06 EXISTING ENVIRONMENT

6.1 Introduction

The existing environment of the Project site shall be described according to four sub-chapters which are:

a) existing Physical Environment;
b) existing Biological Environment;
c) existing Human Environment; and
d) environmentally Sensitive Areas (ESAs).

6.2 Existing Physical Environment

The existing physical environment of the whole Project area located within a 5-km radius from the Project boundary will be described into different sections as the following:

a) land use;
b) hydraulic components;
c) climate and meteorology;
d) tsunami
e) hydrology and drainage;
f) geology and geotechnical;
g) water quality;
h) sediment quality;
i) air quality;
j) noise;
k) marine traffic and navigation; and
l) land traffic.

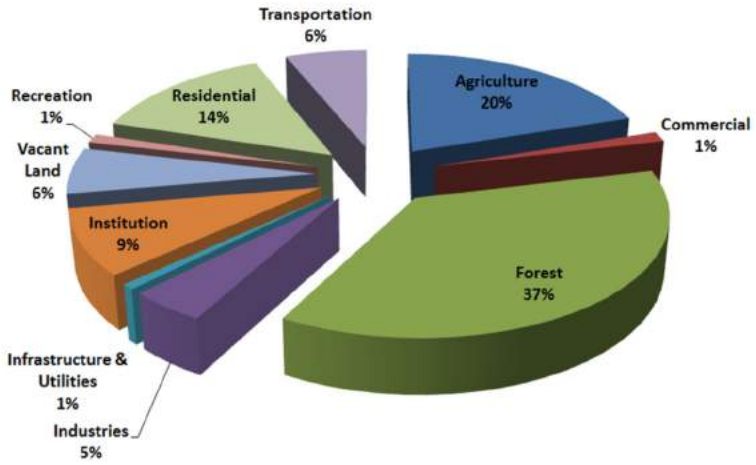
6.2.1 Land Use

This section describes the land use of the study area which refers to the area of 22,545.78 hectares within a 5-km radius from the proposed Project boundary. A major portion or three-quarters of the study area comprise the surrounding waters of the South Channel while the remaining is land-based. The study area includes the entire Mukim 6, 7, 8, 9, 10, 11, 12, I and J of Southwest District. The proposed Project area falls under the jurisdiction of the City Council of Penang Island.

Based on the land use map by the Department of Town and Country Planning (JPBD), the area surrounding the proposed Project site displays a coherent land use pattern. The main land use pattern within the study area consists of Forest, Water Bodies and Agriculture (F6.1 and T6.1). The existing land uses of the study area with 250 m intervals of the 5-km radius are shown in F6.2. The category of Water Bodies covers 72.86% of the existing land use, followed by Forest and Agricultural at 10.64 and 5.77% respectively.

The development patterns of land use at the Southwest District show that the residential development is concentrated around Teluk Kumbar, Bayan Lepas and Batu Maung while industrial activities are concentrated at the Bayan Lepas FIZ. The descriptions of land use are also based on several other sources as listed below:

a) Satellite image (SPOT-5, 20 February 2013);
b) Satellite image (Google Earth); and
c) Field observation and verification on 28 to 31 August 2016.



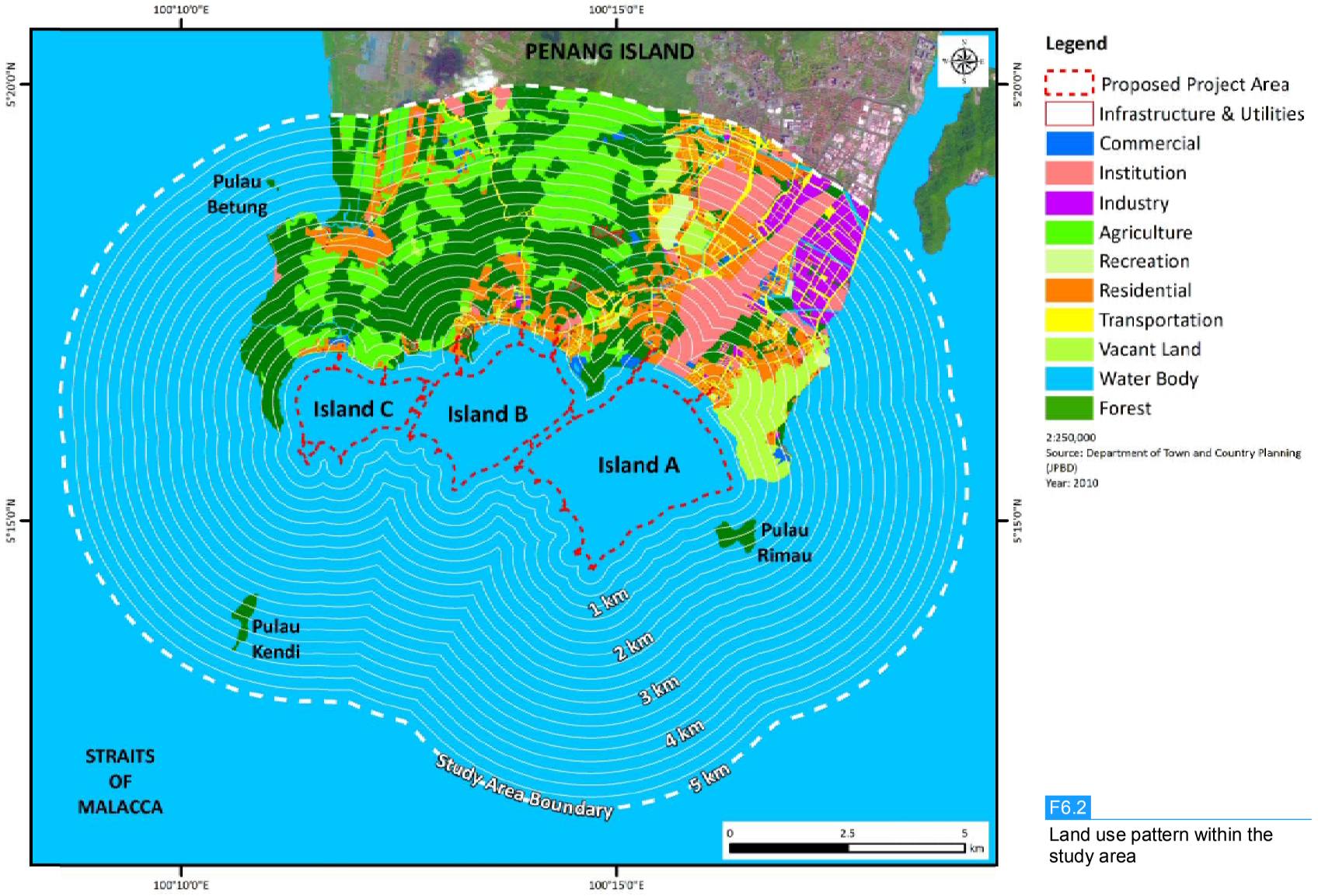
Source: JPBD (2010)

F6.1 Percentage of the current land use within the study area

T6.1 Current land use distribution within the study area

Category	Area (hectare)	Percentage (%)
Agriculture	1,300.28	19.90
Commercial	89.72	1.37
Forest	2,399.51	36.73
Institution	591.76	9.06
Industries	289.87	4.44
Infrastructure & Utilities	49.43	0.76
Vacant Land	412.72	6.32
Recreation	80.06	1.23
Residential	916.10	14.02
Transportation	403.01	6.17
Total	**6,532.48**	**100.00**

Source: JPBD (2010)

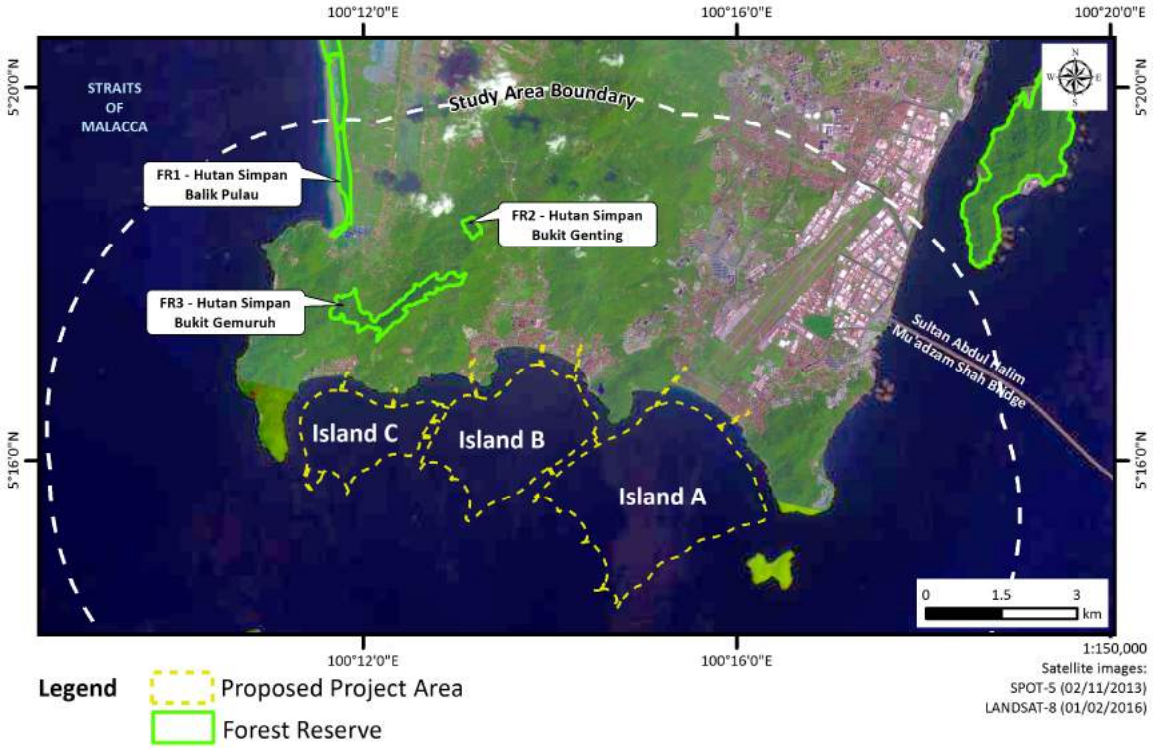


F6.2

Land use pattern within the study area

6.2.2.1 Forest Area

Forest Area is the second largest land use in the proposed Project site and covers 10.64% of the total land use. The major forest reserves in the proposed Project site are Bukit Gemuruh Forest Reserve, Bukit Genting Forest Reserve and Balik Pulau Forest Reserve. The total area of the forest reserve in the study area is 126.96 hectares. The nearest forest reserve is Bukit Gemuruh Forest Reserve which is less than 2 km from the Project site. F6.3 shows the forest reserve area within the proposed Project site.



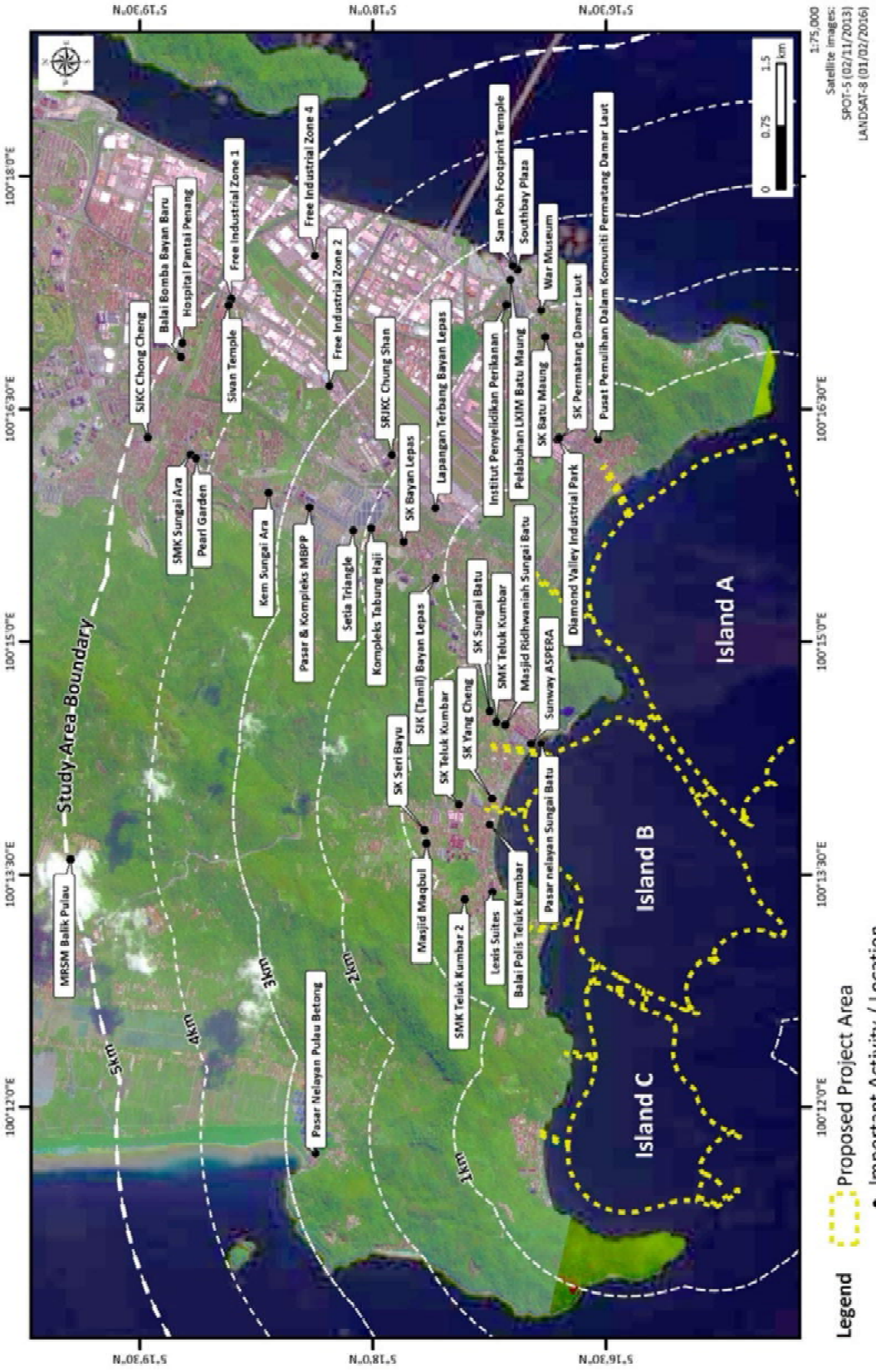
F6.3 Forest area within the study area

6.2.2.2 Other Land Use Activities

In the study area, there are important places and activities carried out by the local residents. There are many public facilities within the study area such as mosques, town halls, tourist attractions and Government buildings. Several education centres in the form of schools and colleges are also present within these corridors. T6.2, F6.4 and F6.5 show the important locations and land use activities in the study area.

T6.2
Current active and important activities/ locations

Place	Radius	Latitude	Longitude
1. Free Industrial Zone 1	5 km	5.31520°N	100.28680°E
2. Free Industrial Zone 2	4 km	5.30467°N	100.27747°E
3. Free Industrial Zone 4	5 km	5.30622°N	100.29144°E
4. SMK Teluk Kumbar 2	1 km	5.29014°N	100.22231°E
5. Masjid Maqbul	1 km	5.29428°N	100.22831°E
6. SK Seri Bayu	1 km	5.29446°N	100.22977°E
7. Balai Polis Teluk Kumbar	1 km	5.28747°N	100.23034°E
8. SK Teluk Kumbar	1 km	5.29078°N	100.23250°E
9. Lexis Suites	1 km	5.28718°N	100.22309°E
10. SK Yang Cheng	1 km	5.28720°N	100.23312°E
11. Sunway ASPERA	1 km	5.28303°N	100.23902°E
12. Pasar nelayan Sungai Batu	1 km	5.28196°N	100.23902°E
13. Masjid Ridhwaniah Sungai Batu	1 km	5.28581°N	100.24106°E
14. SMK Teluk Kumbar	1 km	5.28675°N	100.24136°E
15. SK Sungai Batu	1 km	5.28750°N	100.24252°E
16. SJK (C) Chong Cheng	5 km	5.32413°N	100.27191°E
17. SMK Sungai Ara	5 km	5.31954°N	100.27008°E
18. Pearl Garden	5 km	5.31895°N	100.26969°E
19. Kem Sungai Ara	4 km	5.31120°N	100.26600°E
20. SRJK (C) Chung Shan	3 km	5.29795°N	100.27001°E
21. Sivan Temple	5 km	5.31548°N	100.28613°E
22. Setia Triangle	3 km	5.30212°N	100.26190°E
23. Kompleks Tabung Haji	3 km	5.30020°N	100.26216°E
24. SK Bayan Lepas	2 km	5.29671°N	100.26071°E
25. Lapangan Terbang Bayan Lepas	2 km	5.29331°N	100.26434°E
26. Hospital Pantai Penang	5 km	5.32043°N	100.28206°E
27. Balai Bomba Bayan Baru	5 km	5.32057°N	100.28055°E
28. MRSM Balik Pulau	5 km	5.33243°N	100.22659°E
29. Pasar Nelayan Pulau Betung	3 km	5.30615°N	100.19503°E
30. Pasar & Kompleks MBPP	3 km	5.30681°N	100.26440°E
31. SJK (Tamil) Bayan Lepas	2 km	5.29329°N	100.25682°E
32. Diamond Valley Industrial Park	1 km	5.28024°N	100.27172°E
33. SK Permatang Damar Laut	1 km	5.28007°N	100.27189°E
34. Pusat Pemulihan Dalam Komuniti Permatang Damar Laut	1 km	5.27588°N	100.27172°E
35. SK Batu Maung	2 km	5.28154°N	100.28271°E
36. War Museum	2 km	5.28196°N	100.28559°E
37. Southbay Plaza	3 km	5.28446°N	100.28994°E
38. Sam Poh Footprint Temple	3 km	5.28501°N	100.29037°E
39. Pelabuhan LKIM Batu Maung	3 km	5.28525°N	100.28887°E
40. Institut Penyelidikan Perikanan	3 km	5.28571°N	100.28615°E



F6.4 Existing land use activities and important locations

1. Free Industrial Zone 1

2. Free Industrial Zone 2

3. Free Industrial Zone 4

4. SMK Teluk Kumbar 2

5. Masjid Maqbul

6. SK Seri Bayu

7. Balai Polis Teluk Kumbar

8. SK Teluk Kumbar

9. Lexis Suites

10. SK Yang Cheng

11. Sunway ASPERA

12. Pasar Nelayan Sungai Batu

13. Masjid Ridhwaniah Sungai Batu

14. SMK Teluk Kumbar

15. SK Sungai Batu

16. SJK (C) Chong Cheng

17. SMK Sungai Ara

18. Pearl Garden

F6.5 Important places and associated activities

19. Kem Sungai Ara

20. SRJK (C) Chung Shan

21. Sivan Temple

22. Setia Triangle

23. Kompleks Tabung Haji

24. SK Bayan Lepas

25. Lapangan Terbang Bayan Lepas

26. Hospital Pantai Penang

27. Balai Bomba Bayan Baru

28. MRSM Balik Pulau

29. Pasar Nelayan Pulau Betung

30. Pasar dan Kompleks MBPP

31. SJK (Tamil) Bayan Lepas

32. Diamond Valley Industrial Park

33. SK Permatang Damar Laut

34. Pusat Pemulihan Dalam Komuniti Permatang Damar Laut

35. SK Batu Maung

36. War Museum

F6.5 Important places and associated activities (cont'd)

37. Southbay Plaza


38. Sam Poh Footprint Temple

39. Pelabuhan LKIM Batu Maung

40. Institut Penyelidikan Perikanan

F6.5
Important places and associated activities (cont'd)

6.2.2 Hydraulic Components

The existing hydraulic components of the study area will be explained by the following:

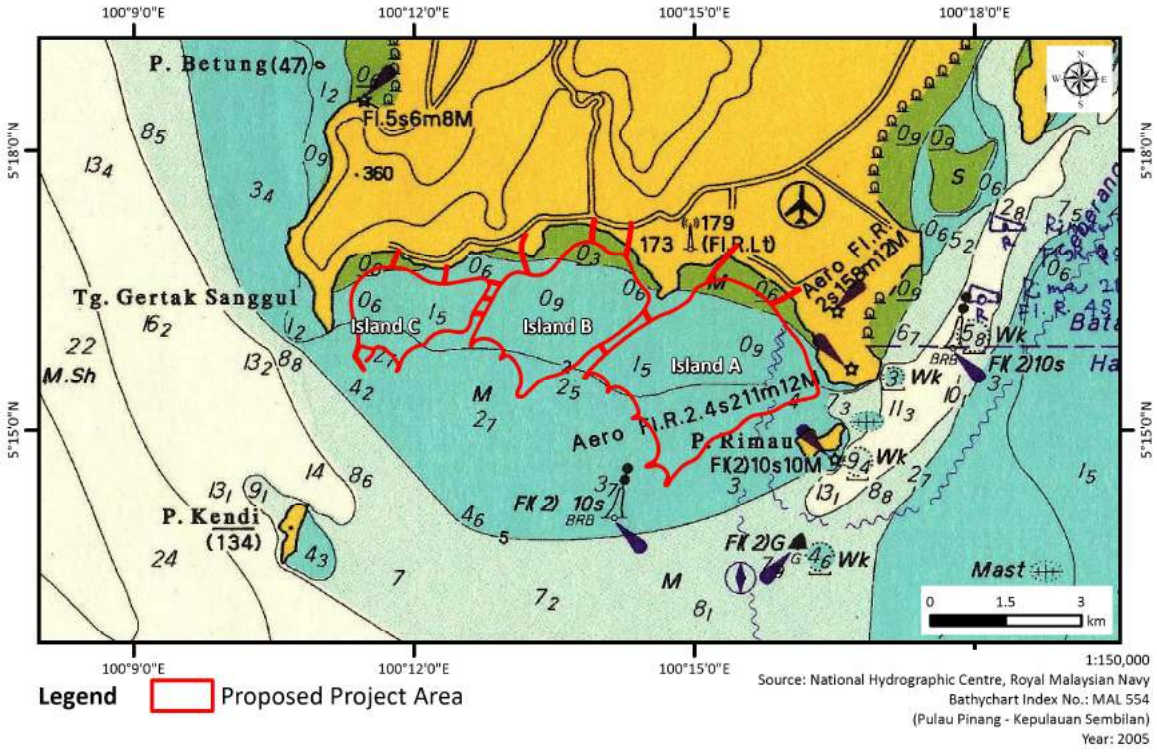
a) bathymetry;
b) water levels;
c) currents; and
d) wave.

6.2.2.1 Bathymetry

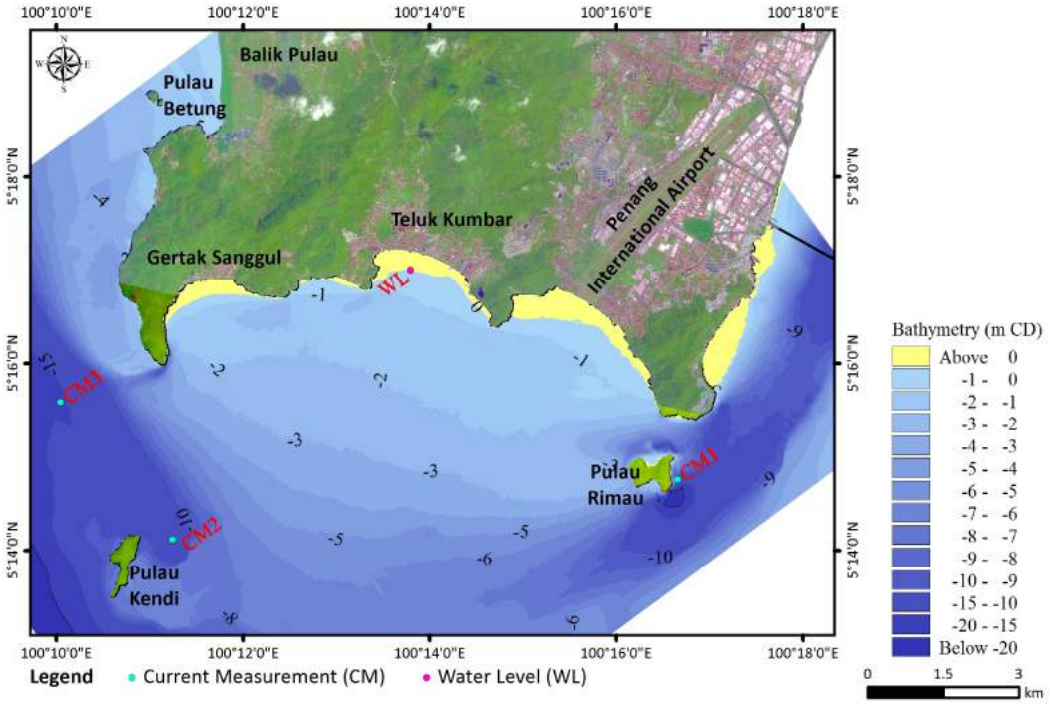
F6.6 shows the Project site overlain on the bathymetry chart (No. MAL554). A bathymetric survey was conducted from August to October 2015 by Jurukur Perunding Services to ascertain the existing bed and nearshore levels within and in the immediate vicinity of the Project site. The Project site is generally shallow, with a seabed level of about –0.3 to –4.0 m CD. There are natural deep channels near the headlands of Tanjung Gertak Sanggul and Tanjung Teluk Tempoyak, indicating relatively fast currents in these areas.

6.2.2.2 Water Levels

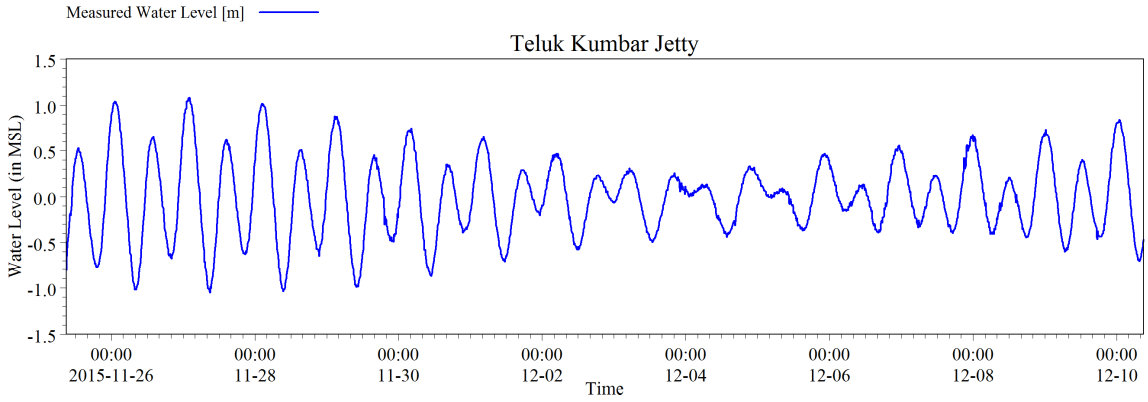
In situ water levels were measured by an automatic water level recorder, Valeport 740 installed at Teluk Kumbar Jetty (100°13.796' E, 5°16.998' N). Its location is indicated in F6.7. The measurement period was between 25th November and 10th December 2015. Time-series records of the measured water levels are shown in F6.8.



F6.6 Project site overlain on the bathymetry chart



F6.7 Location of water level measurement

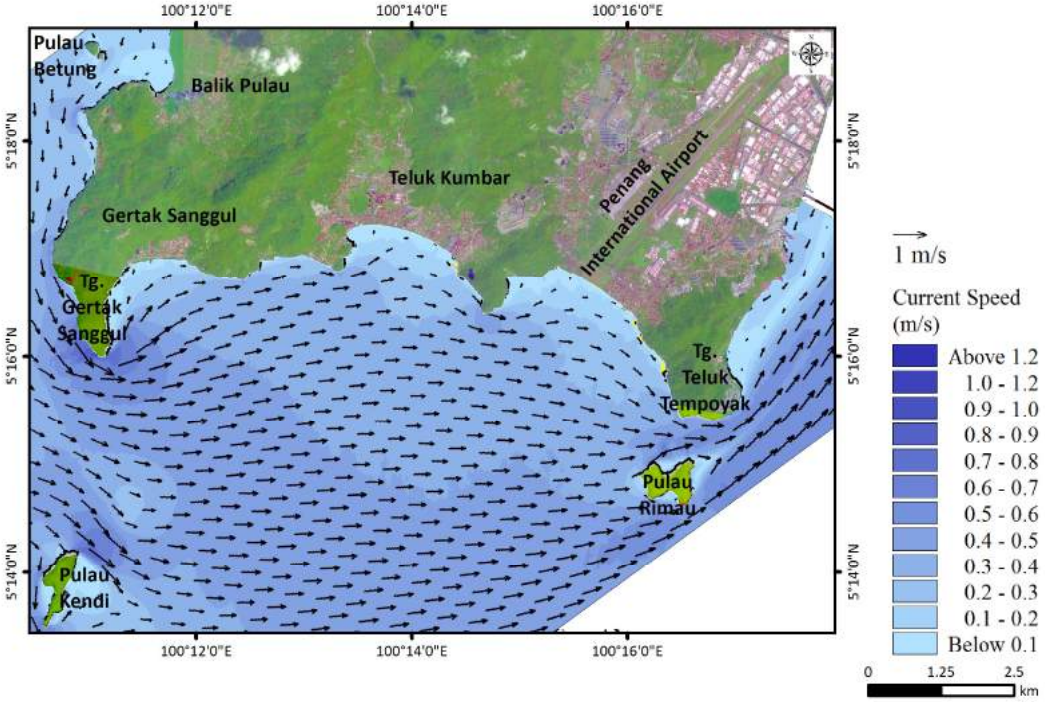


F6.8 Measured water levels

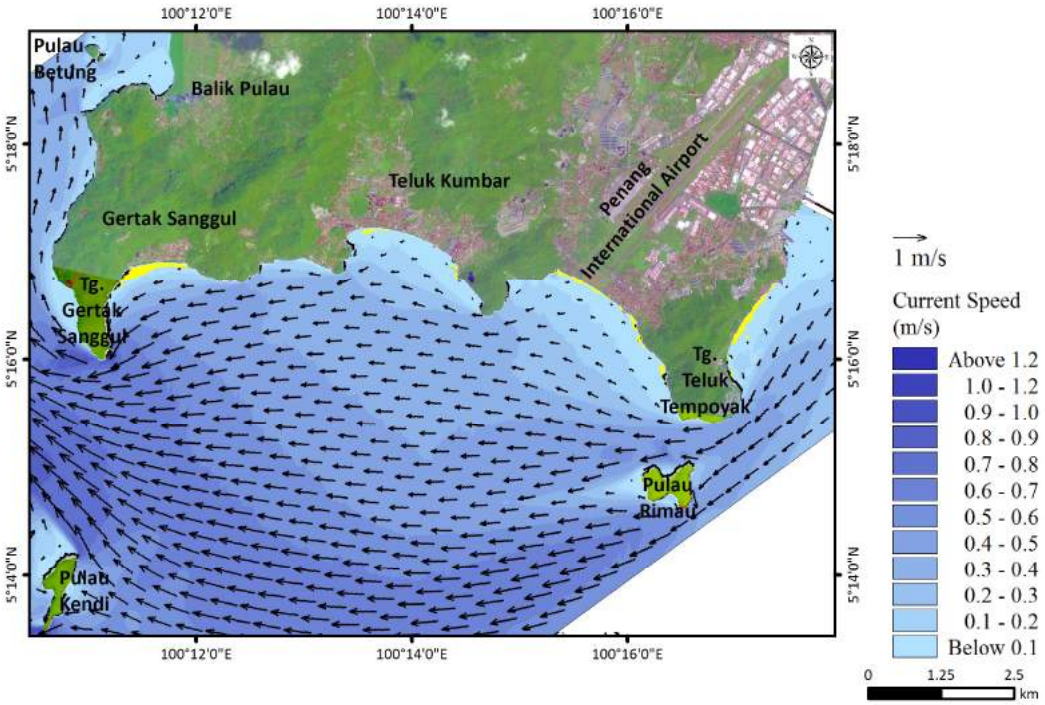
6.2.2.3 Currents

Currents around the Project site for flood and ebb flows during spring and neap periods for pure tide and seasonal conditions are shown in F6.9 to F6.11 respectively. Currents within the Straits of Malacca flow into Penang Straits during flood flow. Water flows out from Penang Straits during ebb flow. The mudflats and mangroves within the Project area are exposed at various stages of low water events.

Mean and maximum current speed plots for seasonal conditions are shown in F6.12 and F6.13. It can be inferred from the results that mean and maximum current speeds of up to about 0.2 and 0.8 m/s respectively can occur in the vicinity of the Project site for all seasonal conditions. On average, the current is of moderate speed while maximum current speed occurs at Pulau Kendi, Tanjung Teluk Tempoyak and Tanjung Gertak Sanggul.

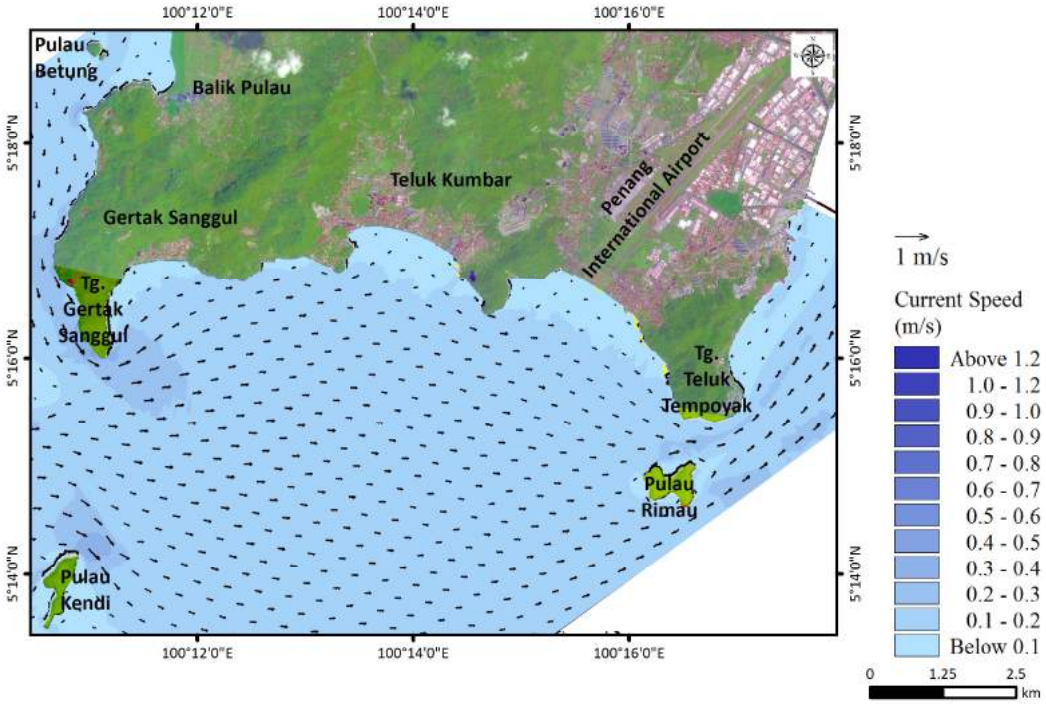


a) Spring period: Flood flow

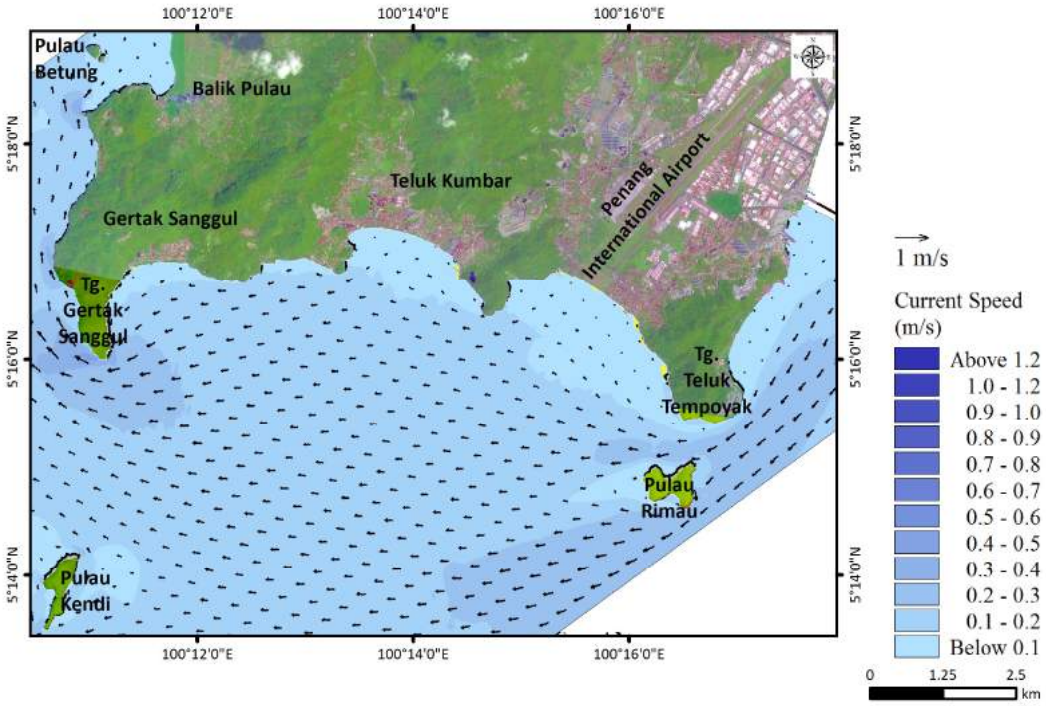


b) Spring period: Ebb flow

F6.9 Flow pattern during spring and neap periods for existing conditions (pure tide condition)

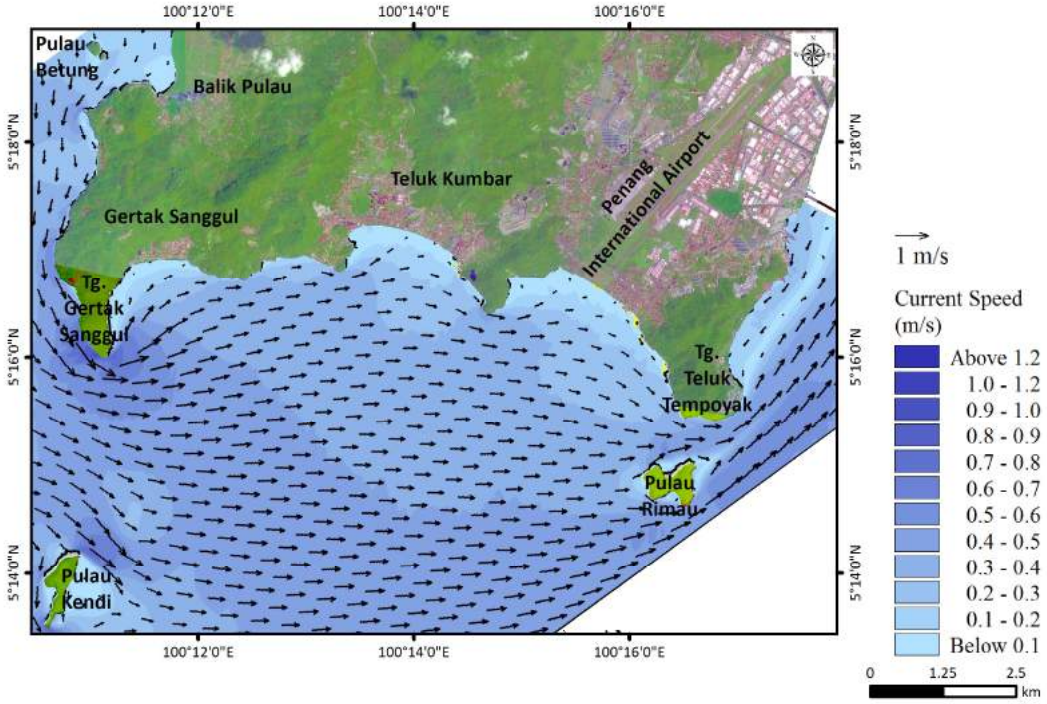


c) Neap period: Flood flow

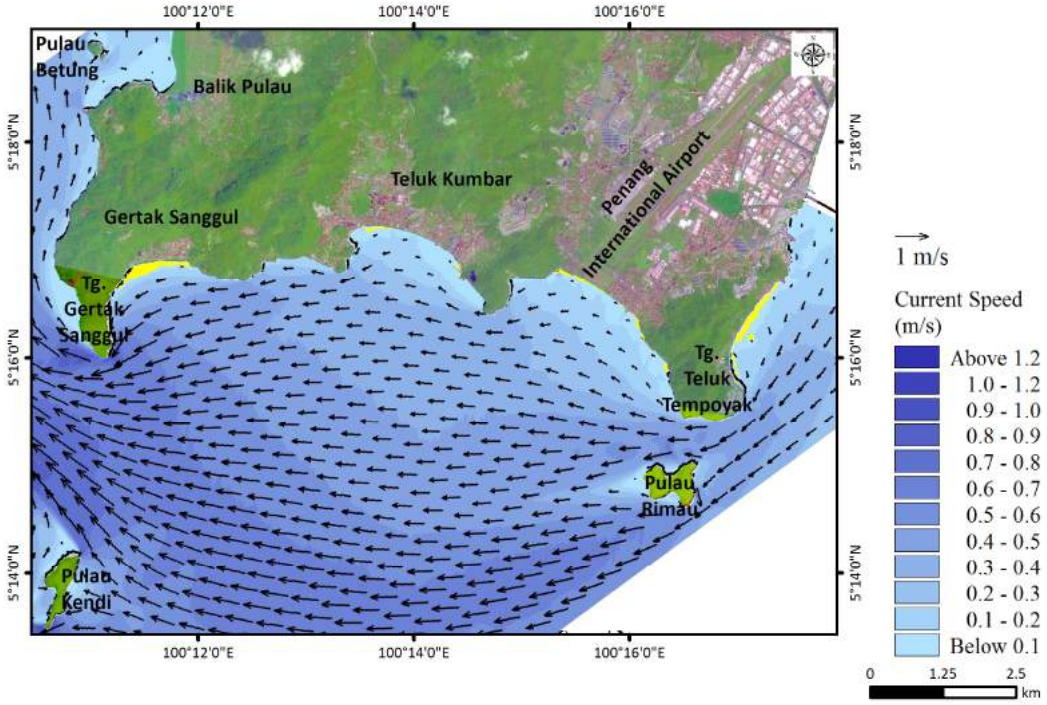


d) Neap period: Ebb flow

F6.9 Flow pattern during spring and neap periods for existing conditions (pure tide condition) (cont'd)

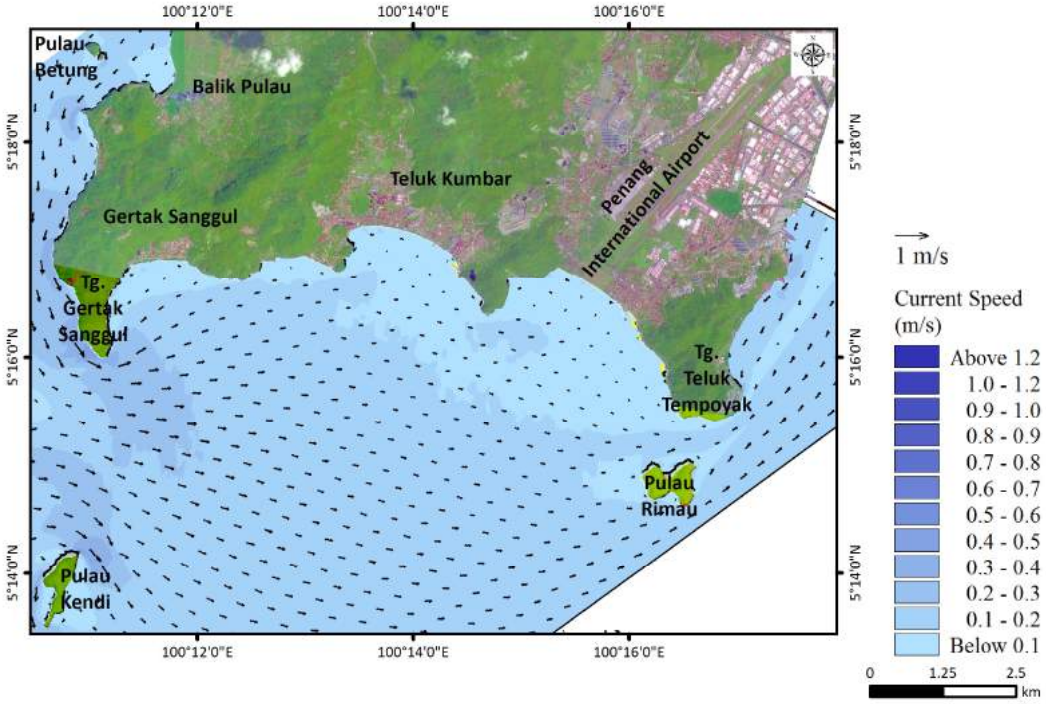


a) Spring period: Flood flow

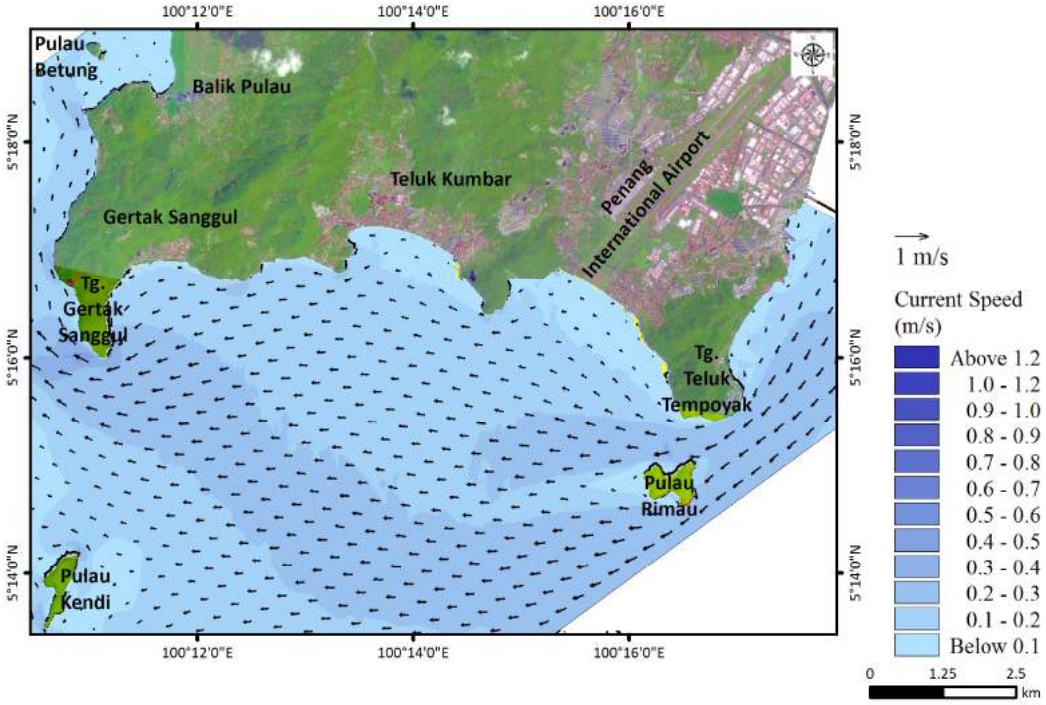


b) Spring period: Ebb flow

F6.10 Flow pattern during spring and neap periods for existing conditions (Northeast Monsoon condition)

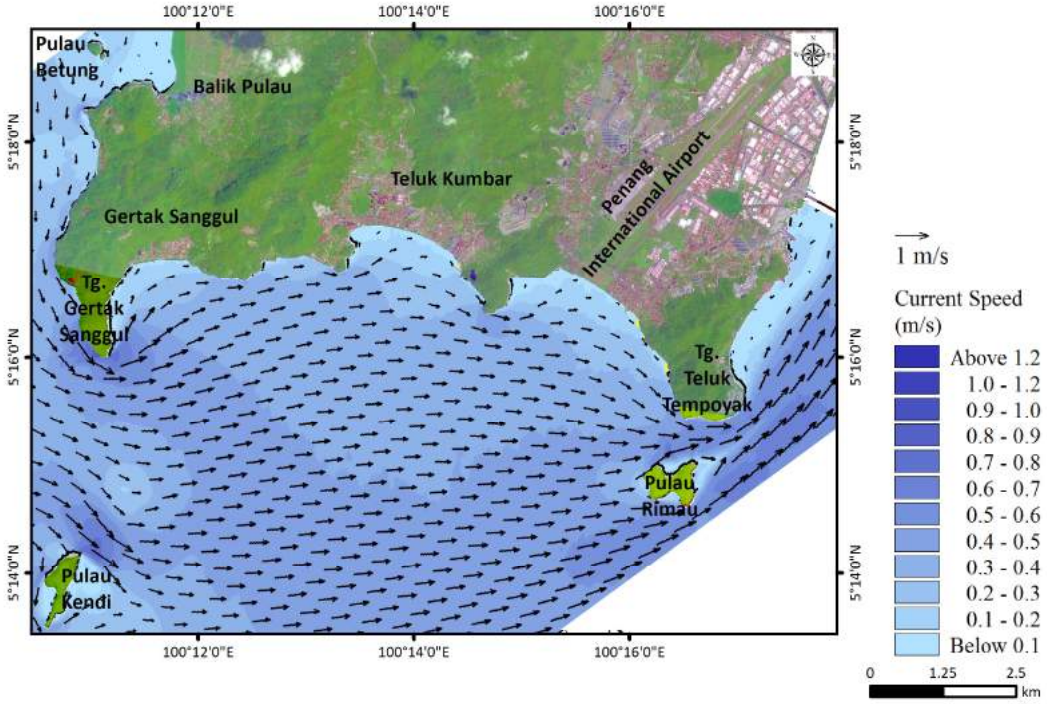


c) Neap period: Flood flow

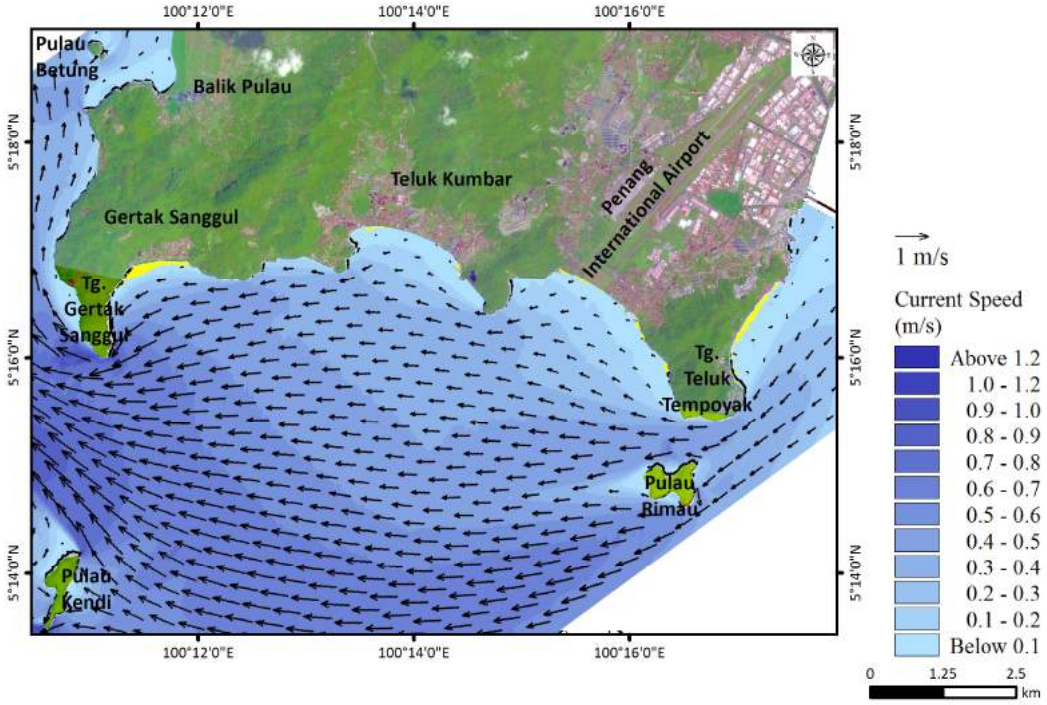


d) Neap period: Ebb flow

F6.10 Flow pattern during spring and neap periods for existing conditions (Northeast Monsoon condition) (cont'd)

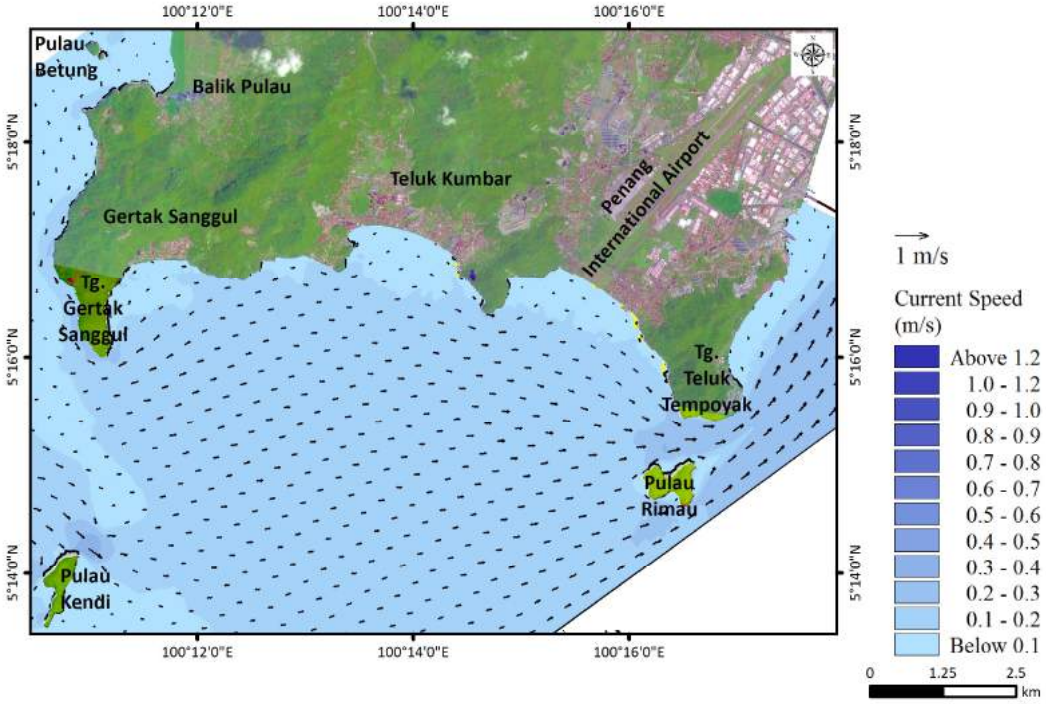


a) Spring period: Flood flow

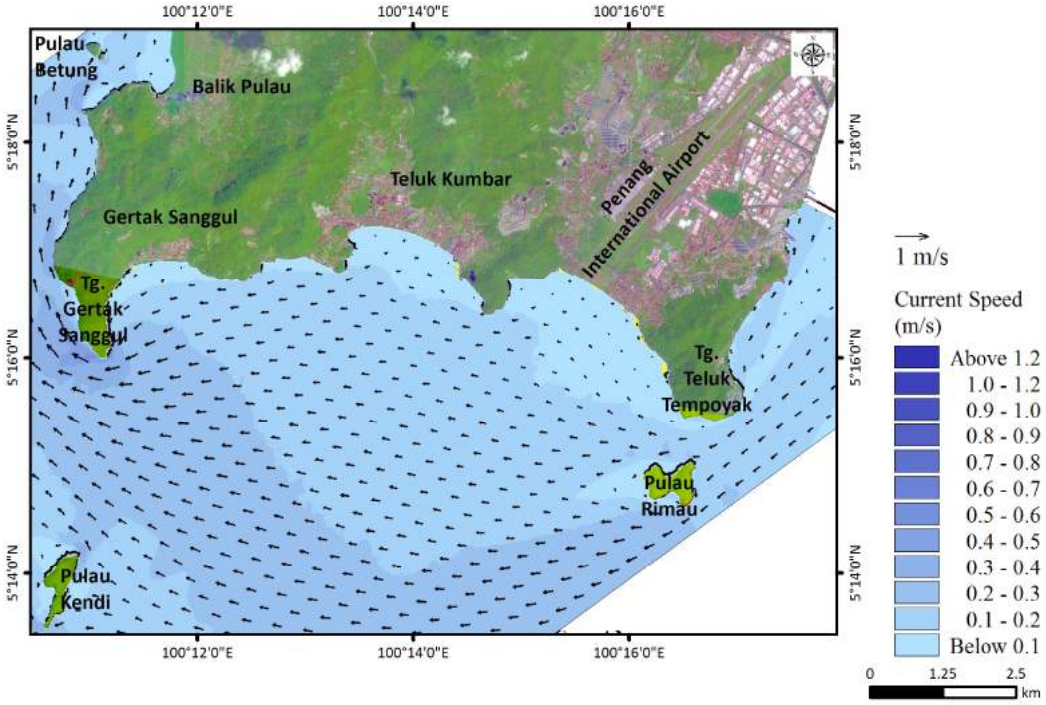


b) Spring period: Ebb flow

F6.11 Flow pattern during spring and neap periods for existing conditions (Southwest Monsoon condition)

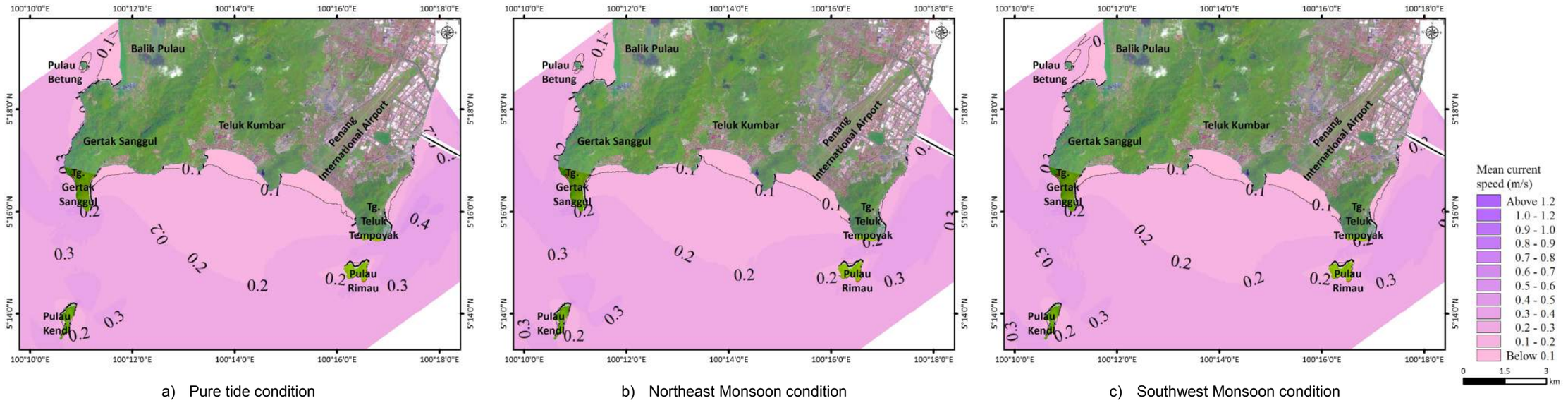


c) Neap period: Flood flow



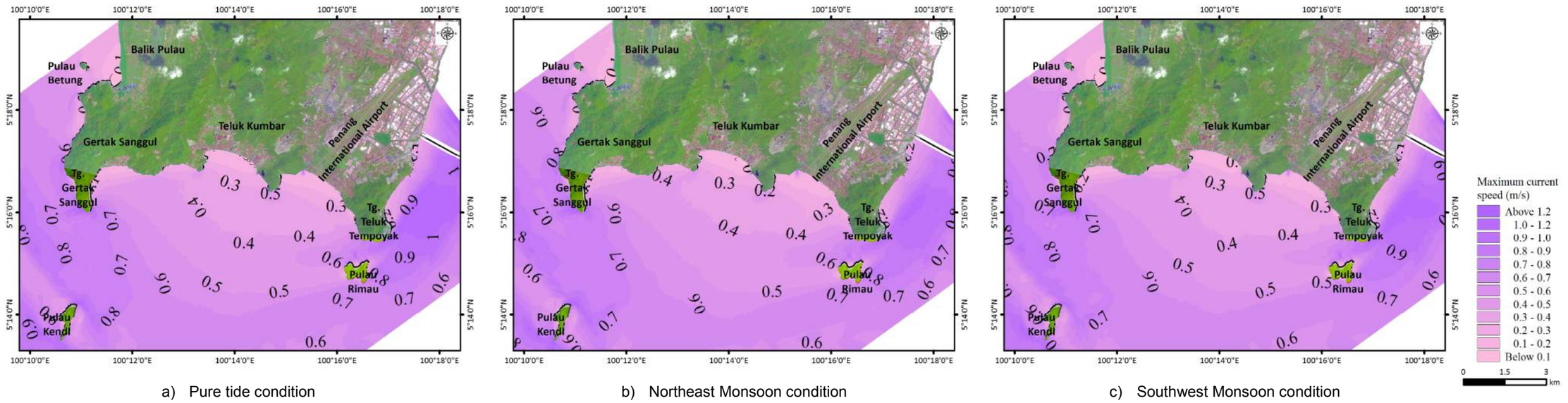
d) Neap period: Ebb flow

F6.11 Flow pattern during spring and neap periods for existing conditions (Southwest Monsoon condition) (cont'd)



a) Pure tide condition b) Northeast Monsoon condition c) Southwest Monsoon condition

F6.12 Mean current speed plots for baseline condition

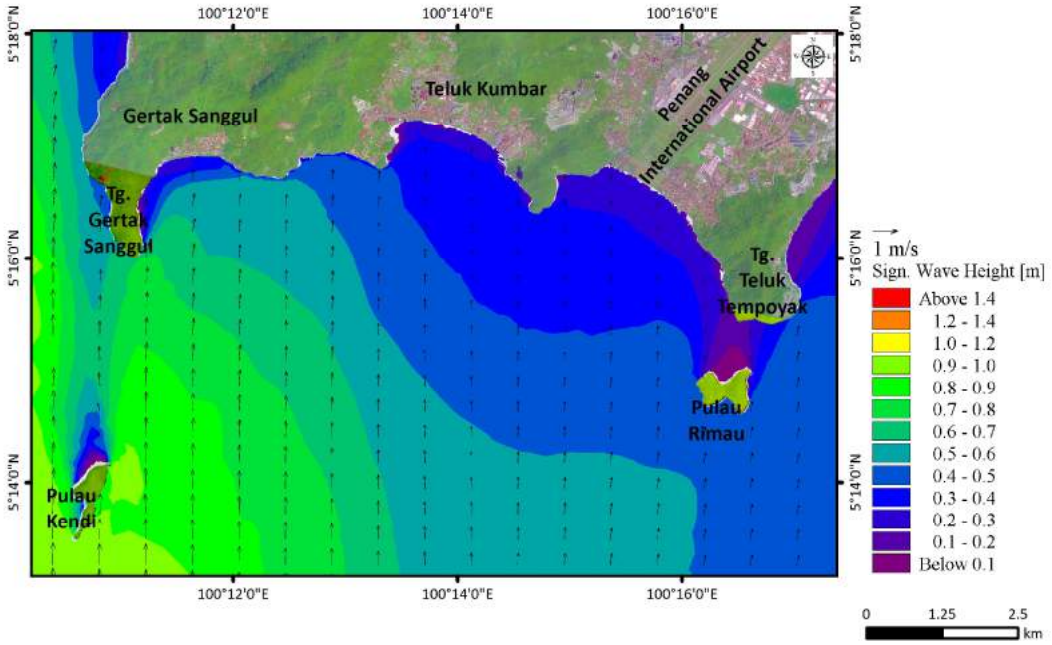


a) Pure tide condition b) Northeast Monsoon condition c) Southwest Monsoon condition

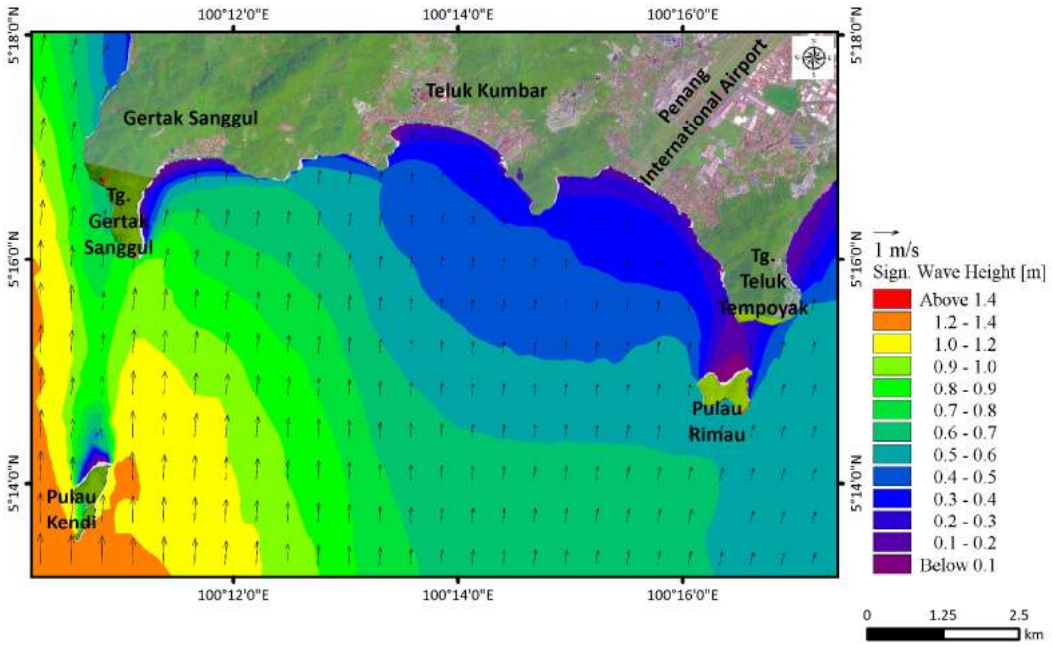
F6.13 Maximum current speed plots for baseline condition

6.2.2.4 Waves

The wave modelling results of the 1 in 1 year and 1 in 60 years return period events under the baseline condition are shown in F6.14 to F6.17 for waves propagating from the 180, 210, 240 and 270°N respectively.

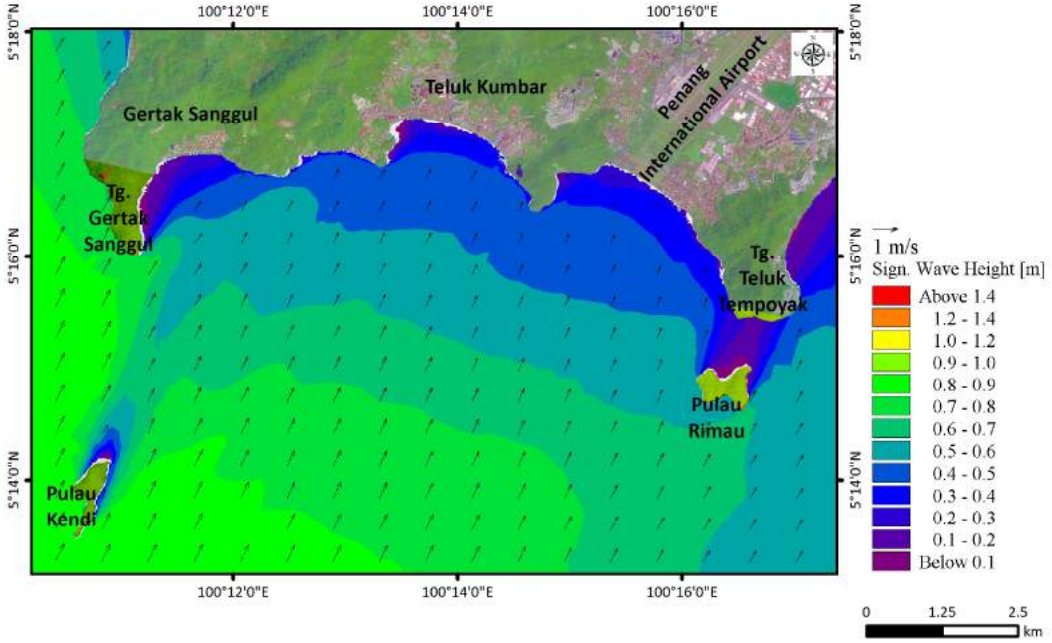


a) 1 in 1 year return period event: H_{m0} = 1.0 m, T_p = 5.0 s

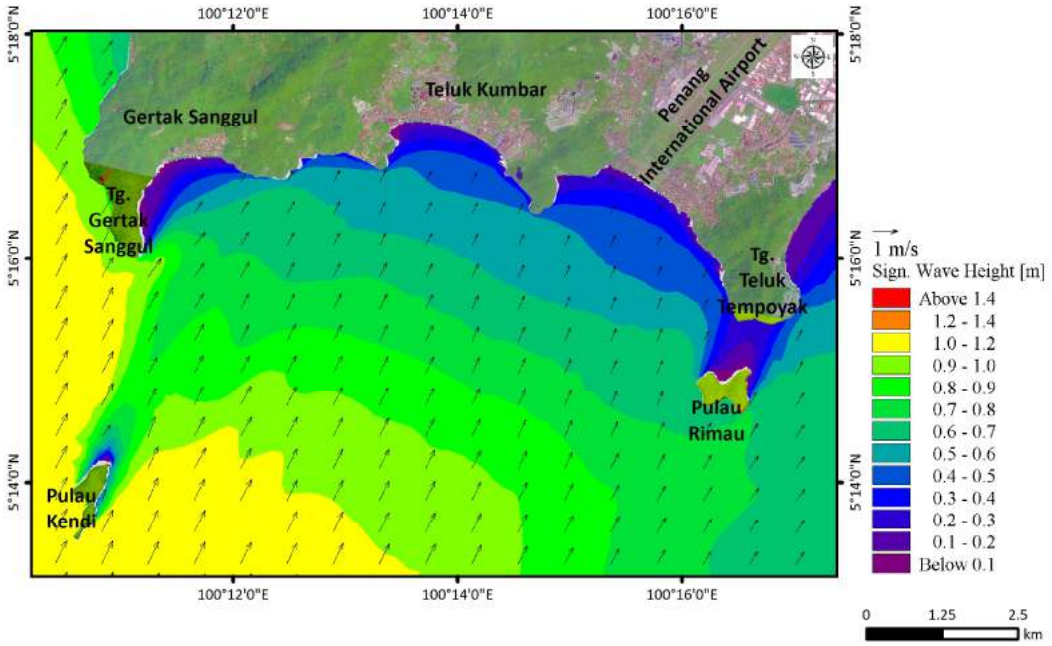


b) 1 in 60 year return period event: H_{m0} = 1.4 m, T_p = 5.5 s

F6.14 Significant wave heights (H_{m0}); baseline condition; Mean Wave Direction = 180°N



a) 1 in 1 year return period event: H_{m0} = 0.9 m, T_p = 5.0 s



b) 1 in 60 year return period event: H_{m0} = 1.2 m, T_p = 5.5 s

F6.15 Significant wave heights (H_{m0}); baseline condition; Mean Wave Direction = 210°N