

## LOCAL VESSELS ADVISORY COMMITTEE

### Assessment of Typhoon Shelter Space Requirements

#### **Purpose**

Members are invited to note the results of the draft report on “Assessment of Typhoon Shelter Space Requirements 2022 – 2035” (the “draft report”).

#### **Background**

2. Marine Department (“MD”) conducts assessment periodically on the existing and projected situations of demand and supply of sheltered space for local vessels to take refuge during passages of typhoons on a territory-wide basis. A report on the previous assessment covering the period from 2015 to 2030 was released in June 2017.

3. The Department of Logistics and Maritime Studies of the Faculty of Business, The Hong Kong Polytechnic University, has been commissioned by MD to conduct the current round of assessment on typhoon shelter space requirements in Hong Kong covering the period up to 2035.

#### **The Draft Report**

4. A copy of the draft report is attached in *Annex*. It comprises an executive summary, the main report body and eight appendices.

5. Salient points of the draft report are briefly set out below:

- (i) Sheltered space is provided for all local vessels in need. Moreover, locally licensed vessels with valid operating licences and those expired within 12 months are included in the demand for assessment. In addition, vessels usually not taking up sheltered space in Hong Kong waters are excluded. (Paragraph 14(c))
- (ii) Time series model is mainly employed to project the number of vessels.

The demand for sheltered space also takes into account the change in size of vessels. (Paragraphs 15 and 19)

- (iii) The supply of sheltered space includes statutory typhoon shelters, sheltered anchorages and marinas with berthing facilities in their own premises. The supply of sheltered space up to 2035 will be affected by some development projects. For the purpose of matching demand and supply of sheltered space, typhoon shelters are generally put under the supply for working vessels (i.e. Classes I to III vessels and Mainland visiting vessels). Sheltered anchorages other than those with cargo operation therein are generally put under the supply for pleasure vessels (i.e. Class IV vessels and visiting pleasure vessels). Besides, the water space in marinas is allocated by private clubs to designated pleasure vessels. (Paragraphs 22 and 32)
- (iv) The demand for sheltered space for working vessels is projected to increase from 328.5 hectares in 2021 to 345.9 hectares in 2035. There has been significant decrease in the number of licensed fish carriers (Class III a) and fishing vessels (Class III c) in 2020 and 2021 as these vessels might not be able to carry out periodic surveys and renew their operating licenses due to quarantine measures relating to the COVID-19 pandemic. Data in 2020 and 2021 are therefore treated as outliers in the projection on number of such vessels. The supply is projected to decrease from 376.7 hectares in 2021 to 375.3 hectares in 2035. When comparing the demand and supply of sheltered space for working vessels, the balance will decrease from a surplus of 48.2 hectares in 2021 to a surplus of 29.4 hectares in 2035. (Paragraphs 16 – 17, 20, 33 and 35)
- (v) The demand for sheltered space for pleasure vessels is projected to increase from 240.3 hectares in 2021 to 311.1 hectares in 2035. There has been upsurge in the number of open cruisers (Class IV c) in 2021 which might be due to the fact that local people purchased more relatively affordable vessels while they could not travel to other places conveniently for leisure purposes during the COVID-19 pandemic. Data in 2021 are therefore treated as outliers in the projection on number of such vessels. The supply is projected to increase from 248.2 hectares in 2021 to 284.8 hectares in 2035. When comparing the demand and supply of sheltered space for pleasure vessels, the balance will decrease from a surplus of 7.9

hectares in 2021 to a shortfall of 26.3 hectares in 2035. (Paragraphs 16, 18, 20, 34 and 36)

- (vi) The surge in demand for sheltered space for local vessels is largely attributable to the significant increase for Class IV vessels. (Paragraph 21)
- (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 pleasure vessels can be absorbed by the surplus of sheltered space with respect to working vessels throughout the period up to 2035. On a territory-wide basis, the supply of sheltered space for local vessels can adequately meet the demand throughout the period up to 2035, with an overall surplus of 3.1 hectares in 2035. (Paragraph 37)

## **Way Forward**

6. MD will keep in view the availability of suitable sheltered space and conduct study, as well as maintain the established practice of periodically carrying out assessment of sheltered space for local vessels to ensure that there is sufficient space within Hong Kong waters suitable for local vessels and small visiting vessels to take refuge during passages of typhoons. The projection on demand for sheltered space for local vessels, particularly fish carriers, fishing vessels and open cruisers, will be closely monitored and reviewed, alongside with the development of the COVID-19 pandemic and economy in the coming few years.

Planning and Services Division  
Marine Department  
December 2022



**Marine Department**  
The Government of the Hong Kong Special Administrative Region

Department of  
**LOGISTICS  
& MARITIME  
STUDIES**  
物流及航運學系



**PolyU 理大商學院**  
**Business School**  
Innovation-driven Education and Scholarship

Annex



# REPORT

Assessment of Typhoon Shelter Space Requirements (2022–2035)

December 2022

# Contents

---

|  | Page |
|--|------|
| Foreword   |      |
| Executive Summary .....  | 1    |
| <u>Assessment of Typhoon Shelter Space Requirements 2022 – 2035</u>                    |      |
| Introduction .....   | 4    |
| Background .....   | 4    |
| Coverage .....   | 5    |
| Data Sources .....   | 6    |
| Classification of Vessels.....   | 6    |
| Methodology .....  | 7    |
| Findings.....  | 9    |
| Demand for Sheltered Space.....  | 9    |
| Supply of Sheltered Space .....  | 10   |
| Balance of Demand and Supply of Sheltered Space for<br>Working Vessels .....           | 13   |
| Balance of Demand and Supply of Sheltered Space for<br>Pleasure Vessels .....          | 14   |
| Overall Balance of Demand and Supply of Sheltered Space for<br>Local Vessels.....      | 14   |
| Conclusions.....   | 15   |
| Limitations .....  | 15   |
| <br><u>Appendices</u>  |      |
| 1. List of Vessel Groups and Projection Models .....                                   | A1   |
| 2. Demands for Sheltered Space for Different Vessel Groups .....                       | A2   |
| 3. Demands for Sheltered Space for Different Classes of Local Vessels .....            | A3   |
| 4. Method for Calculating the Effective Area of Sheltered Space .....                  | A4   |
| 5. Location Plan of Typhoon Shelters, Sheltered Anchorages and Marinas<br>in 2021..... | A5   |
| 6. Supply of Sheltered Space for Working Vessels .....                                 | A6   |
| 7. Supply of Sheltered Space for Pleasure Vessels .....                                | A7   |
| 8. Demand and Supply of Sheltered Space for Local Vessels .....                        | A8   |

## Foreword

---

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

The Department of Logistics and Maritime Studies in the Faculty of Business, The Hong Kong Polytechnic University, has long pursued a combination of academic achievements and practical experience. In 2021, Associate Professor Dr. Dong Yang and his research team have been commissioned by the Marine Department of the Government of the Hong Kong Special Administrative Region (Marine Department) to conduct an assessment on the latest and projected situations of demand and supply of sheltered space in Hong Kong up to 2035.

This report presents the findings of an assessment of the current demand and supply of sheltered space in Hong Kong waters suitable for local vessels seeking refuge during passages of typhoons, as well as projected situations up to 2035. The assessment is made on an overall territory-wide basis. The findings will be useful for the Government in regulating and managing local vessels and typhoon shelter space.

Department of Logistics and Maritime Studies  
The Hong Kong Polytechnic University  
December 2022

## Executive Summary

### Demand and Supply of Sheltered Space for Working Vessels

1. The demand for sheltered space for working vessels (Classes I to III vessels and Mainland visiting vessels<sup>1</sup>) is projected to increase from 328.5 hectares in 2021 to 345.9 hectares in 2035.
2. The supply of sheltered space for working vessels including statutory typhoon shelters<sup>2</sup> and five sheltered anchorages<sup>3</sup> in 2021 is 376.7 hectares. Due to some development projects which may involve small reclamation and installation of floating barriers, the supply will be slightly decreased to 375.3 hectares in 2035.
3. The matching of demand and supply of sheltered space for working vessels indicates that the supply of sheltered space can adequately meet the projected demand on a territory-wide basis with a surplus of 29.4 hectares in 2035. The results are shown in Table 1 below.

**Table 1: Balance of Demand and Supply of Sheltered Space for Working Vessels**

|                | Actual | Projection |       |       | Hectares |
|----------------|--------|------------|-------|-------|----------|
|                |        | 2021       | 2025  | 2030  | 2035     |
| <b>Supply</b>  | 376.7  | 376.8      | 375.3 | 375.3 |          |
| <b>Demand</b>  | 328.5  | 349.8      | 351.4 | 345.9 |          |
| <b>Balance</b> | +48.2  | +27.0      | +23.9 | +29.4 |          |

Note: Figures refer to year-end position.

<sup>1</sup> They include river trade vessels and coastal vessels registered in the Mainland.

<sup>2</sup> The typhoon shelters for working vessels include Aberdeen West Typhoon Shelter, Cheung Chau Typhoon Shelter, New Yau Ma Tei Typhoon Shelter, Rambler Channel Typhoon Shelter, Sam Ka Tsuen Typhoon Shelter, Shau Kei Wan Typhoon Shelter, Shuen Wan Typhoon Shelter, To Kwa Wan Typhoon Shelter, Tuen Mun Typhoon Shelter, and part of the typhoon shelters including Causeway Bay Typhoon Shelter, Hei Ling Chau Typhoon Shelter, Kwun Tong Typhoon Shelter and Yim Tin Tsai Typhoon Shelter.

<sup>3</sup> The sheltered anchorages for working vessels include Chai Wan Cargo Basin, Kat O, Sha Tau Kok, Tai O and Tsuen Wan.

## Demand and Supply of Sheltered Space for Pleasure Vessels

4. The demand for sheltered space for pleasure vessels (Class IV vessels and visiting pleasure vessels) is projected to increase from 240.3 hectares in 2021 to 311.1 hectares in 2035.
5. The supply of sheltered space for pleasure vessels includes statutory typhoon shelters<sup>4</sup>, sheltered anchorages<sup>5</sup>, as well as marinas. The supply will increase from 248.2 hectares in 2021 to 284.8 hectares in 2035, mainly attributable to the expansion of Aberdeen South Typhoon Shelter.
6. The matching of demand and supply of sheltered space for pleasure vessels indicates that there will be a shortfall of sheltered space for pleasure vessels up to 2035. The balance of sheltered space will change from a surplus of 7.9 hectares in 2021 to a shortfall of 26.3 hectares in 2035. The results are shown in Table 2 below.

**Table 2: Balance of Demand and Supply of Sheltered Space for Pleasure Vessels**

|                | Hectares |            |       |       |
|----------------|----------|------------|-------|-------|
|                | Actual   | Projection |       |       |
|                | 2021     | 2025       | 2030  | 2035  |
| <b>Supply</b>  | 248.2    | 254.1      | 284.8 | 284.8 |
| <b>Demand</b>  | 240.3    | 253.9      | 282.5 | 311.1 |
| <b>Balance</b> | +7.9     | +0.2       | +2.3  | -26.3 |

Note: Figures refer to year-end position.

<sup>4</sup> The typhoon shelters for pleasure vessels include Aberdeen South Typhoon Shelter, and part of the typhoon shelters including Causeway Bay Typhoon Shelter, Hei Hing Chau Typhoon Shelter, Kwun Tong Typhoon Shelter and Yim Tin Tsai Typhoon Shelter.

<sup>5</sup> The sheltered anchorages for pleasure vessels include Cheung Sha Lan, Middle Island, Nim Shue Wan, Pak Sha Wan (Hebe Haven), Sai Kung, Shuen Wan Hoi, St. Stephen's Bay, Tai Mei Tuk, Tai Tam Harbour, Ting Kau, Tsam Chuk Wan (Jade Bay) and Tseung Kwan O.



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

7. Although there will be a shortfall in sheltered space for pleasure vessels up to 2035, the shortfall can be absorbed by the surplus with respect to working vessels throughout the period up to 2035 since both statutory typhoon shelters and sheltered anchorages are open to all classes of local vessels on a first-come-first-served basis. On a territory-wide basis, the supply of sheltered space for local vessels can adequately meet the demand throughout the period up to 2035. As shown in Table 3 below, the surplus of sheltered space for local vessels will reduce from 56.1 hectares in 2021 to 3.1 hectares in 2035.

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

|                | Hectares |            |       |       |
|----------------|----------|------------|-------|-------|
|                | Actual   | Projection |       |       |
|                | 2021     | 2025       | 2030  | 2035  |
| <b>Supply</b>  | 624.9    | 630.9      | 660.1 | 660.1 |
| <b>Demand</b>  | 568.8    | 603.7      | 633.9 | 657.0 |
| <b>Balance</b> | +56.1    | +27.2      | +26.2 | +3.1  |

Note: Figures refer to year-end position.

## Conclusions

8. The surge in demand for sheltered space for local vessels from 2021 to 2035 is largely attributable to the significant increase in demand for Class IV vessels.
9. On a territory-wide basis, the supply of sheltered space for local vessels can adequately meet the demand throughout the period up to 2035.
10. It is observed that the trends of the number of fish carriers (Class III a), fishing vessels (Class III c) and open cruisers (Class IV c) have been significantly affected by the COVID-19 pandemic during recent years. It is thus proposed that the projection on demand for sheltered space for local vessels, particularly fish carriers, fishing vessels and open cruisers, should be closely monitored and reviewed, alongside with the development of the COVID-19 pandemic and economy in the coming few years.

# Assessment of Typhoon Shelter Space Requirements 2022 – 2035

---

## Introduction

1. This report includes three elements: Executive Summary, Main Report and Appendices.
2. The methodologies adopted are based on a structured and auditable framework with quantitative and qualitative elements.
3. The assessment has been conducted with the full support of the Marine Department with a view to assessing the sheltered space demand and supply for local vessels during passages of typhoons.

## Background

4. The Marine Department has been periodically conducting assessment on the projected situation of demand and supply of sheltered space for local vessels to take refuge during passages of typhoons on a territory-wide basis.
5. This assessment is undertaken by the Hong Kong Polytechnic University commissioned by the Marine Department. A project team, which consists of maritime specialists and modelling specialists, is tasked to compare the existing and projected situation of demand and supply, and advise on the projected surplus or shortfall in sheltered space for local vessels in Hong Kong waters.
6. The previous assessment report released by the Marine Department in 2017 projected that the demand for sheltered space for local vessels would rise before 2030 and the growth was largely due to a significant increase in the demand from Class IV vessels.
7. Although the territorial sheltered space supply for local vessels could adequately accommodate future demand by 2030, there would be increasing competitions among different types of vessels for sheltered space. The projection horizon for this round of assessment is extended to year 2035 to support long-term planning.

8. At the 27<sup>th</sup> meeting of the Port Progress Committee held on 15 February 1996, the then Secretary for Planning, Environment and Lands decided that assessment of sheltered space requirement by pleasure vessels should be treated as a separate category from the other vessels. This policy directive has also been adopted in this round of assessment.

### **Coverage**

9. Local vessels refer to vessels with valid operating licence in Hong Kong (i.e. the four classes of locally licensed vessels), river trade vessels and coastal vessels registered in the mainland (Mainland visiting vessels), and visiting pleasure vessels.
10. 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. Most vessels exceeding 75 metres in length are excluded as appropriate typhoon arrangements for these relatively large vessels are required to be made by owners as per their licensing conditions.
11. On the supply side, sheltered space includes statutory typhoon shelters (typhoon shelters) as specified in the Schedule of the Merchant Shipping (Local Vessels) (Typhoon Shelters) Regulation (Cap. 548E), sheltered anchorages and marinas with berthing facilities in their own premises. The Government Dockyard and the water areas occupied by Government buoys in typhoon shelters are not included.<sup>6</sup> 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.

<sup>6</sup> 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.

## Data Sources

12. The number of locally licensed vessels is based on the licensing records maintained by the Marine Department. A large-scale survey on sheltered arrangements of locally licensed vessels<sup>7</sup> has been conducted after the typhoon season in 2020. Information on locally licensed vessels usually not taking up sheltered space<sup>8</sup> in Hong Kong waters has been collected in the survey and adopted in the assessment. As for Mainland visiting vessels, the number of such vessels taking refuge in Hong Kong waters during passages of typhoons as recorded in the Typhoon Reports of the Marine Department is adopted. As for visiting pleasure vessels, the number of such vessels which stayed in Hong Kong during passages of typhoons as maintained by the Marine Department is adopted.

## Classification of Vessels

13. 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 mainly include launches and ferries; Class II vessels include dry cargo vessels, dumb lighters, dredgers, barges, pilot boats, tugs, etc.; Class III vessels include fishery related vessels; and Class IV vessels are pleasure vessels. These vessels are further sub-divided into relatively homogenous vessel groups regarding the vessel size, usage and number. Projection is carried out for each of these vessel groups. There are total of 16 vessel groups, including two groups for Mainland visiting vessels and visiting pleasure vessels, as shown in [Appendix 1](#). Appropriate projection model is adopted for each vessel group.

<sup>7</sup> The survey enumerated a total of 5 509 locally licensed vessels with a response rate of 74%.

<sup>8</sup> During passages of typhoons, 17.1% of all locally licensed vessels usually did not take up sheltered space in Hong Kong waters, i.e., outside Hong Kong, stowed in dry berths or mother boats, took refuge in fish culture zones and shipyards.

## Methodology

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

(a) Space requirement for working vessels is computed by the formula:

$$\text{Area required} = \text{vessel length} \times \text{vessel breadth} \times 2 \times 4/3$$

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. The occupancy factors have been verified by using aerial photos. Size of Mainland visiting vessels is based on the average size of typical river trade vessels which are in majority.

(b) Space requirement for pleasure vessels is based on aerial photos of sheltered space where pleasure vessels usually berth. The unit sheltered space for each pleasure vessel is 239 m<sup>2</sup> on average.

(c) Sheltered space is provided for all local vessels in need. Moreover, locally licensed vessels with valid operating licences and those expired within 12 months<sup>9</sup> are included in the demand for assessment. In addition, vessels usually not taking up sheltered space in Hong Kong waters are excluded.

15. Time series model is mainly employed to project the number of vessels. In time series models, vessel numbers are related to its past values, and such dependence is employed to project the number of vessels. Time series model is established for each vessel group, and appropriate model is employed in the projection. The model chosen for each vessel group is shown in [Appendix 1](#).

16. The base period of projection on the number of local vessels is from 2007 since the enactment of the Merchant Shipping (Local Vessels) Ordinance (Cap. 548) to 2021, except fish carriers (Class III a), fishing vessels (Class III c) and open cruisers (Class IV c) of which their trends have been significantly affected by the COVID-19 pandemic during recent years.

<sup>9</sup> 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.

17. In 2020 and 2021, there has been significant decrease in the number of licensed fish carriers and fishing vessels as these vessels might not be able to carry out periodic surveys and renew their operating licences due to quarantine measures relating to the COVID-19 pandemic. Data in 2020 and 2021 are therefore treated as outliers in the projection on number of such vessels.
18. In 2021, there has been upsurge in the number of open cruisers which might be due to the fact that local people purchased more relatively affordable vessels while they could not travel to other places conveniently for leisure purposes during the COVID-19 pandemic. Data in 2021 are therefore treated as outliers in the projection on number of such vessels.
19. The projected demand for sheltered space also considers the projected change in size of vessels. Demands for sheltered space for different vessel groups are shown in [Appendix 2](#).

## Findings

### Demand for Sheltered Space

20. As shown in Table 1 below, the demand for sheltered space for working vessels is projected to increase from 328.5 hectares in 2021 to 345.9 hectares in 2035. On the other hand, the demand for sheltered space for pleasure vessels is projected to increase from 240.3 hectares in 2021 to 311.1 hectares in 2035. Demands for sheltered space for different classes of local vessels are shown in [Appendix 3](#).

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

|                                   | Hectares     |              |              |              |
|-----------------------------------|--------------|--------------|--------------|--------------|
|                                   | Actual       | Projection   |              |              |
|                                   | 2021         | 2025         | 2030         | 2035         |
| <b>Working vessels</b>            | <b>328.5</b> | <b>349.8</b> | <b>351.4</b> | <b>345.9</b> |
| <i>Class I vessels</i>            | 15.5         | 14.3         | 14.3         | 14.3         |
| <i>Class II vessels</i>           | 205.2        | 189.5        | 195.1        | 193.7        |
| <i>Class III vessels</i>          | 87.6         | 97.4         | 93.5         | 89.4         |
| <i>Mainland visiting vessels*</i> | 20.3         | 48.5         | 48.5         | 48.5         |
| <b>Pleasure vessels</b>           | <b>240.3</b> | <b>253.9</b> | <b>282.5</b> | <b>311.1</b> |
| <i>Class IV vessels</i>           | 238.7        | 252.4        | 281.0        | 309.6        |
| <i>Visiting pleasure vessels</i>  | 1.5          | 1.5          | 1.5          | 1.5          |
| <b>Total</b>                      | <b>568.8</b> | <b>603.7</b> | <b>633.9</b> | <b>657.0</b> |

Notes: \* The large increase in Mainland visiting vessels is due to the very small number of such vessels in 2021 owing to the COVID-19 pandemic. Figures may not add up to totals due to rounding. Figures refer to year-end position.

21. The surge in demand for sheltered space for local vessels is largely attributable to the significant increase for Class IV vessels.

## Supply of Sheltered Space

22. The total supply of sheltered space in Hong Kong waters includes: (a) statutory typhoon shelters, (b) sheltered anchorages and (c) marinas with berthing facilities in their own premises. Administrative records maintained by the Government are referred to. Known development projects affecting the supply of sheltered space are also considered in the assessment. Marinas have been approached for updated information on water space and their development plans through a stocktaking exercise by the Marine Department.
23. In 2021, the total supply of sheltered space in 14 statutory typhoon shelters and 16 sheltered anchorages are 419.0 hectares and 178.8 hectares respectively. An area of 3.6 hectares in typhoon shelters occupied by Government buoys is to be excluded. The method for calculating the effective area of sheltered space can be found in [Appendix 4](#). As for the four marinas with berthing facilities in their own premises<sup>10</sup>, the total supply of sheltered space is 30.7 hectares. The total supply of sheltered space for local vessels in 2021 is 624.9 hectares. A map showing the locations of typhoon shelters, sheltered anchorages and marinas is in [Appendix 5](#).
24. The *Central-Wanchai Bypass and Island Eastern Corridor Link* project affected the Causeway Bay Typhoon Shelter. Upon completion of the project, 3.6 hectares in the Causeway Bay Typhoon Shelter will be reinstated in 2022. With the general public's support, Wan Chai Cargo Basin with 2.0 hectares is used for water sports and recreation precinct under the *Urban Design Study for the Wan Chai North and North Point Harbourfront Areas*, and is not included in the supply of sheltered space in this study.
25. Waters within the Eastern Channel of Tseung Kwan O have been occupied by local vessels, particularly pleasure vessels. With a view to enhancing management of the waters, it is considered appropriate to include the water areas (3.4 hectares) as sheltered anchorage (named the Tseung Kwan O Sheltered Anchorage) and add this into the supply of sheltered space in the assessment in 2022.

<sup>10</sup> The marinas include Clearwater Bay Golf and Country Club Marina, Club Marina Cove, Gold Coast Yacht and Country Club, and Lantau Yacht Club.



26. Floating barriers are proposed to be installed in the Hei Ling Chau Typhoon Shelter. Installation is expected to be completed in 2023. Therefore, 1.0 hectare of water areas will be occupied by the floating barriers.
27. A new ferry pier occupying around 0.6 hectares of water areas is proposed to be constructed in the Cheung Chau Typhoon Shelter. The project will commence in 2026.
28. Small reclamation of 0.9 hectares will be carried out in the Tuen Mun Typhoon Shelter from 2026 due to the *Tuen Mun Bypass* project.
29. The Airport City Cove, which includes berthing facilities of around 3.4 hectares by the Airport Authority, is expected to be completed in 2028.
30. The *Invigorating Island South* initiative has proposed to expand the Aberdeen South Typhoon Shelter by 24.0 hectares from 2030.
31. The *Tung Chung New Town Extension* has included sheltered water areas located at the north of the proposed reclamation area. The water areas of 3.3 hectares will be available by 2030.
32. 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 pleasure vessels. For the purpose of matching of demand and supply of sheltered space, typhoon shelters are generally put under the supply for working 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 for pleasure vessels.
33. The supply of sheltered space for working vessels including typhoon shelters<sup>11</sup> and sheltered anchorages<sup>12</sup> in 2021 is 376.7 hectares and will decrease to

<sup>11</sup> The typhoon shelters for working vessels include Aberdeen West Typhoon Shelter, Cheung Chau Typhoon Shelter, New Yau Ma Tei Typhoon Shelter, Rambler Channel Typhoon Shelter, Sam Ka Tsuen Typhoon Shelter, Shau Kei Wan Typhoon Shelter, Shuen Wan Typhoon Shelter, To Kwa Wan Typhoon Shelter, Tuen Mun Typhoon Shelter, and part of the typhoon shelters including Causeway Bay Typhoon Shelter, Hei Ling Chau Typhoon Shelter, Kwun Tong Typhoon Shelter and Yim Tin Tsai Typhoon Shelter.

<sup>12</sup> The sheltered anchorages for working vessels include Chai Wan Cargo Basin, Kat O, Sha Tau Kok, Tai O and Tsuen Wan.

375.3 hectares in 2035 as shown in Table 2 below. Details of the supply of sheltered space for working vessels can be found in [Appendix 6](#).

**Table 2: Supply of Sheltered Space for Working Vessels**

|                      | Actual       | Projection   |              |              |
|----------------------|--------------|--------------|--------------|--------------|
|                      | 2021         | 2025         | 2030         | 2035         |
| Typhoon shelters     | 355.6        | 355.7        | 354.2        | 354.2        |
| Sheltered anchorages | 21.1         | 21.1         | 21.1         | 21.1         |
| <b>Total</b>         | <b>376.7</b> | <b>376.8</b> | <b>375.3</b> | <b>375.3</b> |

Hectares

Note: Figures refer to year-end position.

34. The supply of sheltered space for pleasure vessels includes typhoon shelters<sup>13</sup>, sheltered anchorages<sup>14</sup>, as well as marinas. The supply will increase from 248.2 hectares in 2021 to 284.8 hectares in 2035. The supply of sheltered space for pleasure vessels up to 2035 is shown in Table 3 below. Details of the supply of sheltered space for pleasure vessels can be found in [Appendix 7](#).

<sup>13</sup> The typhoon shelters for pleasure vessels include Aberdeen South Typhoon Shelter, and part of the typhoon shelters including Causeway Bay Typhoon Shelter, Hei Hing Chau Typhoon Shelter, Kwun Tong Typhoon Shelter and Yim Tin Tsai Typhoon Shelter.

<sup>14</sup> The sheltered anchorages for pleasure vessels include Cheung Sha Lan, Middle Island, Nim Shue Wan, Pak Sha Wan (Hebe Haven), Sai Kung, Shuen Wan Hoi, St. Stephen's Bay, Tai Mei Tuk, Tai Tam Harbour, Ting Kau, Tsam Chuk Wan (Jade Bay) and Tseung Kwan O.

**Table 3: Supply of Sheltered Space for Pleasure Vessels**

Hectares

|                      | Actual       | Projection   |              |              |
|----------------------|--------------|--------------|--------------|--------------|
|                      | 2021         | 2025         | 2030         | 2035         |
| Typhoon shelters     | 59.8         | 62.3         | 86.3         | 86.3         |
| Sheltered anchorages | 157.7        | 161.1        | 161.1        | 161.1        |
| Marinas              | 30.7         | 30.7         | 34.1         | 34.1         |
| <b>Total*</b>        | <b>248.2</b> | <b>254.1</b> | <b>284.8</b> | <b>284.8</b> |

Notes: \* Including sheltered water areas of 3.3 hectares to be available by 2030 under the *Tung Chung New Town Extension*.

Figures refer to year-end position.

**Balance of Demand and Supply of Sheltered Space for Working Vessels**

35. When comparing the demand and supply of sheltered space for working vessels, the balance will decrease from a surplus of 48.2 hectares in 2021 to a surplus of 29.4 hectares in 2035. Balance of the demand and supply of sheltered space for working vessels is shown in Table 4 below.

**Table 4: Balance of Demand and Supply of Sheltered Space for Working Vessels**

Hectares

|                | Actual | Projection |       |       |
|----------------|--------|------------|-------|-------|
|                | 2021   | 2025       | 2030  | 2035  |
| <b>Supply</b>  | 376.7  | 376.8      | 375.3 | 375.3 |
| <b>Demand</b>  | 328.5  | 349.8      | 351.4 | 345.9 |
| <b>Balance</b> | +48.2  | +27.0      | +23.9 | +29.4 |

Note: Figures refer to year-end position.

### Balance of Demand and Supply of Sheltered Space for Pleasure Vessels

36. When comparing the supply with the demand for sheltered space for pleasure vessels, the balance will decrease from a surplus of 7.9 hectares in 2021 to a shortfall of 26.3 hectares in 2035 as shown in Table 5 below.

**Table 5: Balance of Demand and Supply of Sheltered Space for Pleasure Vessels**

|                | Actual | Projection |       |       |
|----------------|--------|------------|-------|-------|
|                | 2021   | 2025       | 2030  | 2035  |
| <b>Supply</b>  | 248.2  | 254.1      | 284.8 | 284.8 |
| <b>Demand</b>  | 240.3  | 253.9      | 282.5 | 311.1 |
| <b>Balance</b> | +7.9   | +0.2       | +2.3  | -26.3 |

Note: Figures refer to year-end position.

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

37. As typhoon shelters and sheltered anchorages are on a first-come-first-served basis, the shortfall of sheltered space for pleasure vessels can be absorbed by the surplus with respect to working vessels throughout the period up to 2035. On a territory-wide basis, the supply of sheltered space for local vessels can adequately meet the demand throughout the period up to 2035. The surplus of sheltered space for local vessels will reduce from 56.1 hectares in 2021 to 3.1 hectares in 2035 as shown in Table 6 below.

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

|                         | Actual       | Projection   |              |             |
|-------------------------|--------------|--------------|--------------|-------------|
|                         | 2021         | 2025         | 2030         | 2035        |
| <b>Working Vessels</b>  | +48.2        | +27.0        | +23.9        | +29.4       |
| <b>Pleasure vessels</b> | +7.9         | +0.2         | +2.3         | -26.3       |
| <b>Total</b>            | <b>+56.1</b> | <b>+27.2</b> | <b>+26.2</b> | <b>+3.1</b> |

Note: Figures refer to year-end position.

## Conclusions

38. The surge in demand for sheltered space for local vessels is largely attributable to the significant increase for Class IV vessels.
39. As shown in [Appendix 8](#), the supply of sheltered space for local vessels can adequately meet the projected demand on a territory-wide basis up to 2035 should there be no major reduction of existing typhoon sheltered space or sheltered space in development projects.
40. It is observed that the trends of the number of fish carriers (Class III a), fishing vessels (Class III c) and open cruisers (Class IV c) have been significantly affected by the COVID-19 pandemic during recent years. It is thus proposed that the projection on demand for sheltered space for local vessels, particularly fish carriers, fishing vessels and open cruisers, should be closely monitored and reviewed, alongside with the development of the COVID-19 pandemic and economy in the coming few years.

## Limitations

41. 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 sheltered arrangements of locally licensed vessels conducted after the typhoon season in 2020 and are assumed to remain the same up to 2035. These factors have to be updated to reflect the relevant changes in the floating communities in the next assessment.

**List of Vessel Groups and Projection Models**

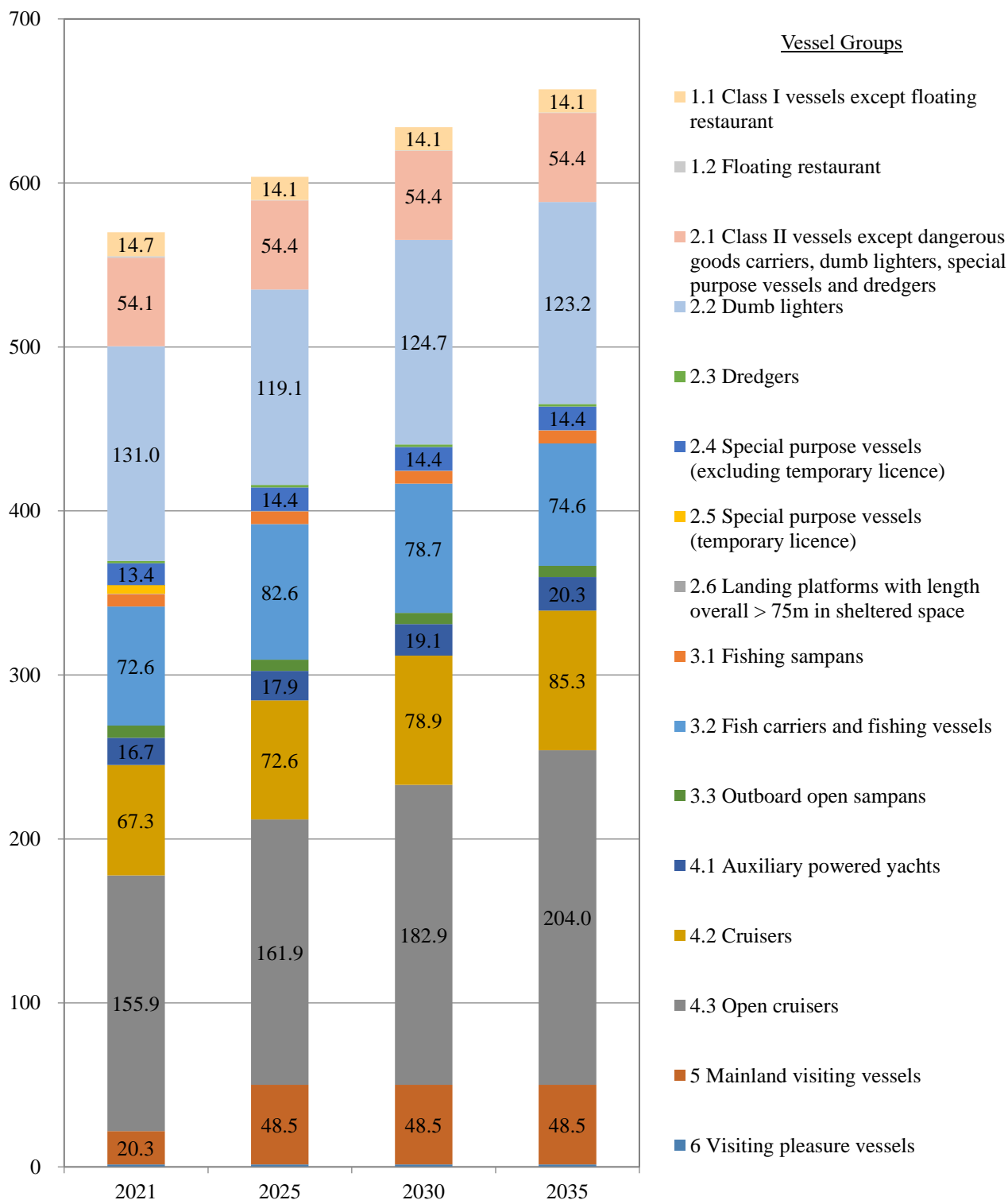
| Local vessels             | Class of vessels | Vessel group  | Description   | Model                     |
|---------------------------|------------------|---------------|---|---------------------------|
| Locally licensed vessels  | I                | 1.1           | Class I vessels except floating restaurant  | ARIMA (0,0,1)             |
|                           |                  | 1.2           | Floating restaurant   | Assume constant till 2035 |
|                           | II               | 2.1           | Class II vessels except dangerous goods carriers, dumb lighters, special purpose vessels and dredgers | ARIMA (0,0,0)             |
|                           |                  | 2.2           | Dumb lighters   | ARIMA (2,0,0)             |
|                           |                  | 2.3           | Dredgers  | Assume constant till 2035 |
|                           |                  | 2.4           | Special purpose vessels (excluding temporary licence)   | Assume constant till 2035 |
|                           |                  | 2.5           | Special purpose vessels (temporary licence)   | Assume constant till 2035 |
|                           |                  | 2.6           | Landing platforms with length overall > 75m in sheltered space  | Assume constant till 2035 |
|                           | III              | 3.1           | Fishing sampans   | ARIMA (0,0,0)             |
|                           |                  | 3.2           | Fish carriers and fishing vessels   | ARIMA (2,1,0)             |
|                           |                  | 3.3           | Outboard open sampans   | ARIMA (0,0,1)             |
|                           | IV               | 4.1           | Auxiliary powered yachts  | ARIMA (0,1,2)             |
|                           |                  | 4.2           | Cruisers  | ARIMA (0,1,1)             |
| 4.3                       |                  | Open cruisers | ARIMA (0,1,2)   |                           |
| Mainland visiting vessels | NA               | 5             | -   | ARIMA (0,1,2)             |
| Visiting pleasure vessels | NA               | 6             | -   | Assume constant till 2035 |

Notes: Classes and types of vessels refer to the vessel types stipulated in Schedule 1 of the Merchant Shipping (Local Vessels) (Certification and Licensing) Regulation (Cap. 548D).

An integrated autoregressive-moving average (ARIMA) model is a statistical analysis model that predicts future values based on past values.

**Demands for Sheltered Space for Different Vessel Groups**

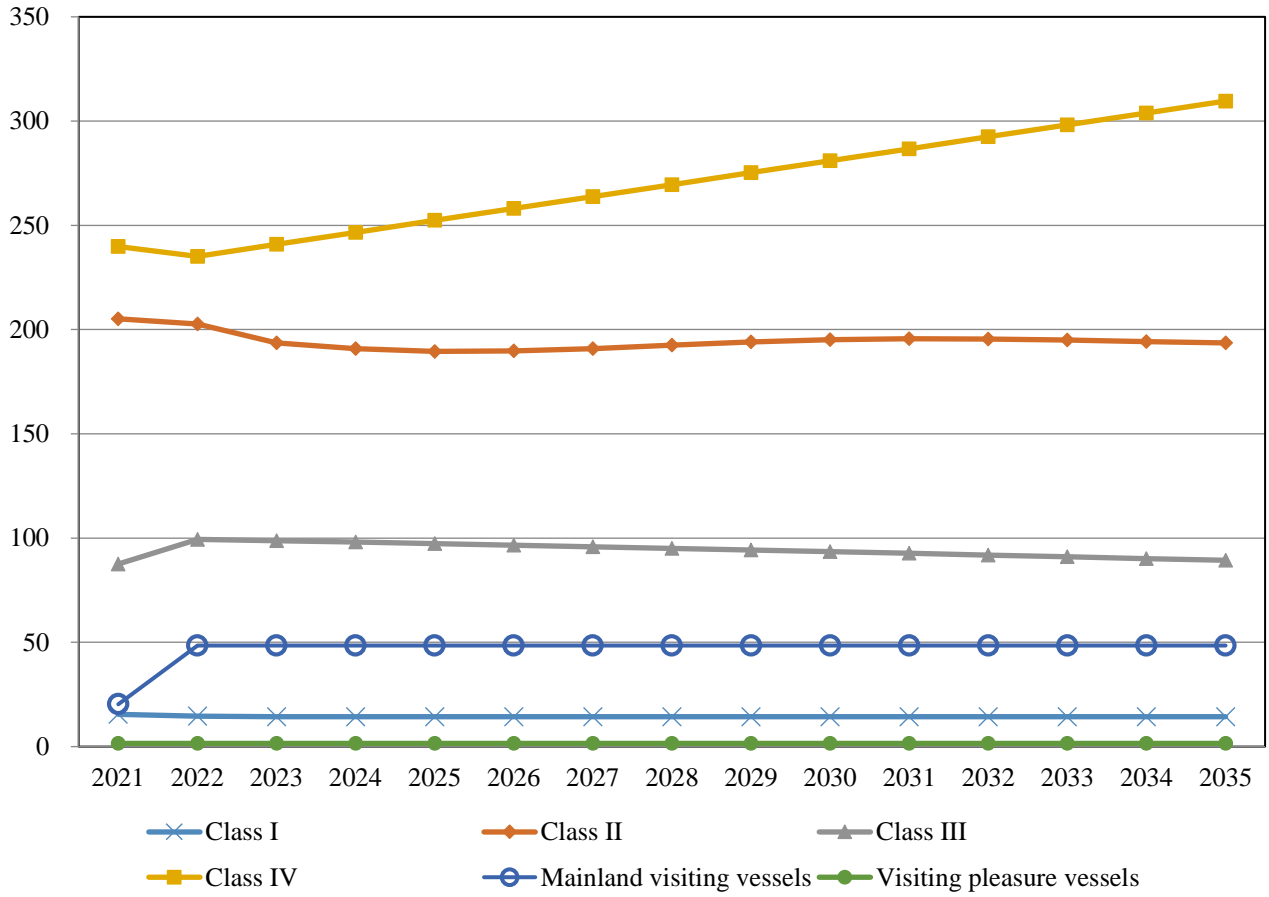
Hectares



Note: Figures less than 10 hectares are suppressed.

**Demands for Sheltered Space for Different Classes of Local Vessels**

Hectares

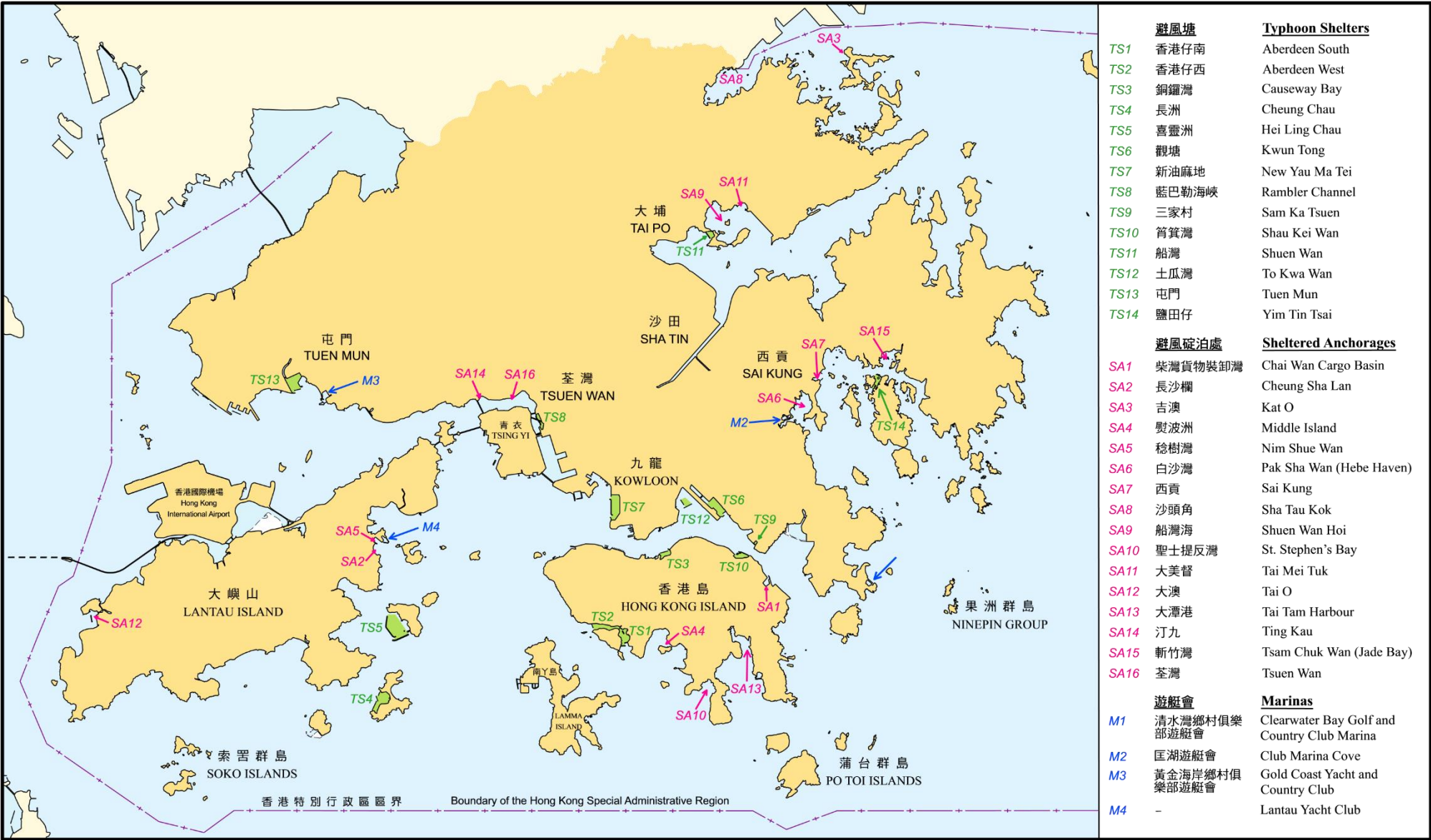




### **Method for Calculating the Effective Area of Sheltered Space**

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 2021**



**Supply of Sheltered Space for Working Vessels**

|                                | Hectares     |              |              |              |
|--------------------------------|--------------|--------------|--------------|--------------|
|                                | Actual       |              | Projection   |              |
|                                | 2021         | 2025         | 2030         | 2035         |
| <b>I. Typhoon Shelter</b>      |              |              |              |              |
| Aberdeen West                  | 34.2         | 34.2         | 34.2         | 34.2         |
| Causeway Bay                   | 3.2          | 4.3          | 4.3          | 4.3          |
| Cheung Chau                    | 50.0         | 50.0         | 49.4         | 49.4         |
| Hei Ling Chau                  | 71.8         | 70.8         | 70.8         | 70.8         |
| Kwun Tong                      | 16.9         | 16.9         | 16.9         | 16.9         |
| 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         | 55.9         | 55.9         |
| Yim Tin Tsai                   | 4.6          | 4.6          | 4.6          | 4.6          |
| <b>Sub-total *</b>             | <b>355.6</b> | <b>355.7</b> | <b>354.2</b> | <b>354.2</b> |
| <b>II. Sheltered Anchorage</b> |              |              |              |              |
| 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          |
| <b>Sub-total</b>               | <b>21.1</b>  | <b>21.1</b>  | <b>21.1</b>  | <b>21.1</b>  |
| <b>Total *</b>                 | <b>376.7</b> | <b>376.8</b> | <b>375.3</b> | <b>375.3</b> |

Note: \* Excluding 3.6 hectares occupied by Government buoys in typhoon shelters.

**Supply of Sheltered Space for Pleasure Vessels**

|   | Hectares     |              |              |              |
|---|--------------|--------------|--------------|--------------|
|   | Actual       |              | Projection   |              |
|   | 2021         | 2025         | 2030         | 2035         |
| <b>I. Typhoon Shelter</b>                   |              |              |              |              |
| Aberdeen South                              | 26.1         | 26.1         | 50.1         | 50.1         |
| Causeway Bay                                | 7.4          | 9.9          | 9.9          | 9.9          |
| Hei Ling Chau                               | 4.8          | 4.8          | 4.8          | 4.8          |
| Kwun Tong                                   | 16.9         | 16.9         | 16.9         | 16.9         |
| Yim Tin Tsai                                | 4.6          | 4.6          | 4.6          | 4.6          |
| <b>Sub-total</b>                            | <b>59.8</b>  | <b>62.3</b>  | <b>86.3</b>  | <b>86.3</b>  |
| <b>II. Sheltered Anchorage</b>              |              |              |              |              |
| Cheung Sha Lan                              | 6.7          | 6.7          | 6.7          | 6.7          |
| Middle Island                               | 6.9          | 6.9          | 6.9          | 6.9          |
| Nim Shue Wan                                | 2.3          | 2.3          | 2.3          | 2.3          |
| Pak Sha Wan (Hebe Haven)                    | 84.0         | 84.0         | 84.0         | 84.0         |
| Sai Kung                                    | 4.3          | 4.3          | 4.3          | 4.3          |
| Shuen Wan Hoi                               | 26.0         | 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          |
| Tseung Kwan O                               | -            | 3.4          | 3.4          | 3.4          |
| <b>Sub-total</b>                            | <b>157.7</b> | <b>161.1</b> | <b>161.1</b> | <b>161.1</b> |
| <b>III. Marina</b>                          |              |              |              |              |
| Airport City Cove                           | -            | -            | 3.4          | 3.4          |
| 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         |
| Gold Coast Yacht and Country Club           | 4.8          | 4.8          | 4.8          | 4.8          |
| Lantau Yacht Club                           | 8.5          | 8.5          | 8.5          | 8.5          |
| <b>Sub-total</b>                            | <b>30.7</b>  | <b>30.7</b>  | <b>34.1</b>  | <b>34.1</b>  |
| <b>Total *</b>                              | <b>248.2</b> | <b>254.1</b> | <b>284.8</b> | <b>284.8</b> |

Note: \* Including sheltered water areas of 3.3 hectares to be available by 2030 under the *Tung Chung New Town Extension*.

**Demand and Supply of Sheltered Space for Local Vessels**

Hectares

