.7	160.9	160.9
III. Marina				
Clearwater Bay Golf and Country Club Marina	7.4	7.4	7.4	7.4
Club Marina Cove	10.0	10.0	10.0	10.0
Discovery Bay Marina Club	8.5	8.5	8.5	8.5
Gold Coast Yacht and Country Club	4.8	4.8	4.8	4.8
Tung Chung[(4)]	-	-	-	3.3
Sub-total	30.7	30.7	30.7	34.0
Total	**186.9**	**224.1**	**227.6**	**230.9**

Notes : (1) Variations are due to the Central – Wanchai Bypass & Island Eastern Corridor Link project and Shatin Central Link project.

(2) Included in the supply of sheltered space starting from 2016.

(3) It is assumed that the Sai Kung Sheltered Anchorage could be enlarged by 3.2 hectares in 2025, taking into account the implementation of the potential reclamation in association with relocation of Sai Kung Sewage Treatment Works.

(4) The sheltered space of a proposed marina facility in Tung Chung is assumed to be around 3.3 hectares and in operation in 2030.

Appendix 9

Demand and Supply of Sheltered Space for Local Vessels