Technical Committee Meeting

Johor Bahru, Malaysia
23 April 2025

Mark Hegnauer

Christian Alfonsus Liguori

Rizka Akmalia

Agenda

Wifi

Connect to:	IRDA_Guest
User ID:	KlebangGuest
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Session 1 (10:00-12:00)

1. Opening
2. Presentation and demonstration of the functioning MHP-IM prototype
3. Explanation of financing needs for sustaining MHP-IM operations

Lunch break (12:00-13:00)

Session 2 (13:00-15:00)

1. Data and model validation session with data provider

About the project

The Climate Technology Centre and Network (CTCN) supports the Development of a **Multi-Hazard Platform** for forecasting local level climate extremes and physical hazards for Iskandar Malaysia.

The objective of the Technical Assistance (TA) is to enable Iskandar Malaysia to take early actions to mitigate climate risk through a decision support system designed in an inclusive manner and based on the understanding of the local **level climate extremes** and their impacts by integrating them into a prototype Multi-Hazard Platform (MHP) **focusing on coastal hazards**.

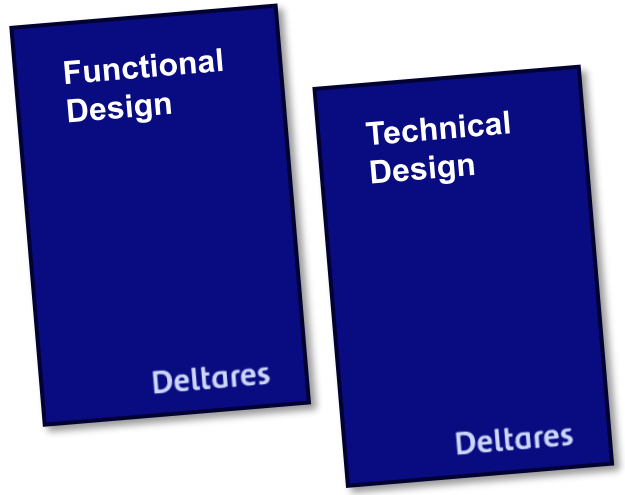
About the project

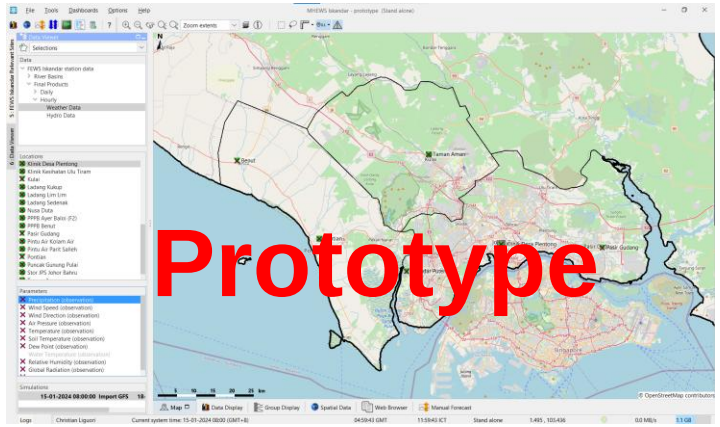
The overall goal of the project is to:

Develop technical specifications to design and integrate information on local climate extremes and hazard risks in a **multi-hazard platform** (MHP) for Iskandar Malaysia (IM)

Develop a **prototype** and establish the **financing requirements** to operationalize the MHP for IM

Improve local capacities in implementing a people-centred forecasting system using social innovation.





Capacity building

About the project

Workshop 1: 11 March 2024

Discussion session with data providers: 24 June 2024

Workshop 2: 10 Dec 2024

Workshop 3: Today

Functional and Technical Design

Deltares

Functional and Technical Design

Updated

Deltares

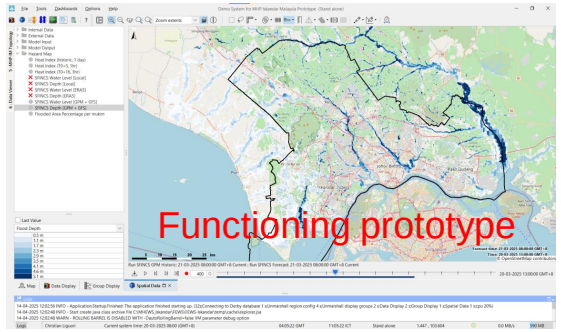
MHP-IM User Manual

Deltares

+

11 Mar 2024

10 Dec 2024

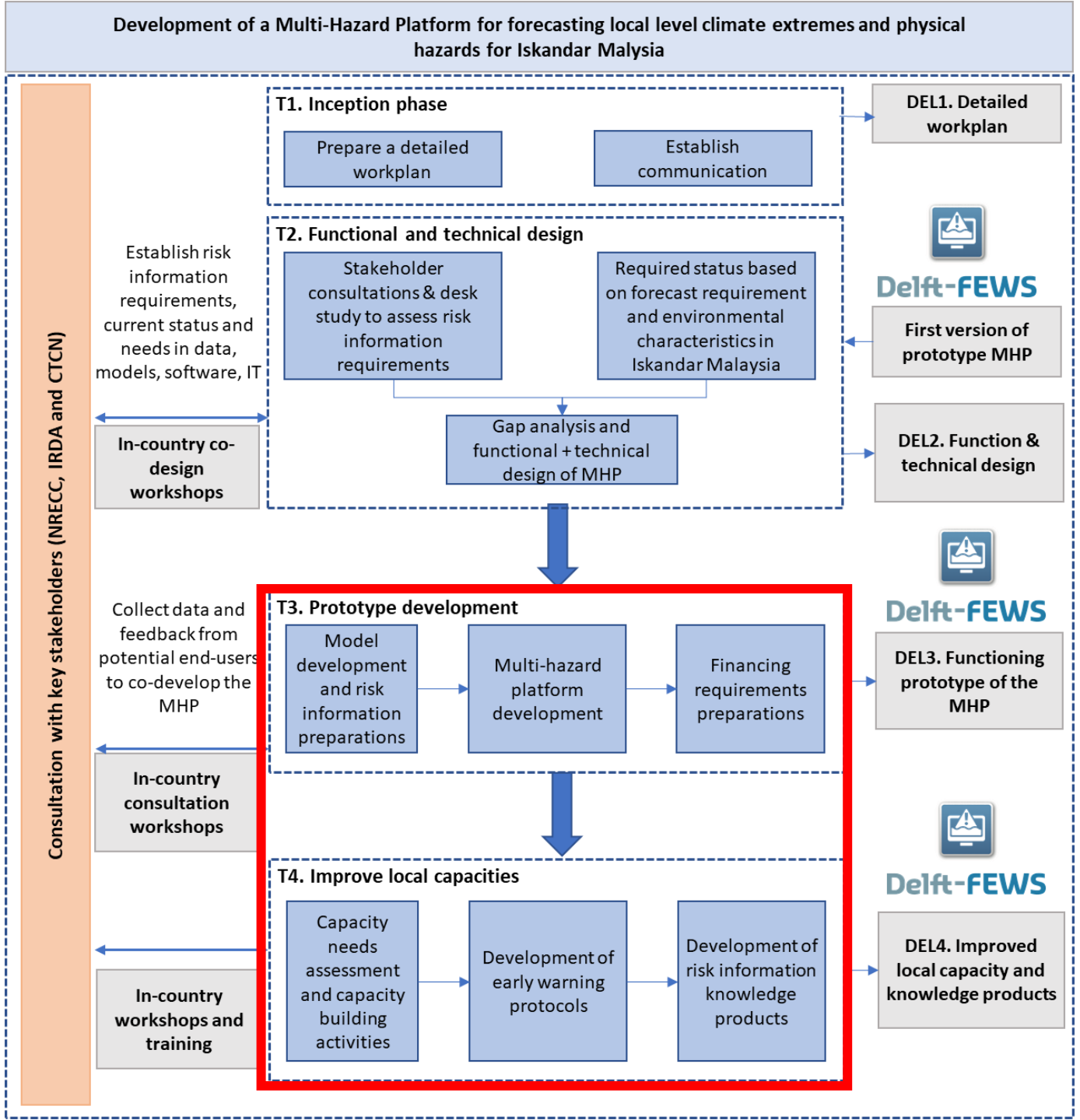


About the project

Now:
End of Phase 3 + start of phase 4

Next:

- Develop knowledge products – Phase 4



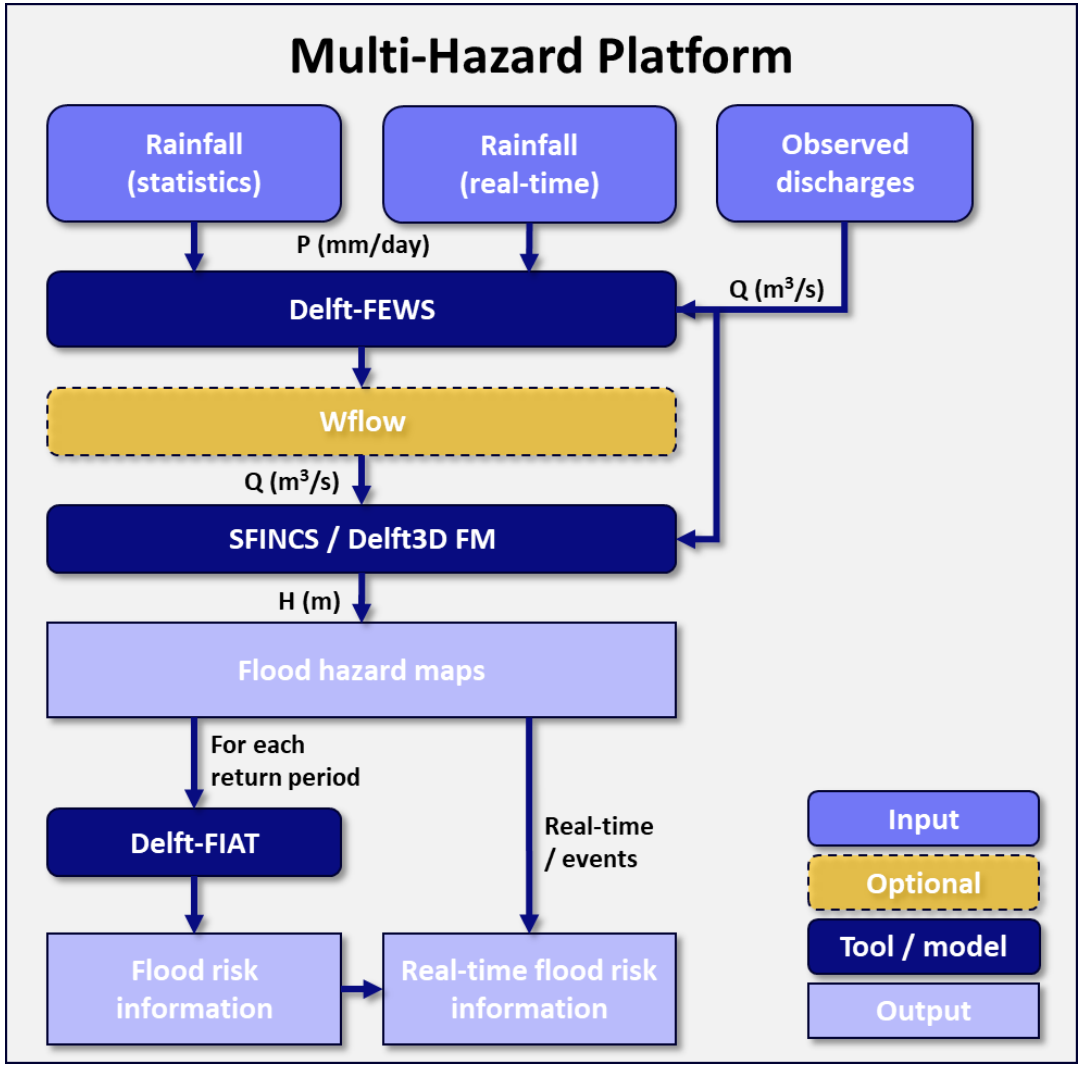
Use cases of the Multi Hazard Platform

Operational use

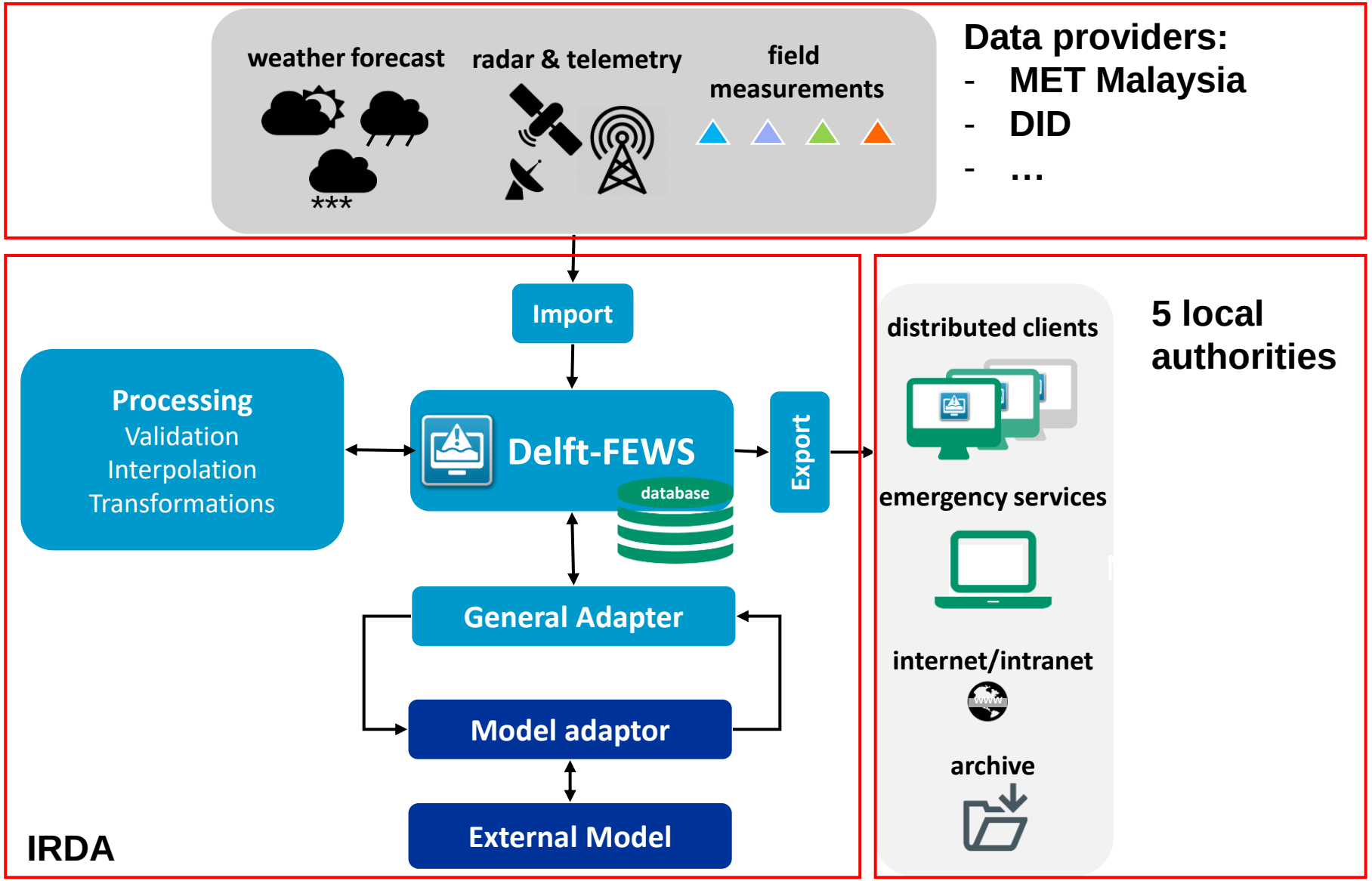
- Real-time monitoring
- Nowcasting (0 – 6 hours)
- Forecasting (0 – 14 days)
- *Long-term / seasonal forecasting (2 weeks – 3 months)*

Use in planning

- Hydrometeorological database (>10 years of data)
- Statistical analysis
- Historical / event-based simulations
- Producing hazard maps
- Producing risk maps



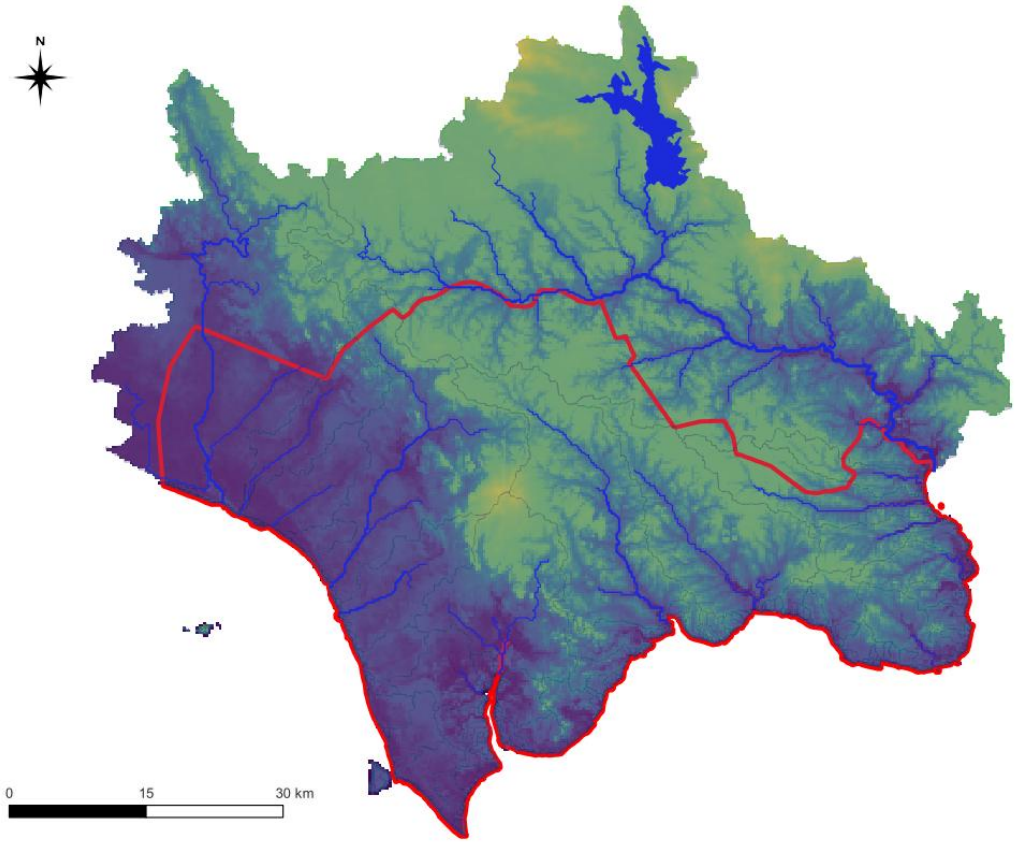
Delft-FEWS (concept)

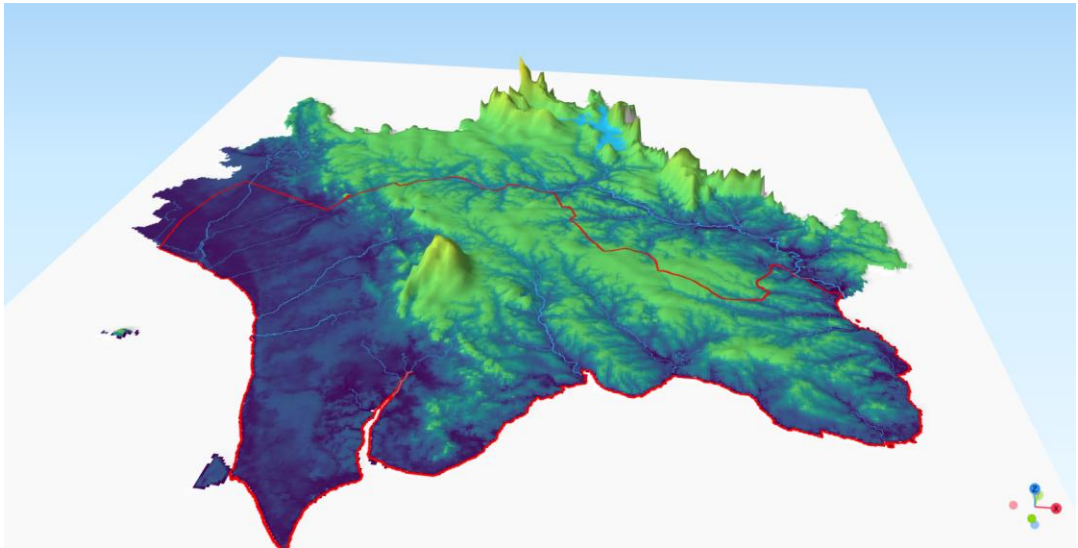


WFLOW Hydrological Model

Model setup

- Using openly available datasets
- For the complete model domain
- Model settings:
  - Timestep: 1 day
  - Grid size: ~250 meter
- Model can be used in both operational and planning mode

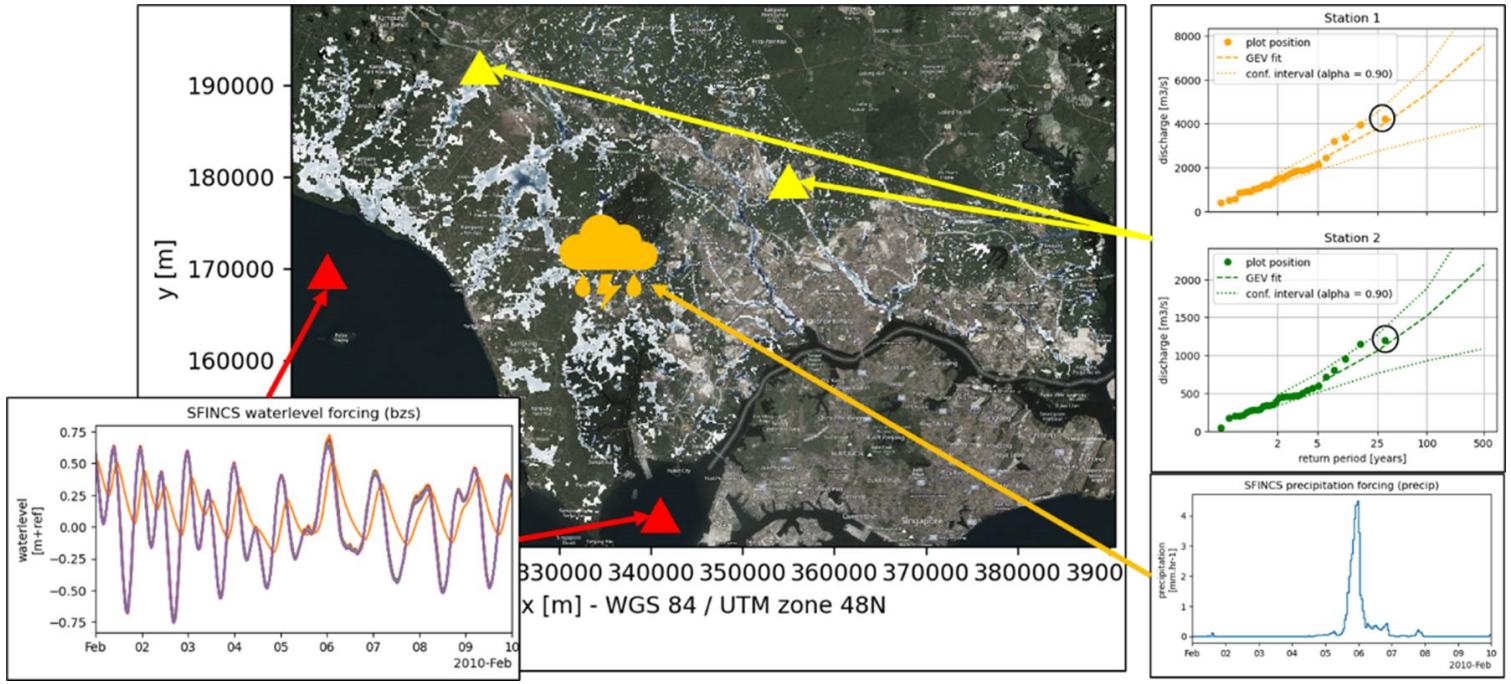




SFINCS: Rapid (compound) flood modelling

SFINCS for Iskandar Malaysia:

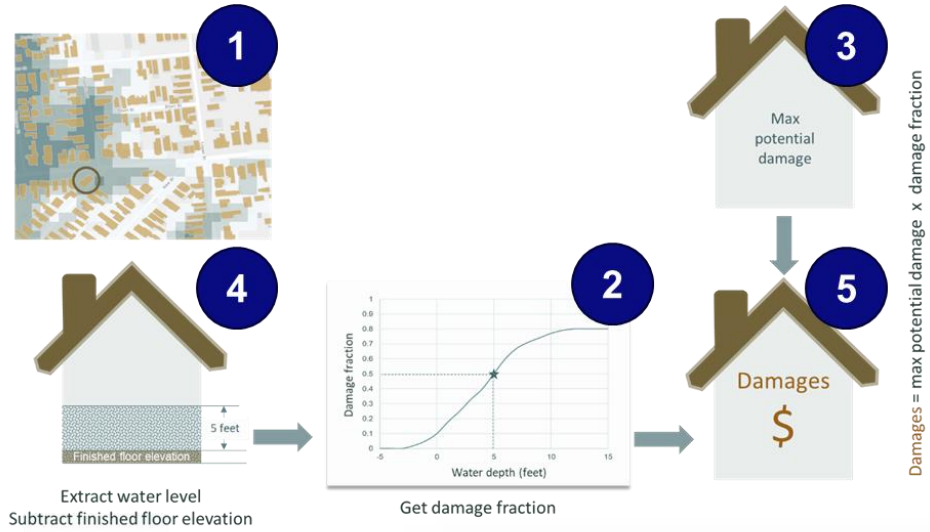
- Based on local DEM
  (10 m and two river bathymetry)
- Landuse
  (ESA Landcover – 10 meters)
- An assumption that coastal water level is at 0 m
- Grid resolution – 100 m



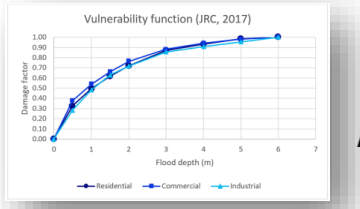
https://www.deltares.nl/en/software-and-data/products/sfincs

Delft-FIAT concept

Calculates Flood Impacts based on available flood hazard, exposure, and vulnerability information



1 Flood maps

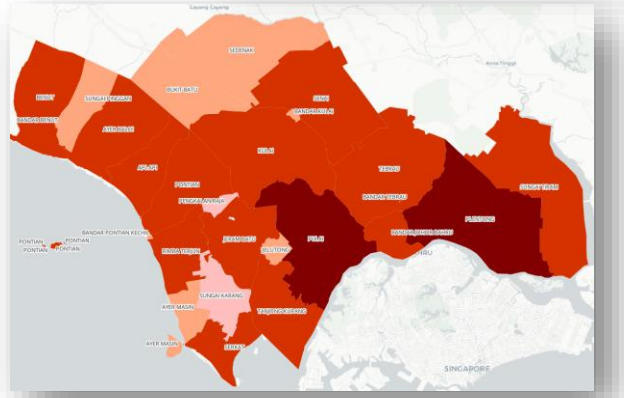


2 Damage functions

3 Exposure

4 Delft-FIAT

5 Flood Impact



Project Development

MHP-IM Main Document

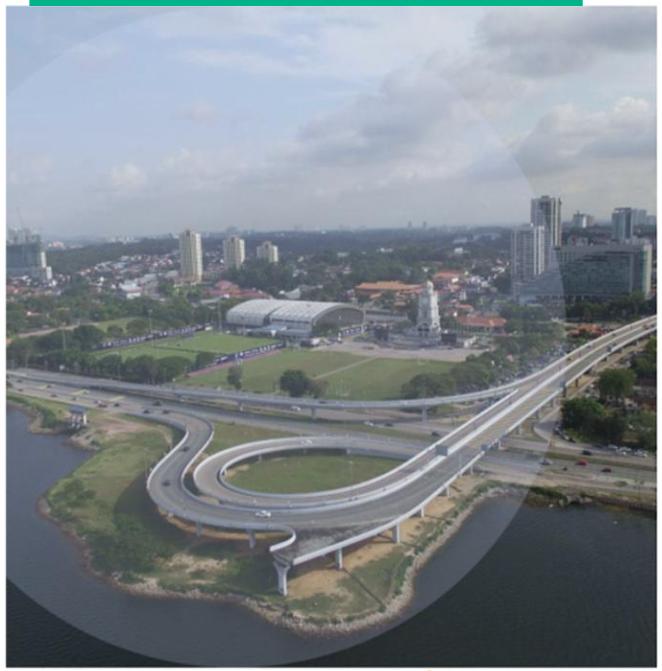
DRAFT

UTM Deltares

Development of a Multi-Hazard Platform (MHP) for forecasting local level climate extremes and physical hazards for Iskandar Malaysia

Functional Design and Prototype Development Report

First doc.



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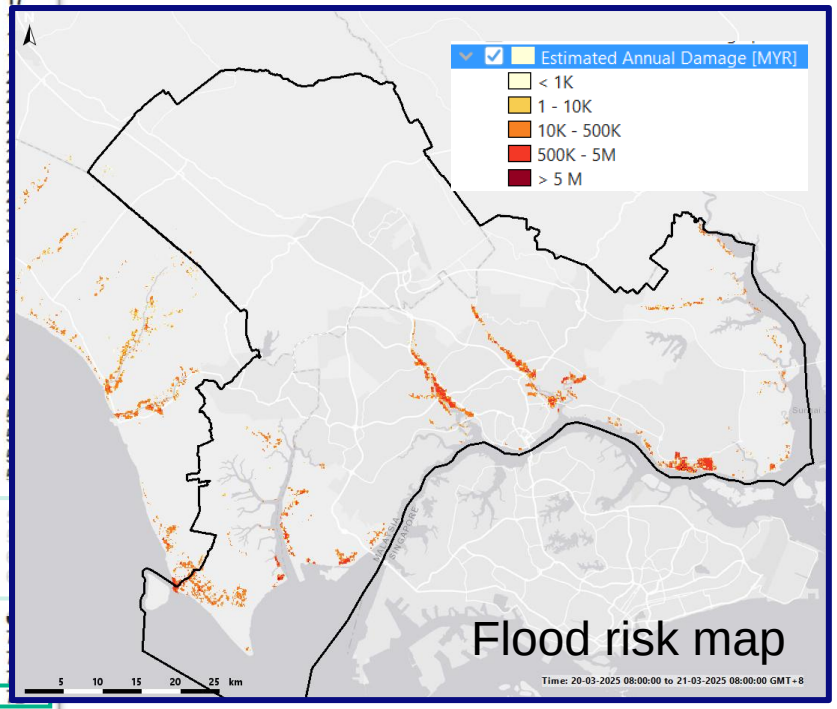
D.3.1
Working MHP prototype + user manual

D.3.2 Report on financing needs



Flood risk map

MHP-IM User Manual (D.3.1.)

DRAFT

UTM Deltares

Development of a Multi-Hazard Platform (MHP) for forecasting local level climate extremes and physical hazards for Iskandar Malaysia

MHP-IM User Manual Complementary doc.

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3 MHP-IM Explorer

3.1 Overview

One of the main windows of the system is the FEWS Explorer shown in **Figure 3.1** below. In this case it is the Map window or Map Display.

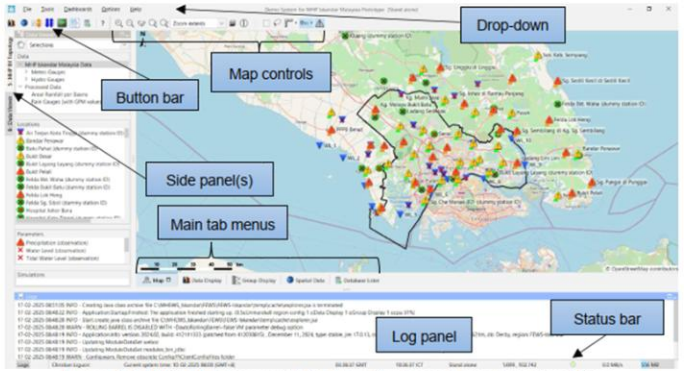


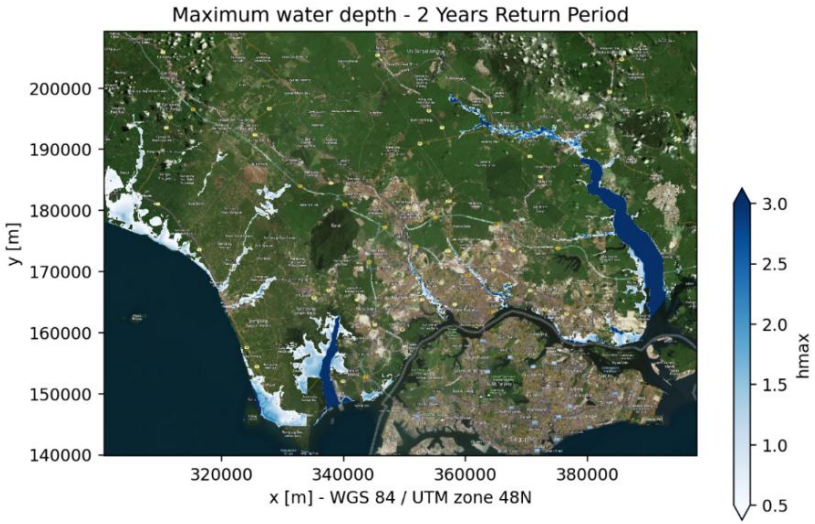
Figure 3.1 MHP-IM Explorer with the Map Display and One Side Panel Open

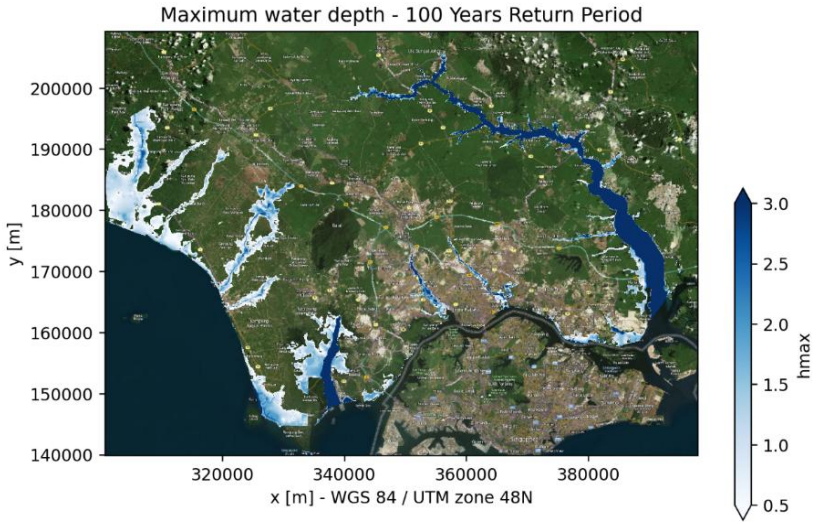
The following elements of the Delft-FEWS Explorer are always shown, regardless of which window or tab is currently open: the drop-down menus, button bar, main tab menus, log panel, status bar and any side panels. These are described in more detail in the subsequent paragraphs.

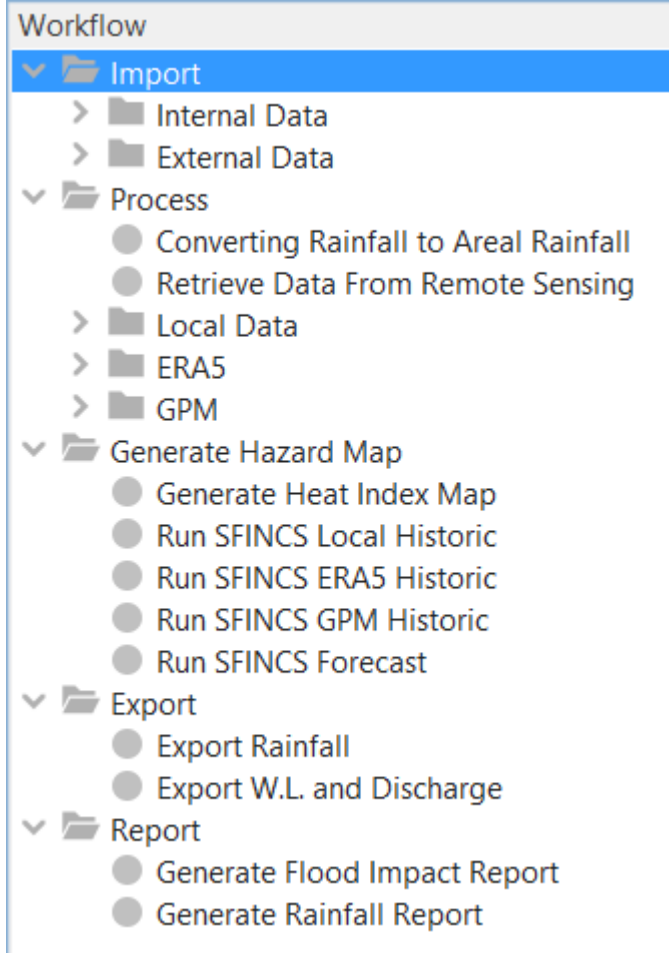
The user can resize, hide or open panels like the Logs or Data Viewer (one of the side panels) by pressing the panel buttons. It is also possible to make any of the tab menus floating and to put them on an additional screen (**Figure 3.2**). The current layout can be saved through the menu File – Save Layout. It is always possible to go back to the default layout from the same menu.

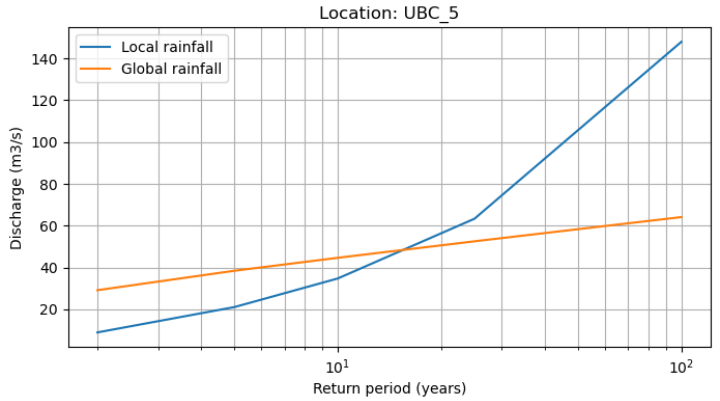
Latest Improvements of the MHP-IM (1)

1. The MHP-IM prototype is functioning properly
2. All collected data have been used to develop the hydrological and hydrodynamic models, and to generate the flood risk map
3. Initial flood model check has been completed
4. Flood maps have been produced for multiple return periods









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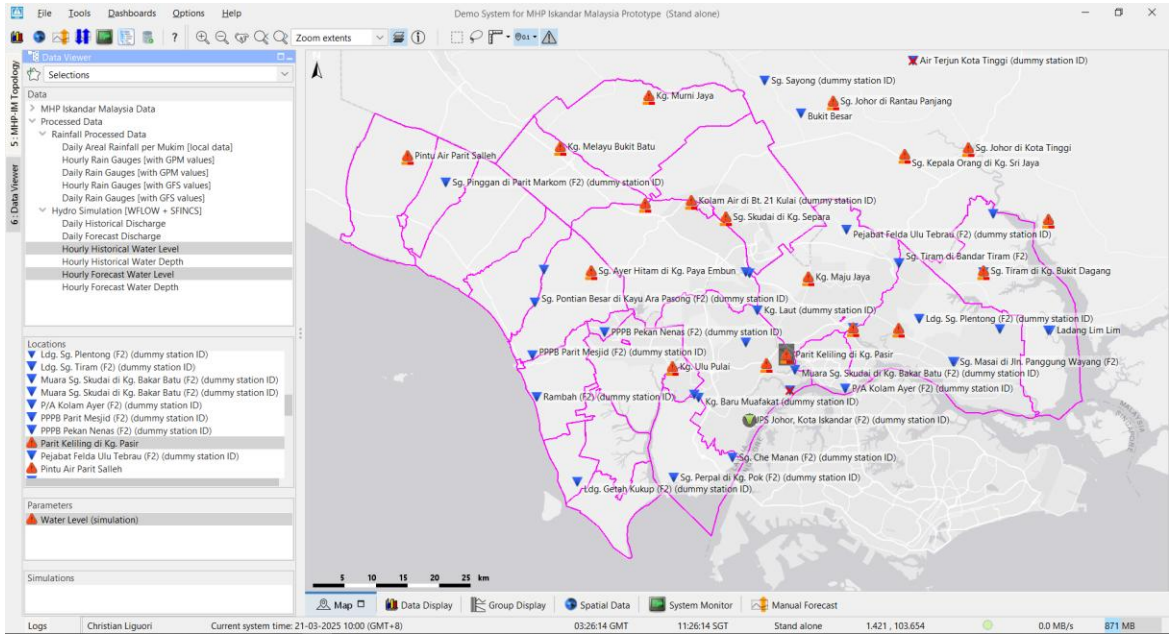
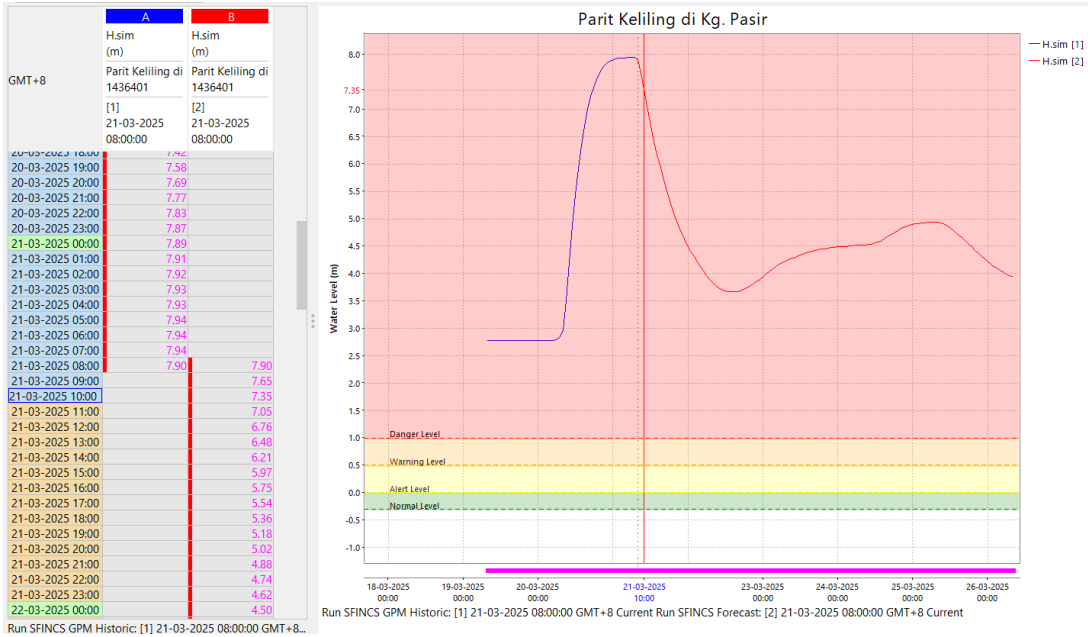
Latest Improvements of the MHP-IM (2)

5. Produce flood early warning at river gauge location based on the water level, water depth and river discharge threshold.





Latest Improvements of the MHP-IM (3)

6. Produce rainfall warning report at the mukim level in Iskandar Malaysia.

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Rainfall Warning Report (16 Mar 2025)

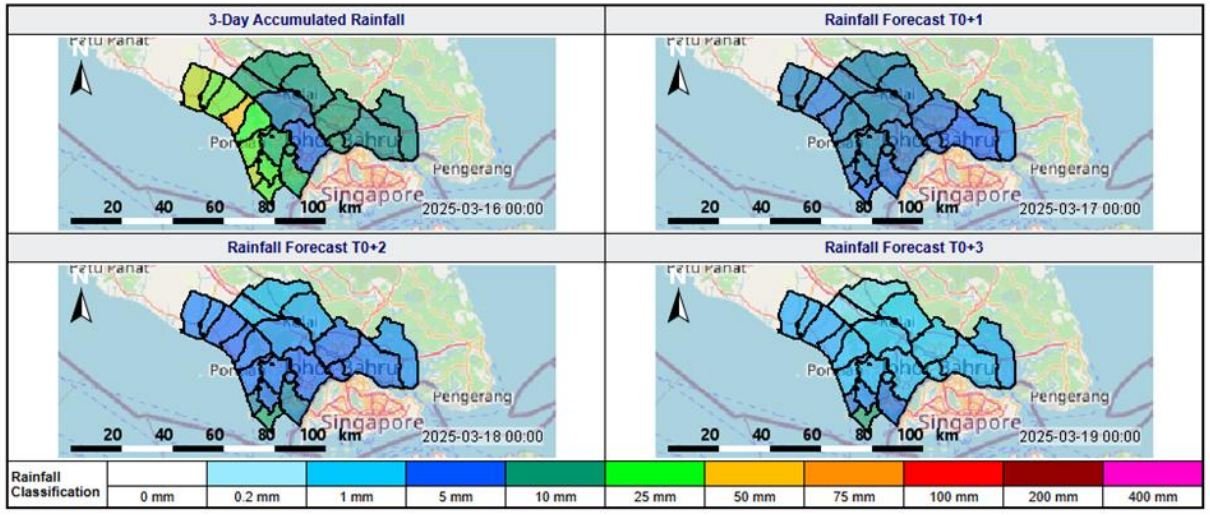

Table of Rainfall per Mukim for the Iskandar Malaysia Region

Based on forecast with T0 = 16 Mar 2025

Mukim	3-Day Accumulated Rainfall [mm]	Rainfall Forecast T0+1 [mm]	Rainfall Forecast T0+2 [mm]	Rainfall Forecast T0+3 [mm]
API-API	51.1	6.3	5.1	2.4
AYER BALOI	32.3	6.4	4.6	2.5
AYER MASIN	40.5	6.1	7.9	6.3
BANDAR BENUT	41.6	7.7	3.4	2.1
BANDAR JOHOR BAHRU	10.2	6.1	4.7	1.2
BANDAR KULAI	7.9	7.4	1.8	0.7
BANDAR PONTIAN KECHIL	51.8	7.5	4.3	1.8
BANDAR TEBRAU	11.2	6.1	4.7	1.2
BENUT	41.7	7.3	3.9	2.3
BUKIT BATU	11.0	7.4	1.8	0.7
JELUTONG	11.5	7.5	4.3	1.8
JERAM BATU	14.2	7.5	4.3	1.8
KULAI	7.4	7.3	3.4	1.3
PEKAN JERAM BATU	6.3	7.5	4.3	1.8
PENGKALAN RAJA	19.2	7.5	4.3	1.8
PLENTONG	8.9	4.8	4.1	1.7
PONTIAN	25.3	7.5	4.3	1.8
PULAI	5.8	6.7	4.5	1.5
RIMBA TERJUN	30.1	7.5	4.3	1.8
SEDENAK	9.8	7.4	1.8	0.7
SENAI	9.2	6.8	2.5	1.0
SERKAT	29.6	4.8	11.2	10.5
SUNGAI KARANG	27.7	7.0	5.7	3.6
SUNGAI PINGGAN	32.2	7.5	3.7	2.2
SUNGAI TIRAM	9.2	3.4	3.2	2.3
TANJONG KUPANG	15.6	6.1	7.9	6.2
TEBRAU	9.8	6.2	4.4	1.2

Note:

Rainfall Classification		
	Light	< 41 mm
	Moderate	41 - 60.9 mm
	Heavy	61 - 80.4 mm
	Very Heavy	> 80.5 mm

Latest Improvements of the MHP-IM (4)

7. Produce flood warning and impact report at the mukim level in Iskandar Malaysia.

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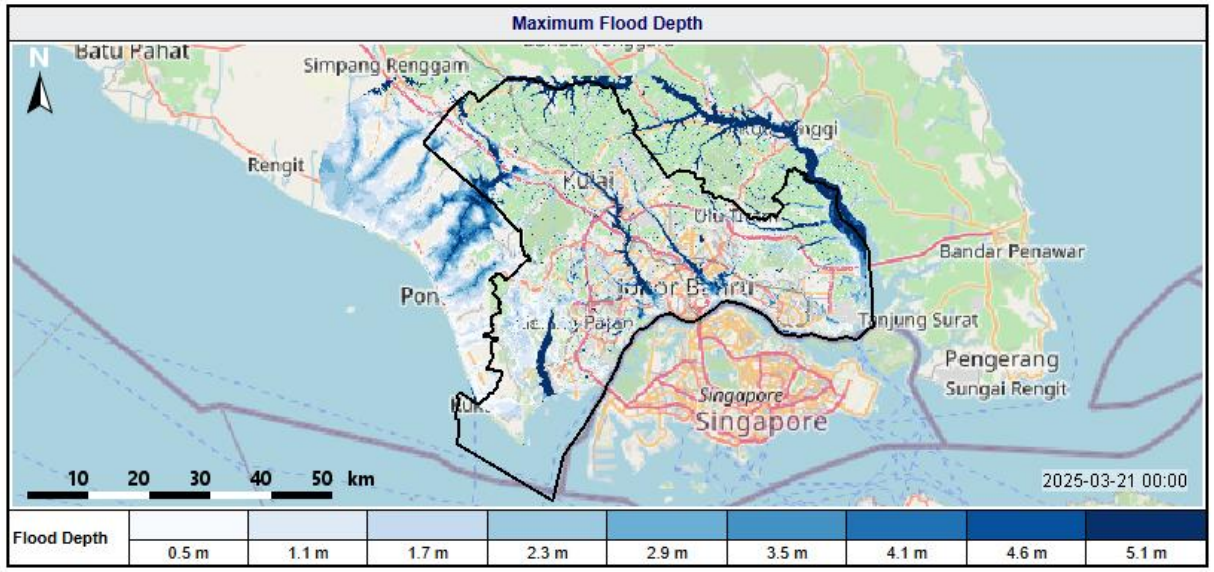
Flood Warning Report (21 Mar 2025)



Note:

1. The percentage of flooded area per mukim is calculated by dividing the inundated area (= 0.5 m depth) by the total area of the mukim.
2. The total affected population in the Number of Population Affected column is rounded to the nearest 5 people.
3. The estimated damage to buildings is rounded to the nearest 1,000 MYR.

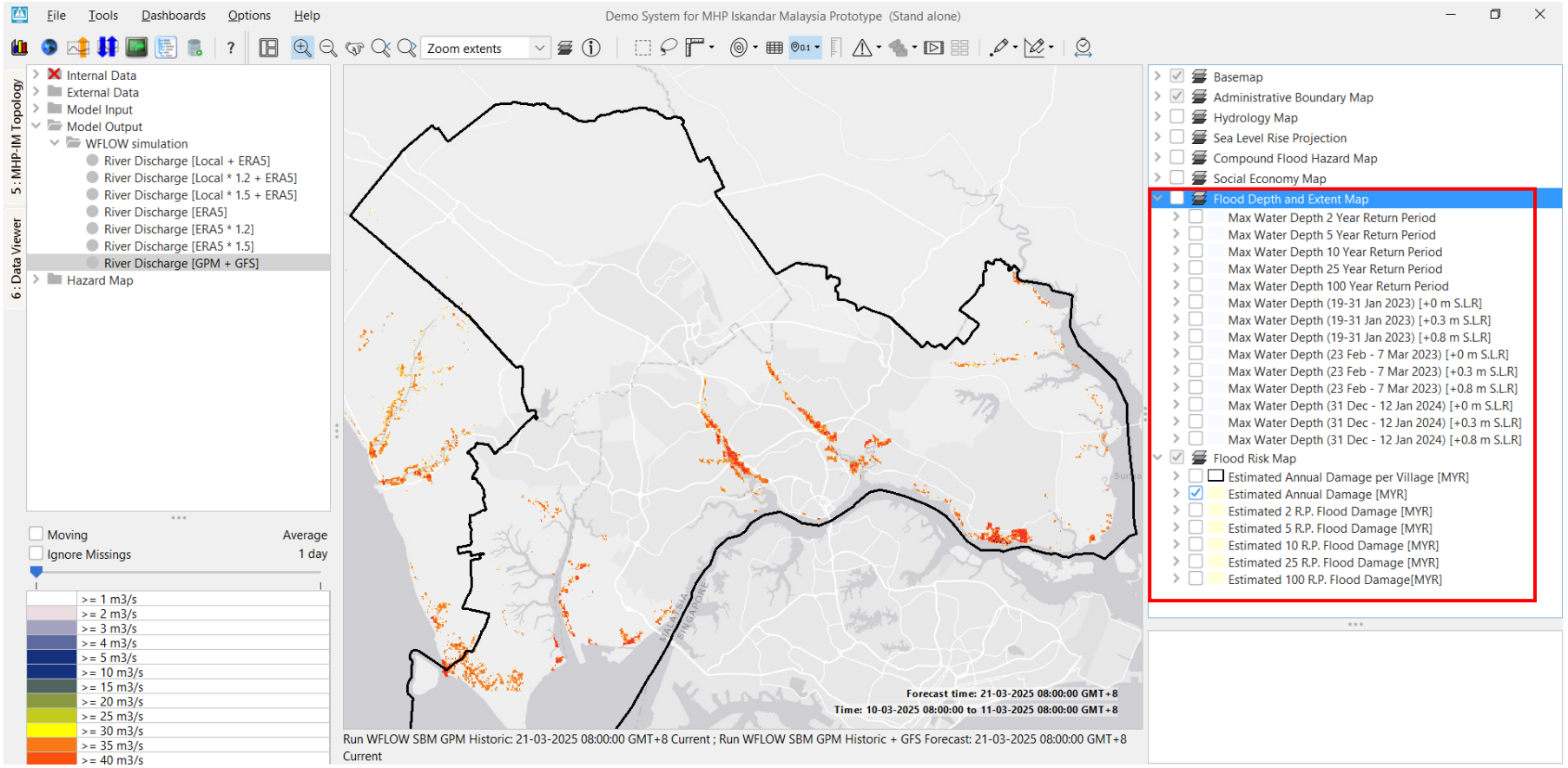
Table of Flood Early Warning Impact per Mukim for the Iskandar Malaysia Region

Based on forecast with T0 = 21 Mar 2025

Mukim	Flooded Area [%]	Number of Population Affected [People]	Estimated Damage to Buildings [10^3 MYR]
API-API	79.6	13,170	1,764,278
AYER BALOI	69.3	10,075	954,773
AYER MASIN	45.6	2,630	62,670
BANDAR BENUT	100.0	4,060	320,921
BANDAR JOHOR BAHRU	14.1	14,805	1,142,602
BANDAR KULAI	39.9	3,210	247,335
BANDAR PONTIAN KECHIL	89.7	2,035	378,046
BANDAR TEBRAU	94.5	115	11,788
BENUT	84.6	9,745	808,576
BUKIT BATU	49.0	5,010	974,119
JELUTONG	48.3	5,575	218,429
JERAM BATU	52.2	14,640	1,550,556
KULAI	20.3	38,920	2,208,953
PEKAN JERAM BATU	0.0	0	0
PENGKALAN RAJA	55.5	680	31,035
PLENTONG	21.5	102,010	7,261,783
PONTIAN	74.6	32,990	2,197,954
PULAI	24.7	108,930	7,956,520
RIMBA TERJUN	64.6	24,835	2,983,769
SEDENAK	22.9	4,875	419,589
SENAI	19.1	21,915	6,583,963
SERKAT	42.9	4,465	450,193
SUNGAI KARANG	45.4	670	35,084
SUNGAI PINGGAN	80.8	7,560	672,249
SUNGAI TIRAM	37.5	3,650	462,269
TANJONG KUPANG	40.1	11,370	783,457
TEBRAU	18.9	70,130	7,050,391

Latest Improvements of the MHP-IM (5)

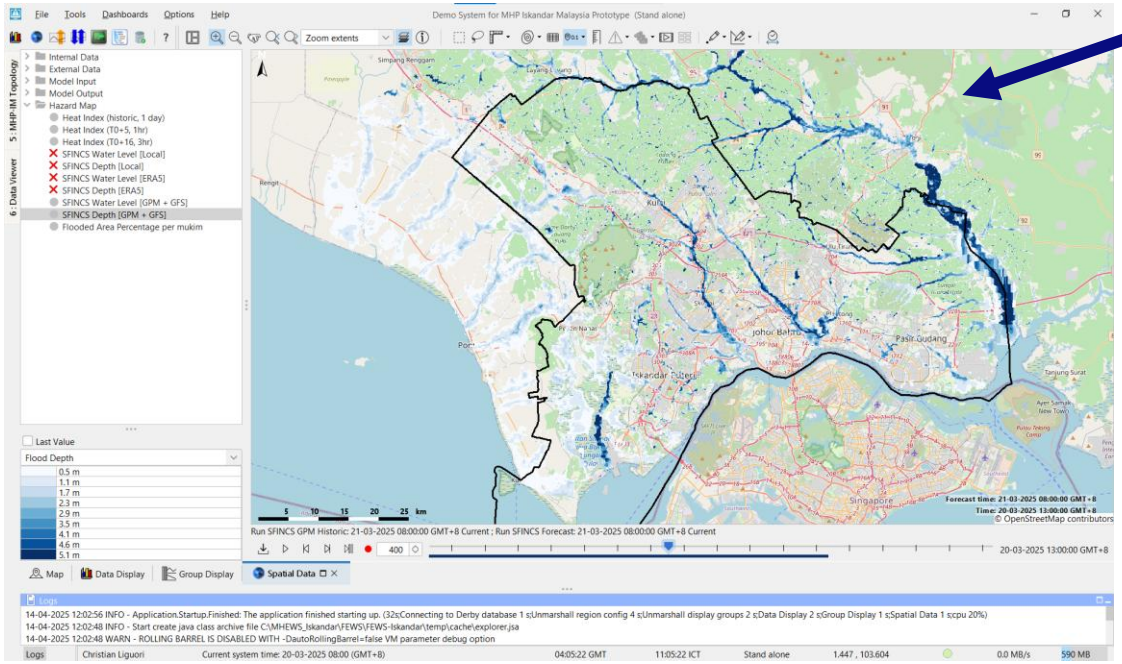
8. Produce flood risk information, i.e. estimated annual damage caused by flooding and estimated flood for several return periods

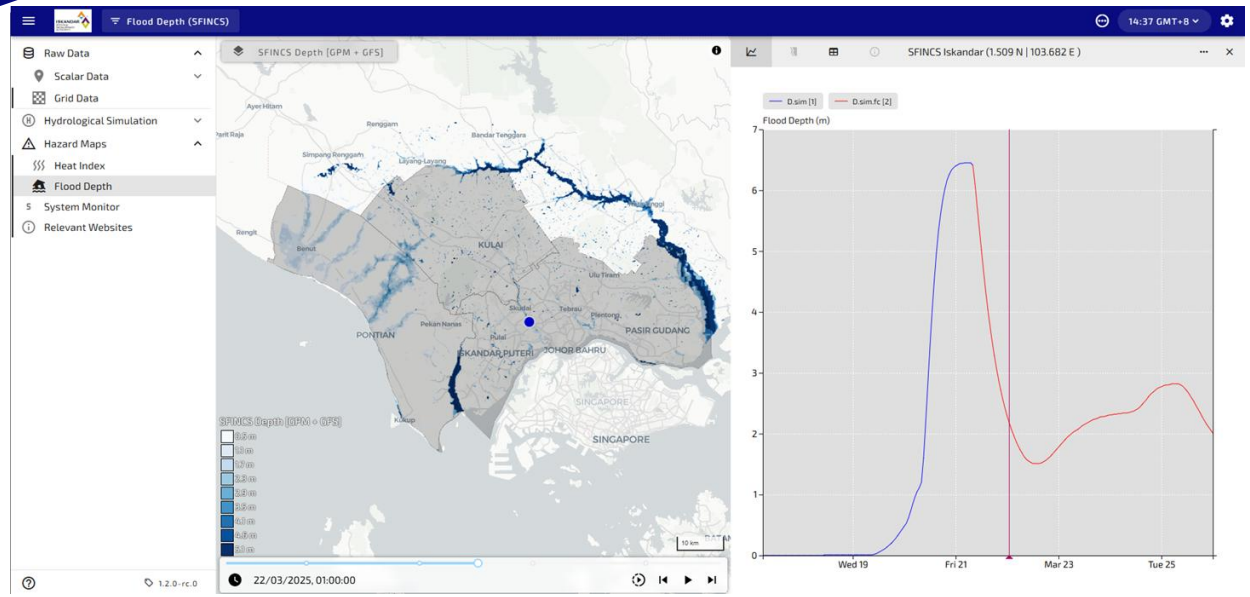


MHP-IM Interfaces

1. MHP-IM Stand Alone Application (for operator)
2. MPH-IM Web OC (for public)

One database





MHP-IM SA

WebOC

MHP-IM Prototype Use Cases

Example Monsoon Surge March, 2025

Monsoon Surge, March 2025

- Extreme rainfall over large areas in Iskandar Malaysia (and Singapore)
- Triggered (flash) floods and causing emergency response
- This presentation shows how the MHEWS can be used in such cases
- We present a timeline of forecasts, starting at 16th of March

Severe floods hit five districts in Johor, 2,550 people evacuated

Authorities have warned that the number of flood victims may increase. PHOTO: THE STAR/ASIA NEWS NETWORK

UPDATED MAR 20, 2025, 06:48 PM -

JOHOR – Heavy rainfall in Johor has led to severe flooding in five districts, forcing the evacuation of 2,550 residents.

The Johor Disaster Management Committee said that as at 4pm on March 20, the evacuees, from 707 families, had been placed at 43 temporary relief centres.

Rainfall Report 16 Mar 2025

- 16th March: 3-day forecast shows no significant rainfall

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Rainfall Warning Report (16 Mar 2025)

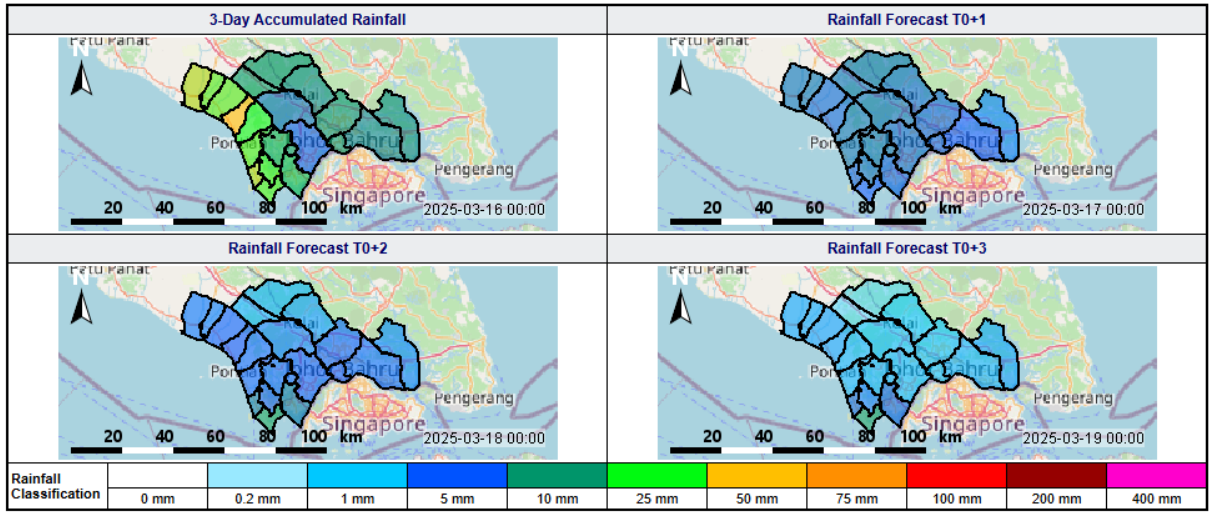

Table of Rainfall per Mukim for the Iskandar Malaysia Region

Based on forecast with T0 = 16 Mar 2025

Mukim	3-Day Accumulated Rainfall [mm]	Rainfall Forecast T0+1 [mm]	Rainfall Forecast T0+2 [mm]	Rainfall Forecast T0+3 [mm]
API-API	51.1	6.3	5.1	2.4
AYER BALOI	32.3	6.4	4.6	2.5
AYER MASIN	40.5	6.1	7.9	6.3
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PENGKALAN RAJA	19.2	7.5	4.3	1.8
PLENTONG	8.9	4.8	4.1	1.7
PONTIAN	25.3	7.5	4.3	1.8
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RIMBA TERJUN	30.1	7.5	4.3	1.8
SEDENAK	9.8	7.4	1.8	0.7
SENAI	9.2	6.8	2.5	1.0
SERKAT	29.6	4.8	11.2	10.5
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Note:

Rainfall Classification		
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	Moderate	41 - 60.9 mm
	Heavy	61 - 80.4 mm
	Very Heavy	> 80.5 mm

Rainfall Report 17 Mar 2025

- 17th March: First sign of significant rainfall in rainfall forecast, but not very extreme yet

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Rainfall Warning Report (17 Mar 2025)

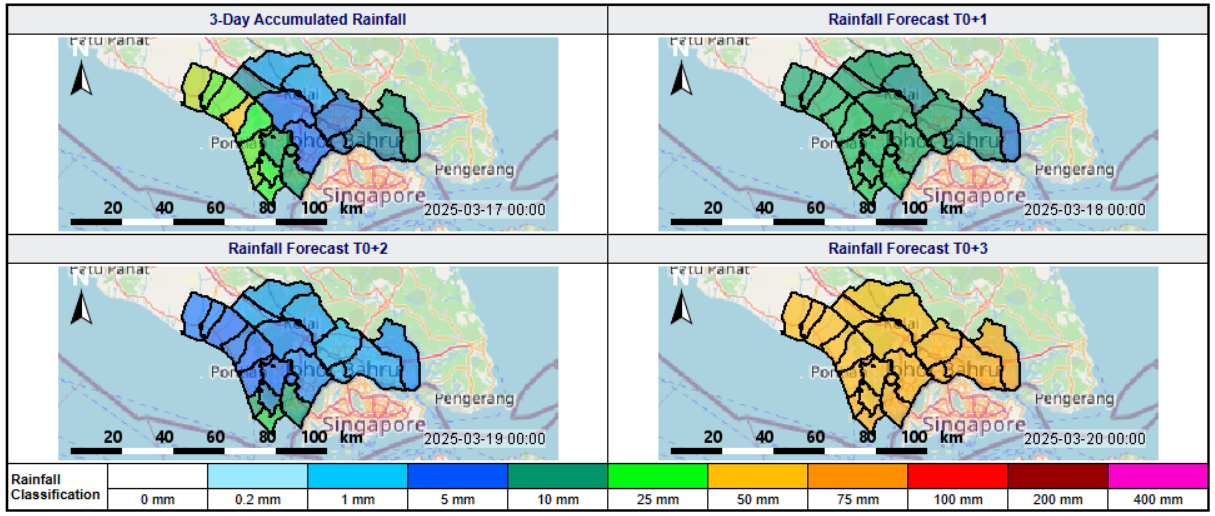


Table of Rainfall per Mukim for the Iskandar Malaysia Region

Based on forecast with T0 = 17 Mar 2025

Mukim	3-Day Accumulated Rainfall [mm]	Rainfall Forecast T0+1 [mm]	Rainfall Forecast T0+2 [mm]	Rainfall Forecast T0+3 [mm]
API-API	49.2	15.0	5.8	56.1
AYER BALOI	30.8	13.2	5.2	56.1
AYER MASIN	34.9	15.5	11.5	60.8
BANDAR BENUT	41.0	10.6	3.5	54.5
BANDAR JOHOR BAHRU	6.8	11.8	1.9	58.7
BANDAR KULAI	3.1	11.1	2.7	51.6
BANDAR PONTIAN KECHIL	51.5	14.2	4.7	54.4
BANDAR TEBRAU	7.7	11.8	1.9	58.7
BENUT	41.5	11.4	4.1	55.2
BUKIT BATU	8.6	11.1	2.7	51.7
JELUTONG	11.7	14.2	4.7	54.4
JERAM BATU	13.9	14.2	4.7	54.4
KULAI	4.4	12.8	3.7	53.9
PEKAN JERAM BATU	4.4	14.2	4.7	54.4
PENGKALAN RAJA	17.7	14.2	4.7	54.4
PLENTONG	8.0	9.5	2.4	62.4
PONTIAN	23.8	14.2	4.7	54.4
PULAI	4.5	12.9	3.2	56.7
RIMBA TERJUN	30.6	14.2	4.7	54.4
SEDENAK	2.8	10.9	2.7	51.5
SENAI	2.6	8.9	2.7	51.4
SERKAT	25.3	16.8	17.8	66.7
SUNGAI KARANG	25.7	14.7	7.3	56.9
SUNGAI PINGGAN	31.5	11.0	3.8	54.9
SUNGAI TIRAM	10.3	6.6	3.2	65.0
TANJONG KUPANG	13.5	15.6	11.3	61.0
TEBRAU	6.1	11.1	2.0	57.5

Note:

Rainfall Classification		
	Light	< 41 mm
	Moderate	41 - 60.9 mm
	Heavy	61 - 80.4 mm
	Very Heavy	> 80.5 mm

Flood Warning Report 17 Mar 2025

- 17th March:
  Also, no significant flooding indicated for this period.

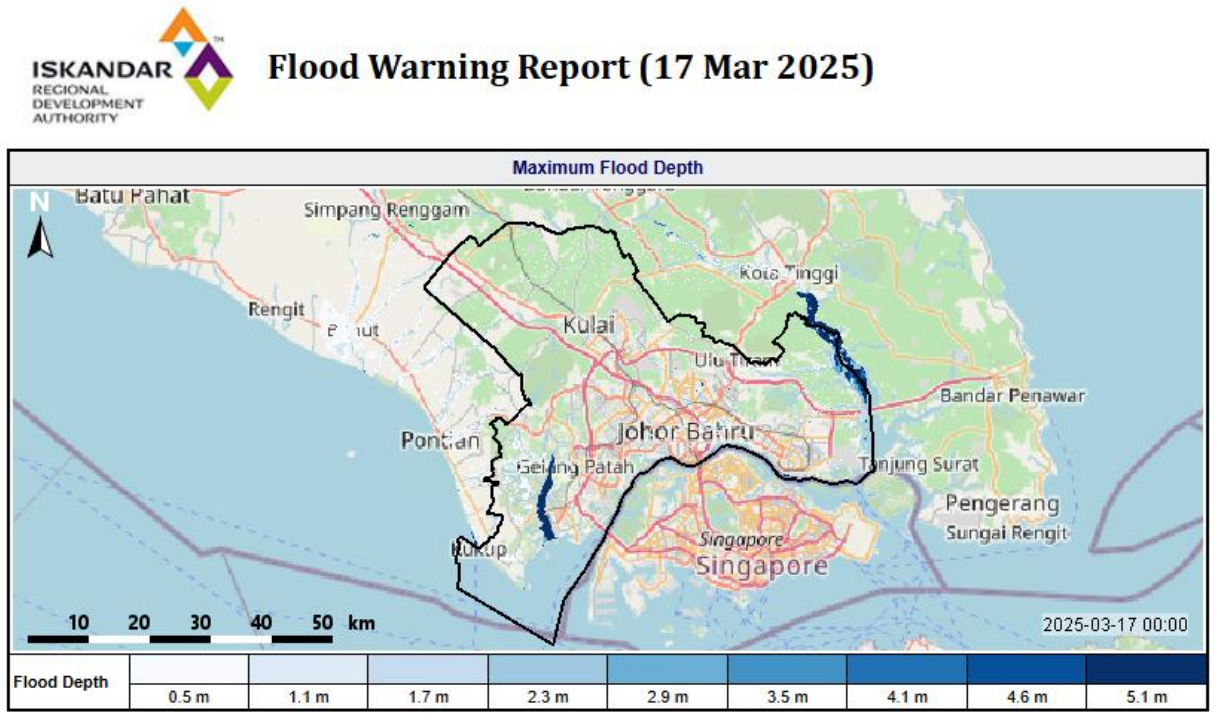


Table of Flood Early Warning Impact per Mukim for the Iskandar Malaysia Region

Based on forecast with T0 = 17 Mar 2025

Mukim	Flooded Area [%]	Number of Population Affected [People]	Estimated Damage to Buildings [10^3 MYR]
API-API	12.9	2,650	135,594
AYER BALOI	11.3	1,125	23,410
AYER MASIN	8.3	350	2,661
BANDAR BENUT	96.9	3,840	46,044
BANDAR JOHOR BAHRU	3.4	5,745	223,538
BANDAR KULAI	7.6	465	14,256
BANDAR PONTIAN KECHIL	24.1	340	48,604
BANDAR TEBRAU	58.0	35	2,725
BENUT	36.7	3,565	32,834
BUKIT BATU	3.5	105	720
JELUTONG	7.4	1,690	44,113
JERAM BATU	11.6	785	14,768
KULAI	0.7	3,110	62,685
PEKAN JERAM BATU	0.0	0	0
PENGKALAN RAJA	1.6	10	0
PLENTONG	5.4	22,520	1,020,245
PONTIAN	13.0	4,420	235,209
PULAI	1.9	7,655	123,029
RIMBA TERJUN	12.4	6,495	157,434
SEDENAK	3.1	415	9,679
SENAI	3.0	3,820	324,997
SERKAT	13.6	825	306,140
SUNGAI KARANG	19.8	320	105
SUNGAI PINGGAN	16.1	1,145	7,589
SUNGAI TIRAM	19.4	560	117,871
TANJONG KUPANG	17.4	4,485	342,409
TEBRAU	3.3	12,935	876,017

Rainfall Report 18 Mar 2025

- 18th March: Clear sign in the forecast that extreme rainfall is predicted over large areas with lead-time of around 1-2 days

ISKANDAR REGIONAL DEVELOPMENT AUTHORITY

Rainfall Warning Report (18 Mar 2025)

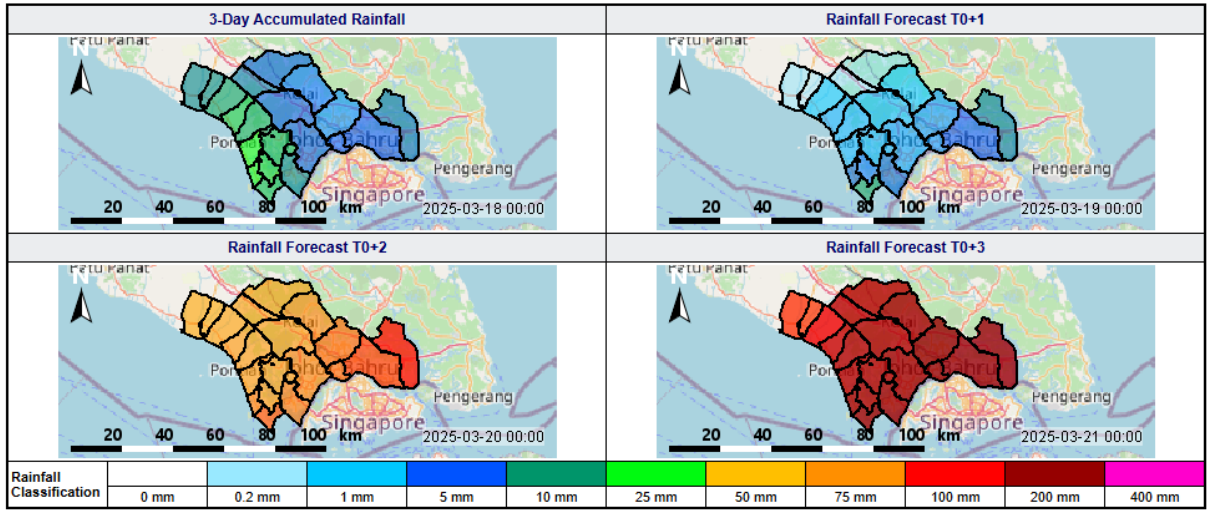


Table of Rainfall per Mukim for the Iskandar Malaysia Region

Based on forecast with T0 = 18 Mar 2025

Mukim	3-Day Accumulated Rainfall [mm]	Rainfall Forecast T0+1 [mm]	Rainfall Forecast T0+2 [mm]	Rainfall Forecast T0+3 [mm]
API-API	17.1	1.9	72.9	152.3
AYER BALOI	11.5	1.1	68.1	113.9
AYER MASIN	24.4	6.6	79.2	189.0
BANDAR BENUT	10.5	0.1	62.1	89.4
BANDAR JOHOR BAHRU	4.5	2.8	82.1	201.7
BANDAR KULAI	4.3	0.4	69.0	163.9
BANDAR PONTIAN KECHIL	33.5	1.8	72.1	173.2
BANDAR TEBRAU	2.7	2.8	82.1	201.7
BENUT	8.9	0.4	63.7	92.7
BUKIT BATU	7.9	0.4	68.9	162.3
JELUTONG	14.9	1.8	72.1	173.2
JERAM BATU	14.9	1.8	72.1	173.2
KULAI	6.0	1.4	72.2	173.2
PEKAN JERAM BATU	7.3	1.8	72.1	173.2
PENGKALAN RAJA	11.3	1.8	72.1	173.2
PLENTONG	5.5	5.4	89.3	210.1
PONTIAN	13.2	1.8	72.1	173.1
PULAI	6.2	2.3	77.5	188.5
RIMBA TERJUN	25.0	1.8	72.1	173.2
SEDENAK	6.0	0.4	69.5	165.3
SENAI	3.8	1.0	76.8	185.2
SERKAT	15.5	11.0	85.7	203.6
SUNGAI KARANG	19.1	3.7	74.8	179.3
SUNGAI PINGGAN	9.3	0.3	62.9	91.1
SUNGAI TIRAM	7.4	8.2	96.6	213.7
TANJONG KUPANG	9.1	6.6	79.5	190.3
TEBRAU	2.9	2.6	82.0	201.0

Note:

Rainfall Classification		
	Light	< 41 mm
	Moderate	41 - 60.9 mm
	Heavy	61 - 80.4 mm
	Very Heavy	> 80.5 mm

Flood Warning Report 18 Mar 2025

- 18th March: Resulting in substantial flooded areas, estimated number of affected people and damage

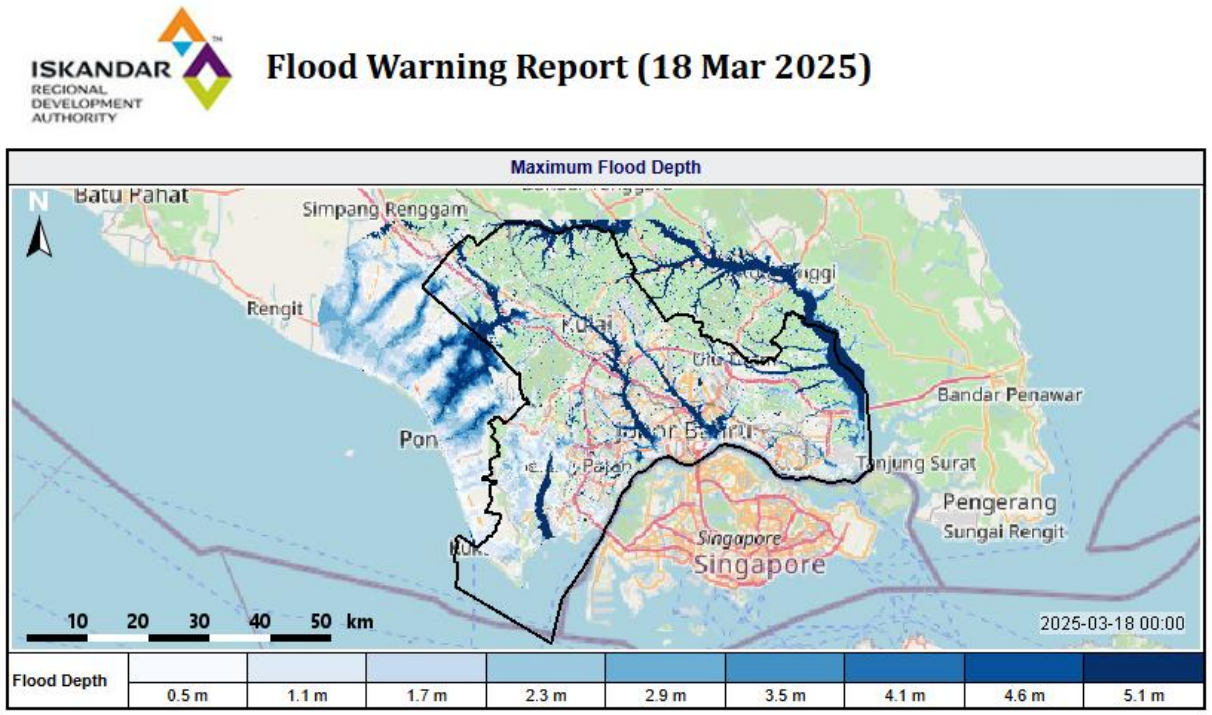


Table of Flood Early Warning Impact per Mukim for the Iskandar Malaysia Region

Based on forecast with T0 = 18 Mar 2025

Mukim	Flooded Area [%]	Number of Population Affected [People]	Estimated Damage to Buildings [10^3 MYR]
API-API	88.2	13,655	1,872,436
AYER BALOI	80.9	10,480	1,111,848
AYER MASIN	54.9	3,055	197,081
BANDAR BENUT	100.0	4,060	320,921
BANDAR JOHOR BAHRU	17.0	18,935	1,482,768
BANDAR KULAI	46.7	3,835	295,843
BANDAR PONTIAN KECHIL	92.1	2,040	465,678
BANDAR TEBRAU	100.0	125	12,514
BENUT	86.8	9,885	831,565
BUKIT BATU	56.2	6,720	1,352,507
JELUTONG	55.5	6,440	301,003
JERAM BATU	59.4	18,155	2,256,354
KULAI	24.3	50,920	3,184,002
PEKAN JERAM BATU	0.0	0	0
PENGKALAN RAJA	65.4	975	68,921
PLENTONG	25.9	132,370	10,085,375
PONTIAN	84.2	34,985	2,637,748
PULAI	28.4	131,775	10,080,468
RIMBA TERJUN	73.8	26,045	3,360,191
SEDENAK	28.6	8,620	735,550
SENAI	22.9	29,395	8,890,810
SERKAT	48.4	4,870	644,137
SUNGAI KARANG	50.4	735	45,628
SUNGAI PINGGAN	84.3	7,680	689,359
SUNGAI TIRAM	41.7	4,785	601,455
TANJONG KUPANG	45.7	12,995	1,101,799
TEBRAU	22.5	86,010	9,341,065

Rainfall Report 19 Mar 2025

- 19th March: Clear sign in the forecast that extreme rainfall is predicted over large areas with lead-time of around 0-1 days. Total rainfall volume slightly less then in previous forecast.

ISKANDAR REGIONAL DEVELOPMENT AUTHORITY

Rainfall Warning Report (19 Mar 2025)

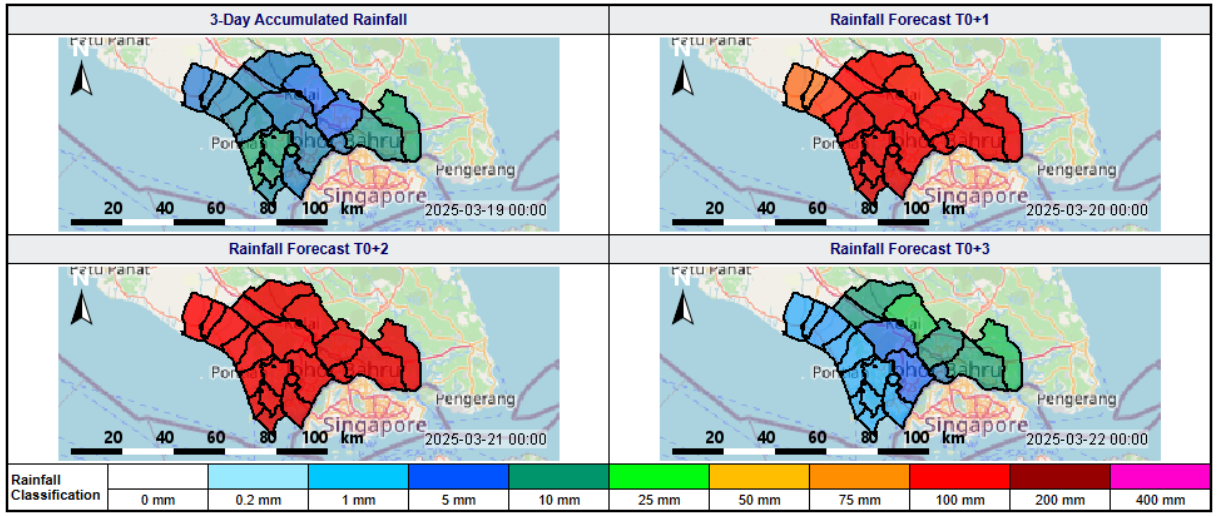


Table of Rainfall per Mukim for the Iskandar Malaysia Region

Based on forecast with T0 = 19 Mar 2025

Mukim	3-Day Accumulated Rainfall [mm]	Rainfall Forecast T0+1 [mm]	Rainfall Forecast T0+2 [mm]	Rainfall Forecast T0+3 [mm]
API-API	8.1	108.0	112.7	2.7
AYER BALOI	7.5	92.7	106.3	3.1
AYER MASIN	11.9	127.6	124.3	2.3
BANDAR BENUT	7.5	81.9	99.4	2.7
BANDAR JOHOR BAHRU	7.1	115.0	123.8	7.3
BANDAR KULAI	5.2	99.9	111.2	9.1
BANDAR PONTIAN KECHIL	14.5	114.3	113.2	2.3
BANDAR TEBRAU	4.9	115.0	123.8	7.3
BENUT	6.5	84.3	101.0	2.5
BUKIT BATU	7.3	99.5	111.0	9.0
JELUTONG	11.8	114.3	113.2	2.3
JERAM BATU	10.5	114.3	113.2	2.3
KULAI	6.7	109.1	113.7	5.4
PEKAN JERAM BATU	7.3	114.3	113.2	2.3
PENGKALAN RAJA	7.4	114.3	113.2	2.3
PLENTONG	9.4	114.0	120.6	10.6
PONTIAN	7.7	114.2	113.2	2.4
PULAI	7.6	114.7	118.9	5.0
RIMBA TERJUN	11.6	114.3	113.2	2.3
SEDENAK	6.5	99.7	111.4	9.7
SENAI	4.9	97.8	114.5	17.1
SERKAT	8.3	140.0	134.6	2.3
SUNGAI KARANG	10.0	119.5	117.5	2.3
SUNGAI PINGGAN	7.1	83.2	100.2	2.6
SUNGAI TIRAM	11.8	111.3	119.2	15.5
TANJONG KUPANG	7.2	127.4	124.6	2.5
TEBRAU	5.0	112.0	122.6	9.6

Note:

Rainfall Classification		
	Light	< 41 mm
	Moderate	41 - 60.9 mm
	Heavy	61 - 80.4 mm
	Very Heavy	> 80.5 mm

Rainfall Report 20 Mar 2025

- 20th March: Rainfall arrived with high total observed rainfall volumes and still some rain to come

ISKANDAR REGIONAL DEVELOPMENT AUTHORITY

Rainfall Warning Report (20 Mar 2025)

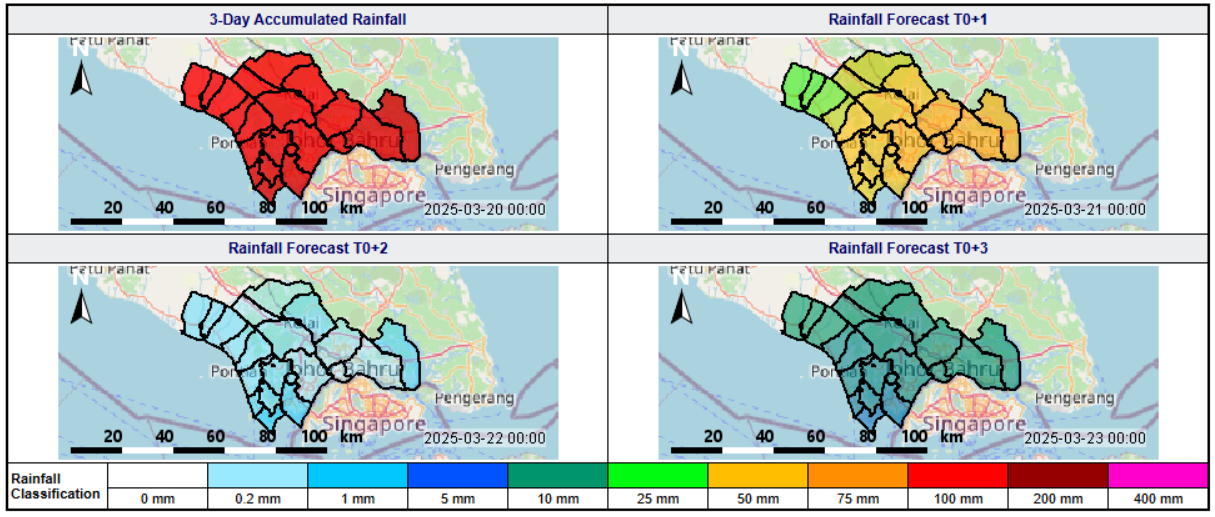


Table of Rainfall per Mukim for the Iskandar Malaysia Region

Based on forecast with T0 = 20 Mar 2025

Mukim	3-Day Accumulated Rainfall [mm]	Rainfall Forecast T0+1 [mm]	Rainfall Forecast T0+2 [mm]	Rainfall Forecast T0+3 [mm]
API-API	113.8	42.6	0.6	9.0
AYER BALOI	108.6	33.2	0.6	10.1
AYER MASIN	133.6	48.7	0.8	7.9
BANDAR BENUT	107.2	29.8	0.6	11.1
BANDAR JOHOR BAHRU	122.5	64.3	0.3	9.4
BANDAR KULAI	108.3	44.7	0.3	9.7
BANDAR PONTIAN KECHIL	125.5	50.2	0.6	8.8
BANDAR TEBRAU	118.8	64.3	0.3	9.4
BENUT	105.0	29.9	0.6	10.9
BUKIT BATU	107.0	44.4	0.3	9.7
JELUTONG	121.5	50.2	0.6	8.8
JERAM BATU	119.3	50.2	0.6	8.8
KULAI	112.1	49.8	0.5	9.2
PEKAN JERAM BATU	116.0	50.2	0.6	8.8
PENGKALAN RAJA	115.2	50.2	0.6	8.8
PLENTONG	132.6	62.5	0.3	9.7
PONTIAN	114.9	50.1	0.6	8.8
PULAI	120.0	57.8	0.4	9.1
RIMBA TERJUN	118.5	50.2	0.6	8.8
SEDENAK	99.6	45.0	0.3	9.7
SENAI	106.2	50.7	0.6	9.4
SERKAT	140.8	47.3	1.0	7.0
SUNGAI KARANG	127.8	49.6	0.7	8.4
SUNGAI PINGGAN	106.1	29.9	0.6	11.0
SUNGAI TIRAM	139.3	61.4	0.7	9.6
TANJONG KUPANG	131.5	49.3	0.8	8.0
TEBRAU	117.5	62.6	0.4	9.4

Note:

Rainfall Classification		
	Light	< 41 mm
	Moderate	41 - 60.9 mm
	Heavy	61 - 80.4 mm
	Very Heavy	> 80.5 mm

Rainfall Report 21 Mar 2025

- 21st March: Rainfall arrived with high total observed rainfall volumes (up to ~250 mm!)

ISKANDAR REGIONAL DEVELOPMENT AUTHORITY

Rainfall Warning Report (21 Mar 2025)

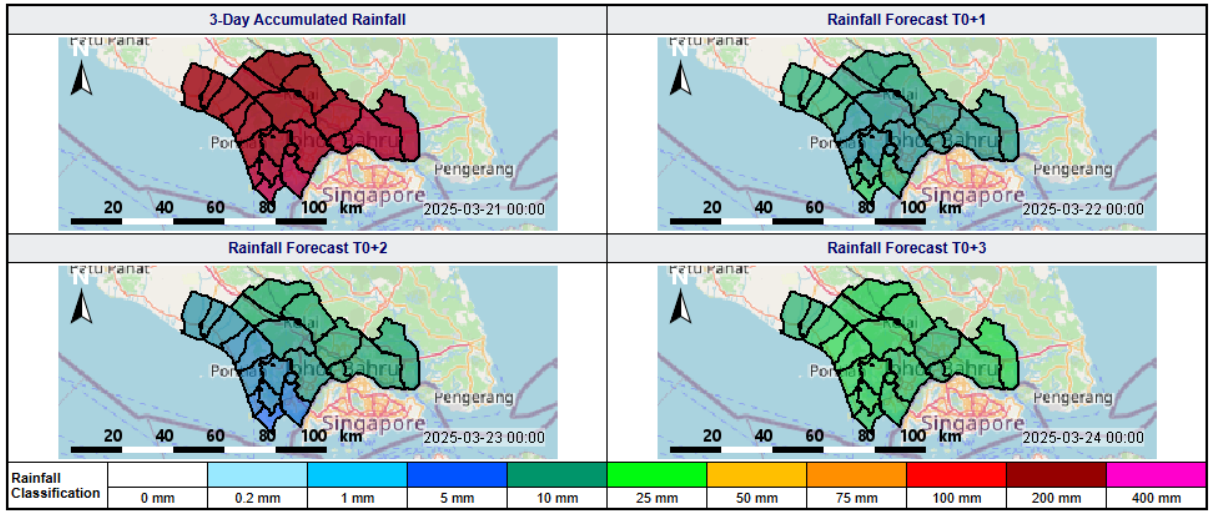


Table of Rainfall per Mukim for the Iskandar Malaysia Region

Based on forecast with T0 = 21 Mar 2025

Mukim	3-Day Accumulated Rainfall [mm]	Rainfall Forecast T0+1 [mm]	Rainfall Forecast T0+2 [mm]	Rainfall Forecast T0+3 [mm]
API-API	220.6	11.3	7.6	19.2
AYER BALOI	212.8	12.6	8.3	16.3
AYER MASIN	254.2	12.6	6.2	16.7
BANDAR BENUT	213.3	11.4	8.7	11.5
BANDAR JOHOR BAHRU	237.0	9.2	11.0	12.6
BANDAR KULAI	214.8	9.8	11.6	17.1
BANDAR PONTIAN KECHIL	232.9	8.5	7.5	17.6
BANDAR TEBRAU	230.0	9.2	11.0	12.6
BENUT	213.7	11.9	8.4	12.8
BUKIT BATU	220.1	9.8	11.5	17.0
JELUTONG	230.5	8.5	7.5	17.6
JERAM BATU	226.4	8.5	7.5	17.6
KULAI	218.6	9.0	9.4	16.9
PEKAN JERAM BATU	220.6	8.5	7.5	17.6
PENGKALAN RAJA	221.5	8.5	7.5	17.6
PLENTONG	246.1	9.2	11.0	16.0
PONTIAN	221.6	8.5	7.5	17.6
PULAI	231.3	8.9	9.4	14.9
RIMBA TERJUN	223.4	8.5	7.5	17.6
SEDENAK	216.3	9.8	11.6	17.0
SENAI	214.3	9.8	11.3	16.1
SERKAT	273.5	16.4	5.0	15.8
SUNGAI KARANG	247.8	10.1	7.0	17.2
SUNGAI PINGGAN	213.8	11.7	8.5	12.2
SUNGAI TIRAM	243.7	9.7	10.8	19.0
TANJONG KUPANG	259.1	12.6	6.4	16.5
TEBRAU	226.8	9.3	11.0	13.1

Note:

Rainfall Classification		
	Light	< 41 mm
	Moderate	41 - 60.9 mm
	Heavy	61 - 80.4 mm
	Very Heavy	> 80.5 mm

Flood Warning Report 21 Mar 2025

- 21st March: With substantial (simulated) flooded area as a result

ISKANDAR REGIONAL DEVELOPMENT AUTHORITY

Flood Warning Report (21 Mar 2025)

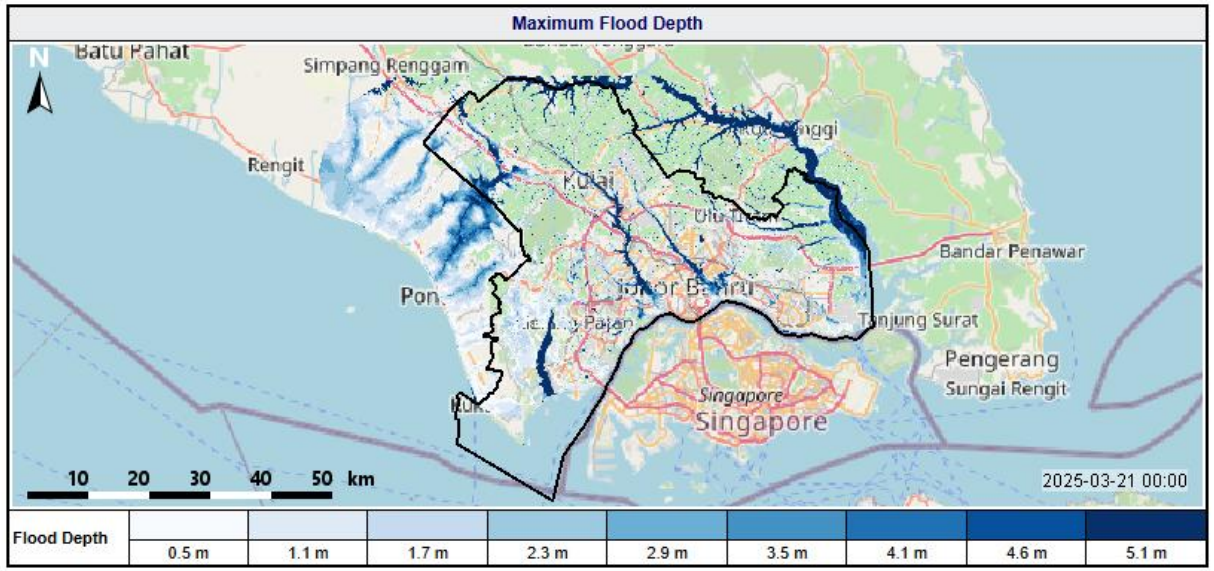


Table of Flood Early Warning Impact per Mukim for the Iskandar Malaysia Region

Based on forecast with T0 = 21 Mar 2025

Mukim	Flooded Area [%]	Number of Population Affected [People]	Estimated Damage to Buildings [10^3 MYR]
API-API	79.6	13,170	1,764,278
AYER BALOI	69.3	10,075	954,773
AYER MASIN	45.6	2,630	62,670
BANDAR BENUT	100.0	4,060	320,921
BANDAR JOHOR BAHRU	14.1	14,805	1,142,602
BANDAR KULAI	39.9	3,210	247,335
BANDAR PONTIAN KECHIL	89.7	2,035	378,046
BANDAR TEBRAU	94.5	115	11,788
BENUT	84.6	9,745	808,576
BUKIT BATU	49.0	5,010	974,119
JELUTONG	48.3	5,575	218,429
JERAM BATU	52.2	14,640	1,550,556
KULAI	20.3	38,920	2,208,953
PEKAN JERAM BATU	0.0	0	0
PENGKALAN RAJA	55.5	680	31,035
PLENTONG	21.5	102,010	7,261,783
PONTIAN	74.6	32,990	2,197,954
PULAI	24.7	108,930	7,956,520
RIMBA TERJUN	64.6	24,835	2,983,769
SEDENAK	22.9	4,875	419,589
SENAI	19.1	21,915	6,583,963
SERKAT	42.9	4,465	450,193
SUNGAI KARANG	45.4	670	35,084
SUNGAI PINGGAN	80.8	7,560	672,249
SUNGAI TIRAM	37.5	3,650	462,269
TANJONG KUPANG	40.1	11,370	783,457
TEBRAU	18.9	70,130	7,050,391

Monsoon Surge, March 2025

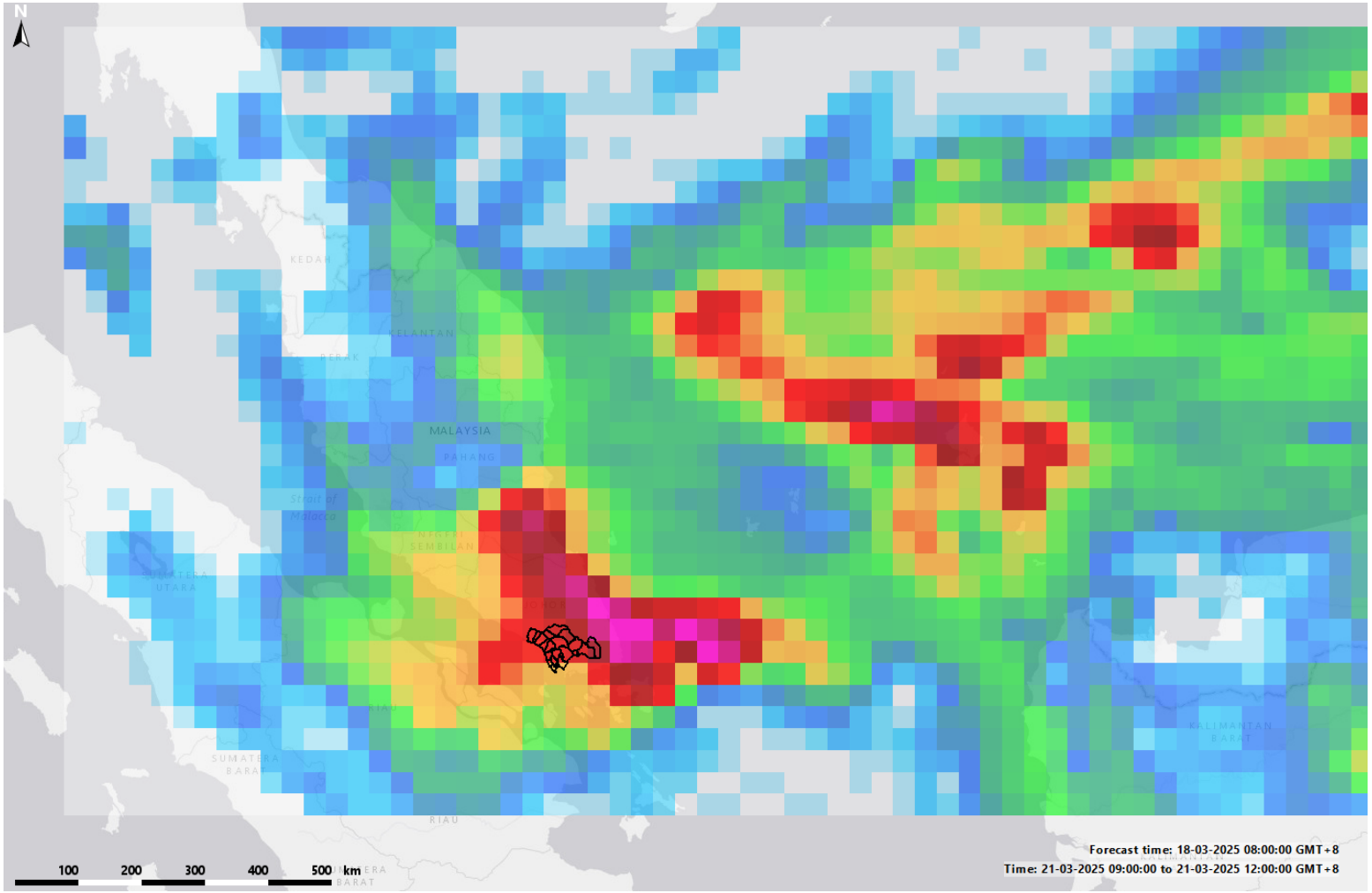
GFS forecast of 18-03-2025

Remarks:

- Forecasts based on global data only (GFS forecast)
- No validation was done, this demo purely demonstrates the possibilities of the MHP

Recommendations:

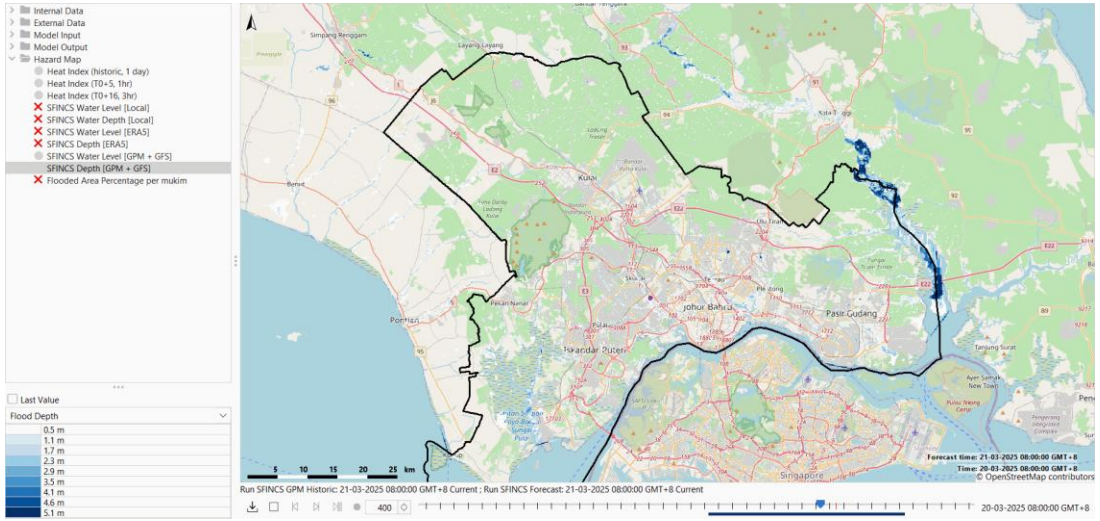
- Test with MET-Malaysia data as input.
- Validate flood maps using feedback from field reports.



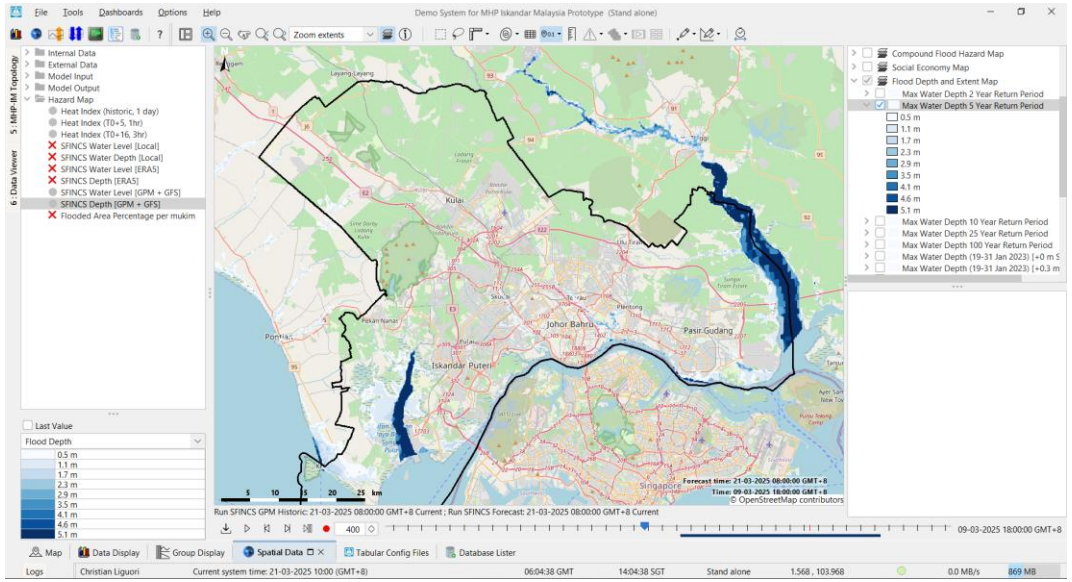
MHP-IM Prototype Live Demonstration

Added Value of MHP-IM (1)

1. **Integrated Situational Awareness**
2. **Model-Based Flood Hazard Information**
3. **Forecasting Capability (river discharge + flood estimate)**
4. **User-Centric Interface Design**
5. **Flood Impact Estimation** (flooded area, number of people affected and number of estimated damage)
6. **Provide flood risk map and other relevant map layers**
7. **Provide information on multiple hazards, such as sea level rise and landslides.**



Flood forecasting using SFINCS model



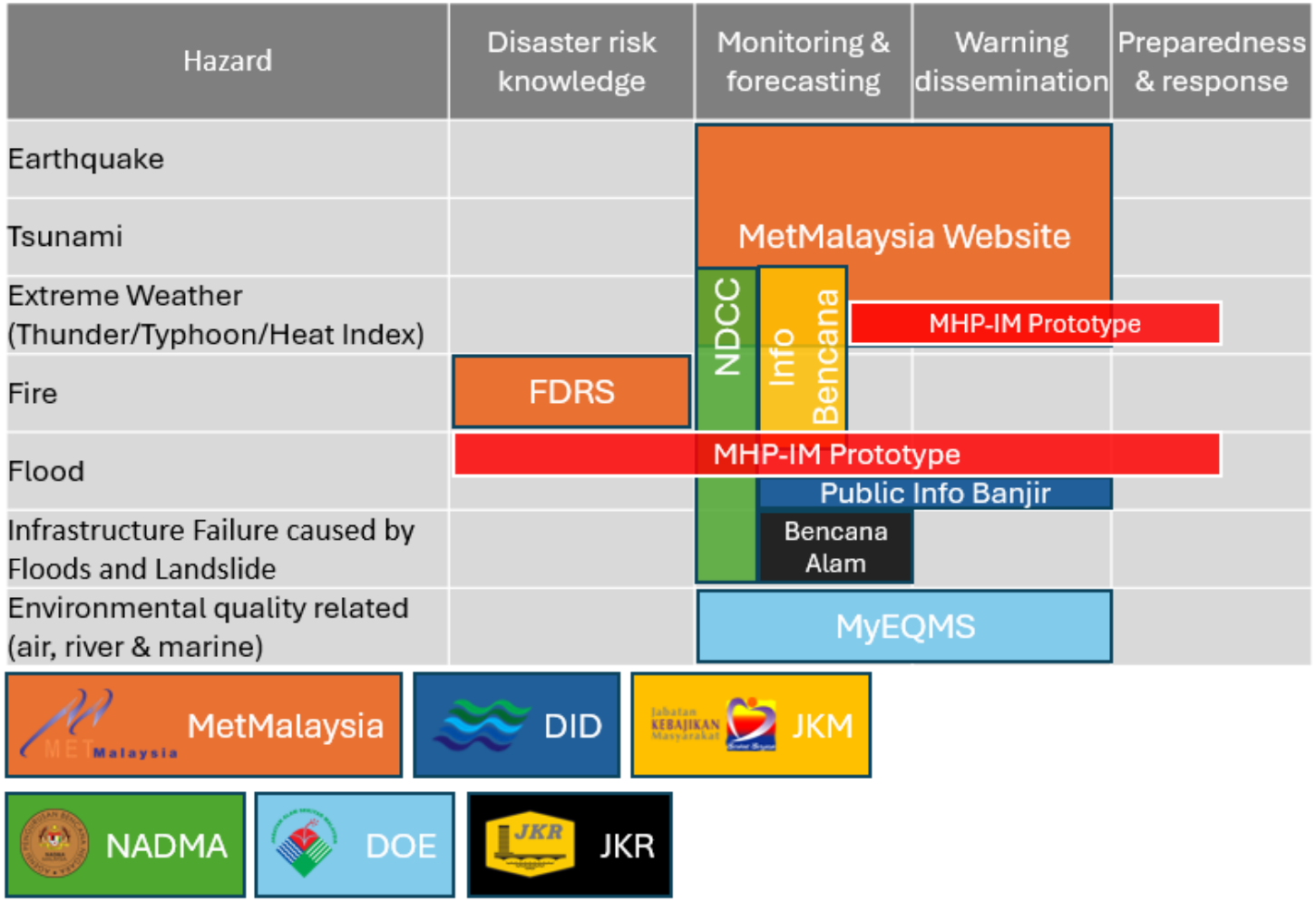
Max water depth 5-year return period

Added Value of MHP-IM (2)

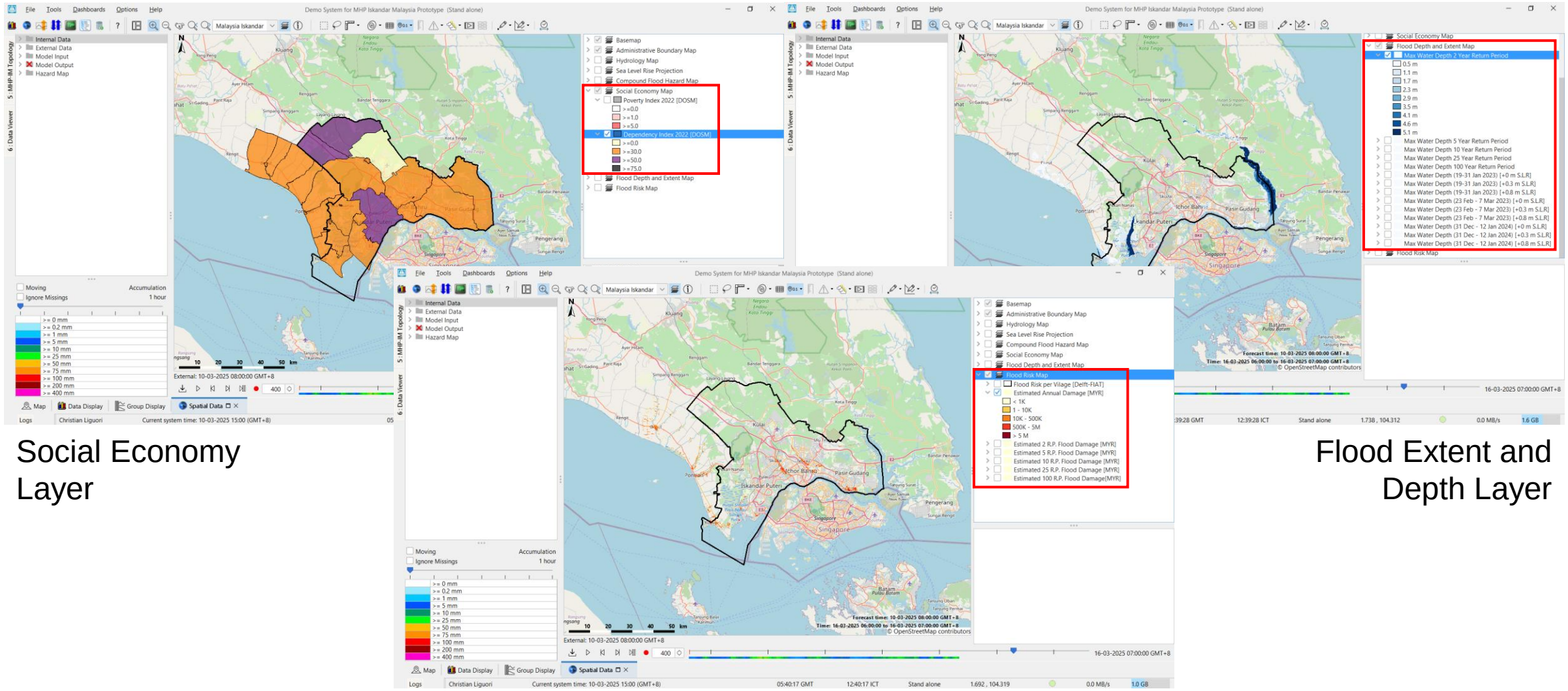
- Provides flood risk knowledge
- Does monitoring & forecasting
- Provide warning via report and changes in icon

⚠	Alert level
⚠	Warning level
⚠	Danger level

- Preparedness → Provide estimate number of population affected that likely needs to be evacuated.



Map Layers inside MHP-IM (1)

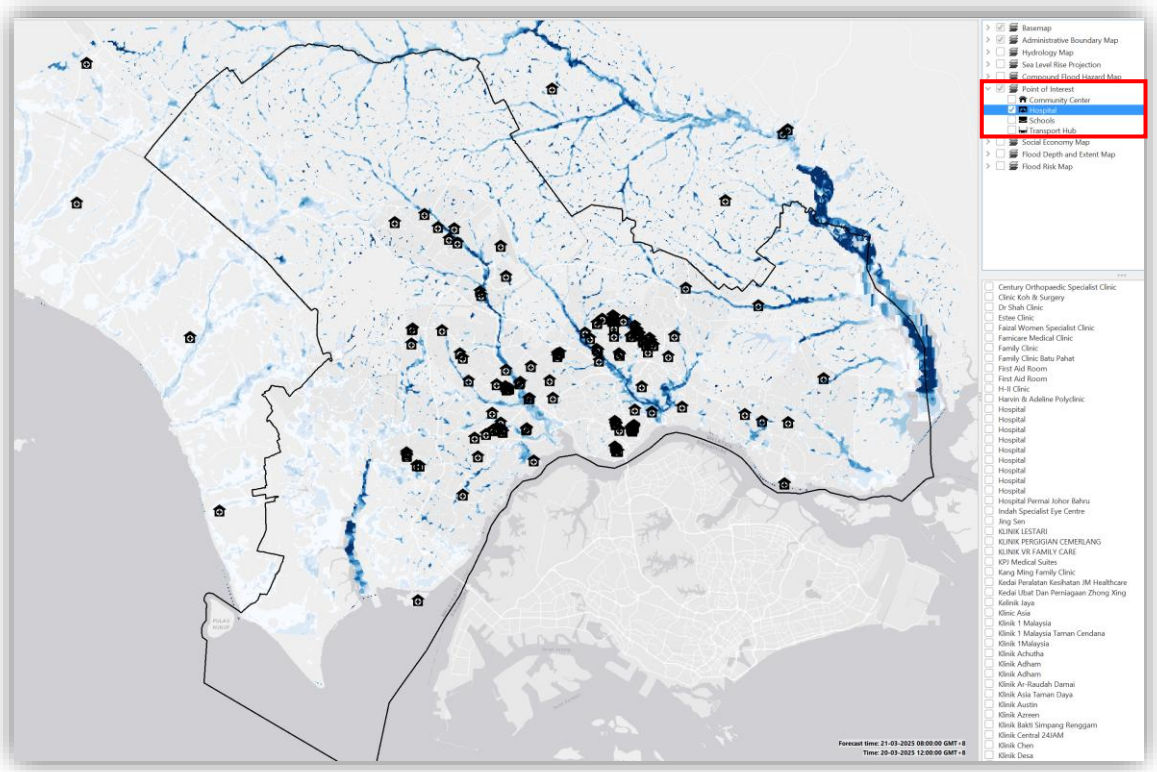


Social Economy Layer

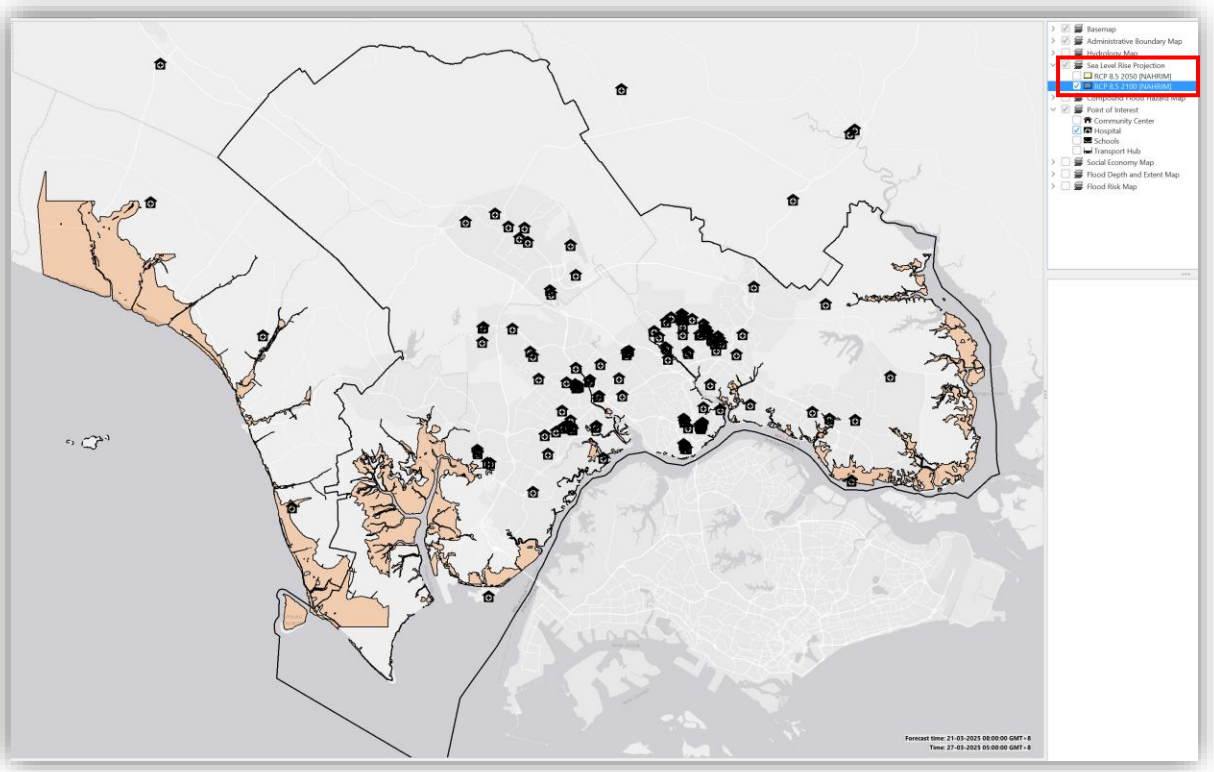
Flood Extent and Depth Layer

Flood Risk & Damage Layer

Map Layers inside MHP-IM (2)



Point of Interest (PoI)

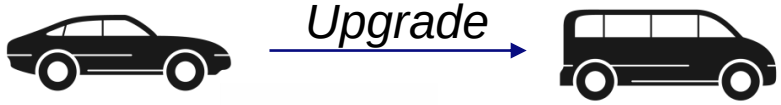


Sea Level Rise
Projection Layer

Financing Needs

What does it mean to have an operationalized MHP-IM?

- A forecasting system is not a 1-time buy
- Needs regular maintenance
- New user requirements (might) require new developments
- Needs (emergency) support
- User needs (regular) training



Phased implementation

- Step-wise improvements:
  - Time to collect end-user requirements
  - Time to develop and adopt the new functionalities
  - Time to test and learn about new functionalities

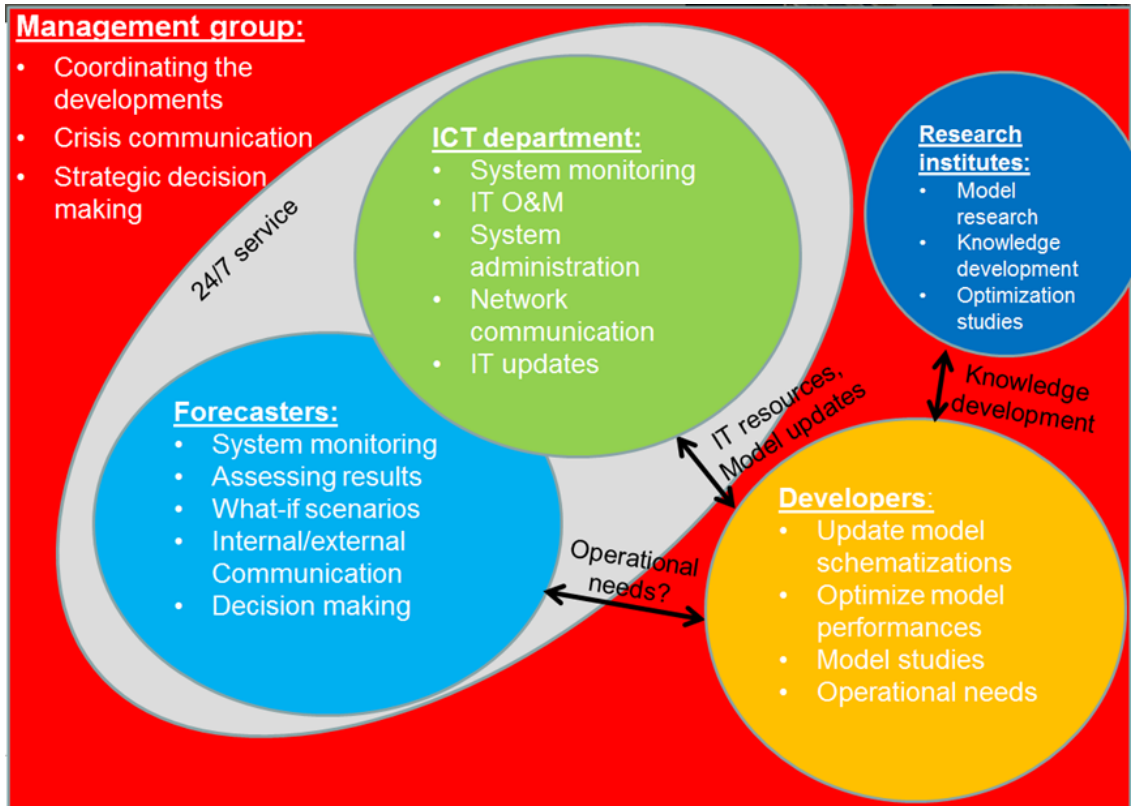
- Continuous development and support:
  - To build commitment
  - To build ownership
  - To build capacity

Financing Needs

1. **Manpower requirements**
2. Hardware requirements
3. MHP-IM development requirements

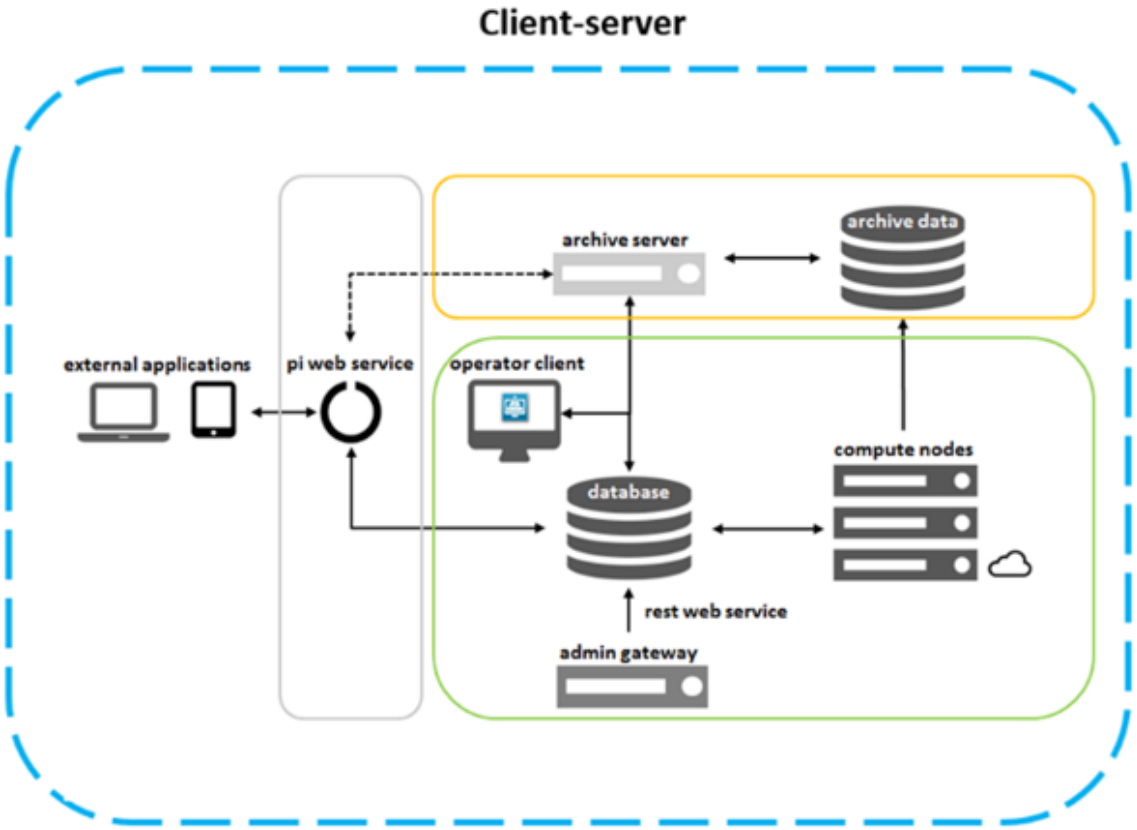
Staffing example

Key Task	Key Specialist	Minimum Number of Staff
System operation	Operational forecaster	6+2
System maintenance	IT specialist	2
System development	System developer	2
System development	Product owner	1
Team manager	Coordinating the team	1



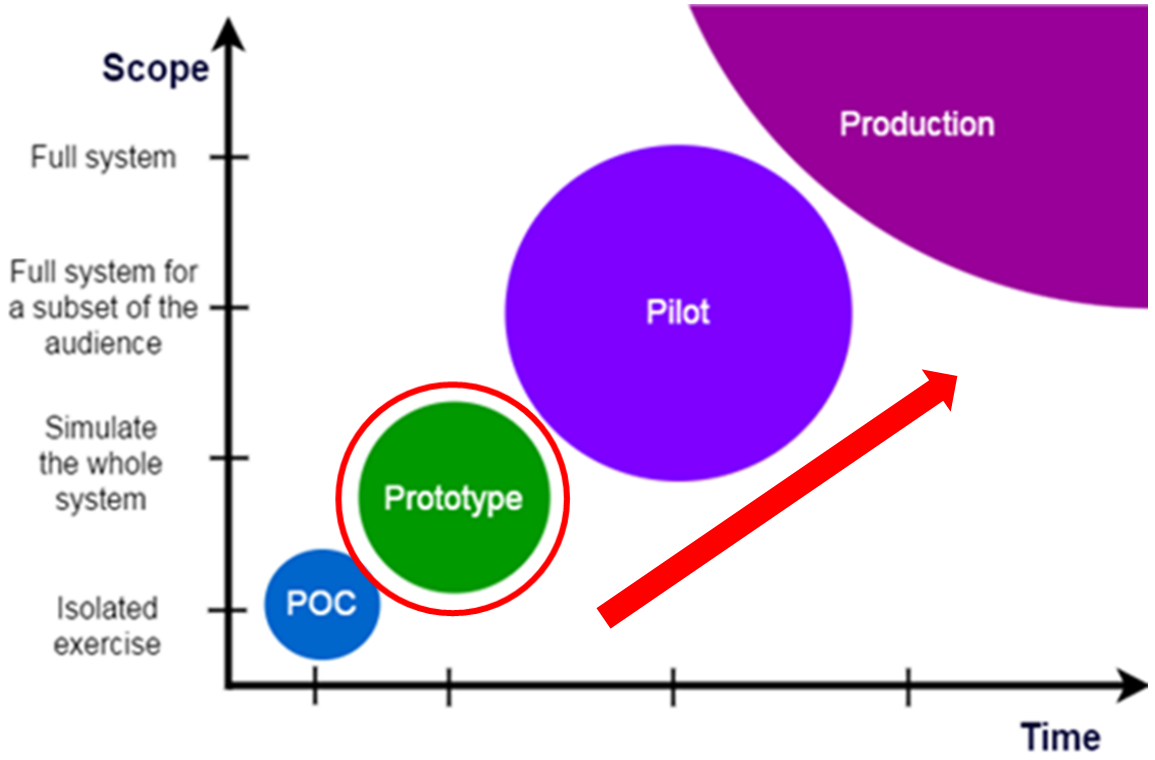
Financing Needs

1. Manpower requirements
2. **Hardware requirements**
3. MHP-IM development requirements



Financing Needs

1. Manpower requirements
2. Hardware requirements
3. **MHP-IM development requirements**
   a) From Stand-Alone to Operational system
   b) Add other hazards
   c) …



Funding sources

- Baseline funding:
  - National Government investment
  - Regional of Local Government investment

- Other funding options:
  - Develop paid services
  - Apply for R&D budgets (link to new functionalities)
  - International funds (loans, grants)

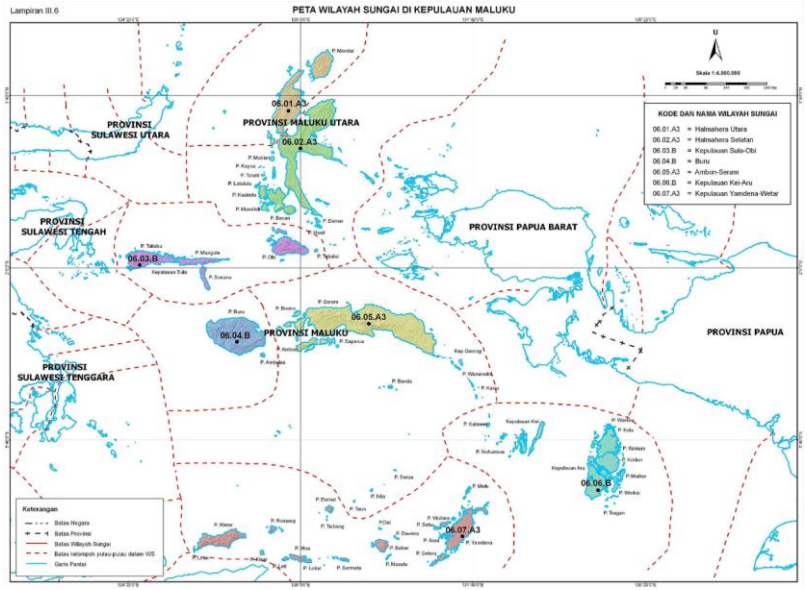
Example: FFEWS in Indonesia

Regional: BBWS Cidanau–Ciujung–Cidurian & BWS Maluku

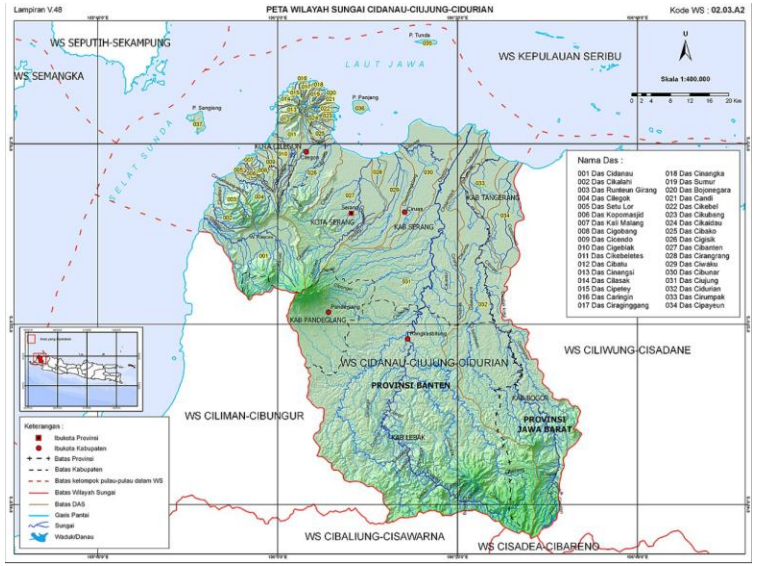
Total Budget: USD 5.87 million for development and maintenance in the first 3 years

Scope of Work:

- Enhancement of basin data and information
- Design and implementation of FFEWS tailored to the specific needs of the river basins.
- Flood risk maps establishment to identify vulnerable areas.



Area of BWS Maluku: 213 catchments



Area of BBWS Cidanau-Ciujung-Cidurian: 4,125.18 km2

Example: RWSOS Netherlands

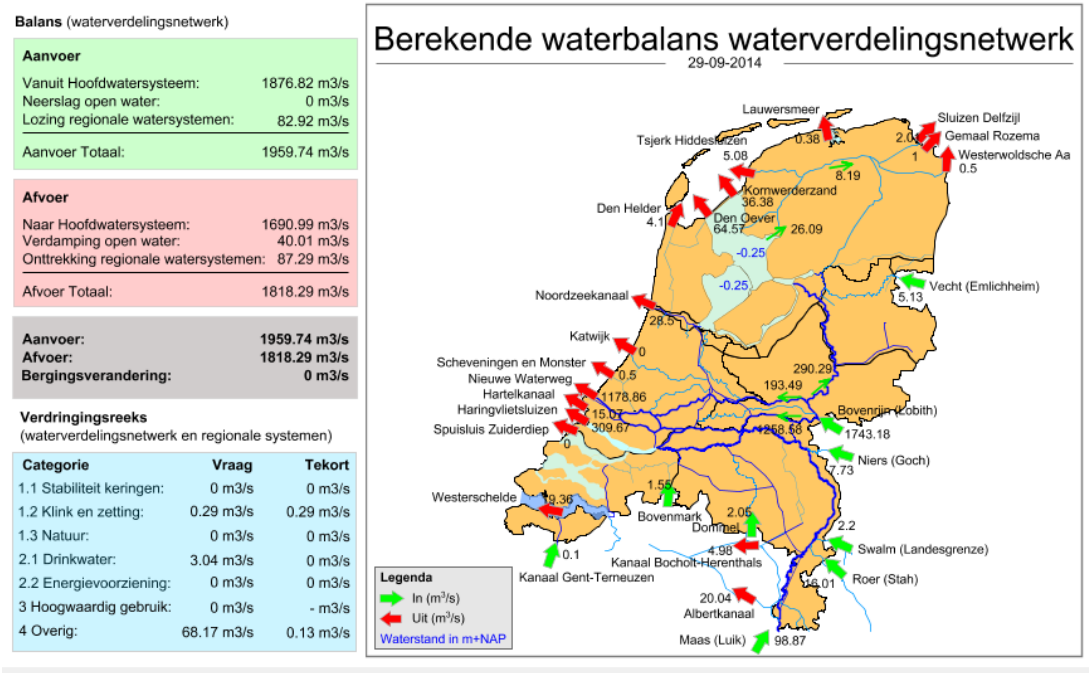
National: Rijkswaterstaat

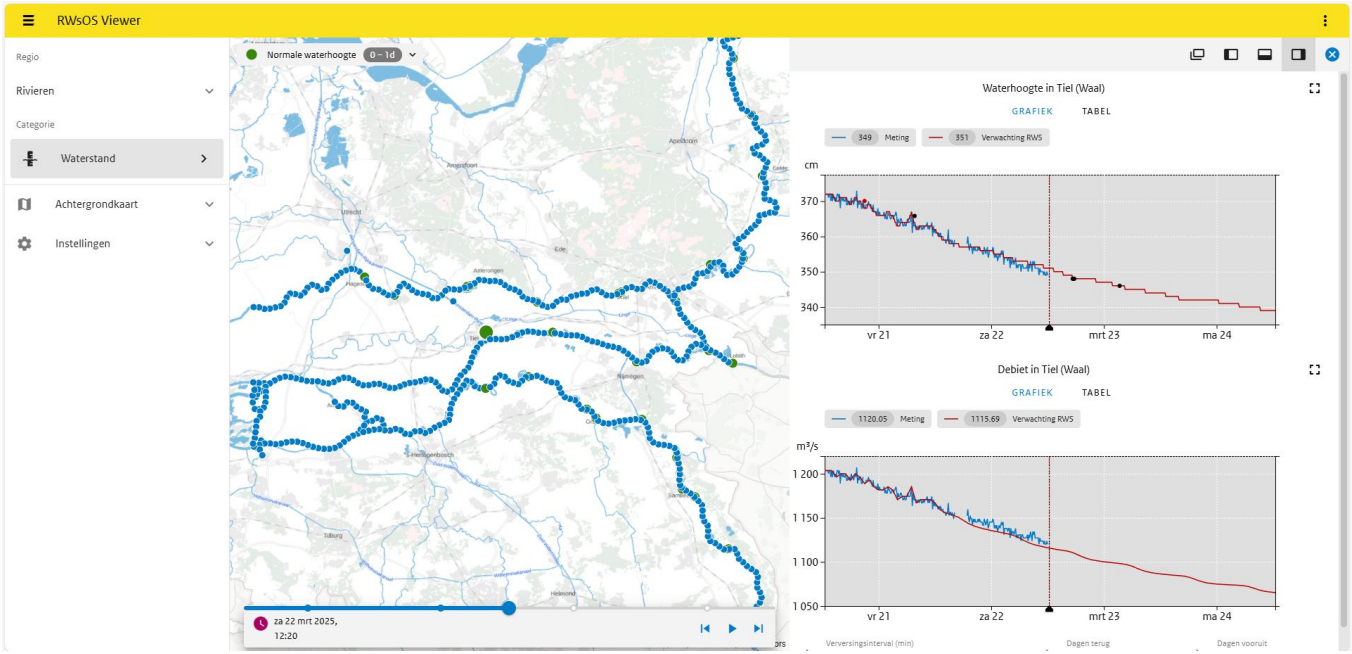
Budget:

- Development Budget: >10 MUSD
- Annual maintenance ~1 MUSD per year
- R&D budget ~1 MUSD per year
- Staffing > 10 FTE

Scope of Work:

- Multi-hazard forecasting: Floods / droughts / navigation / storm-surge
- Designed to integrate and communicate with regional water authorities
- Includes national operations center (WMCN)





Deltares

Next Steps

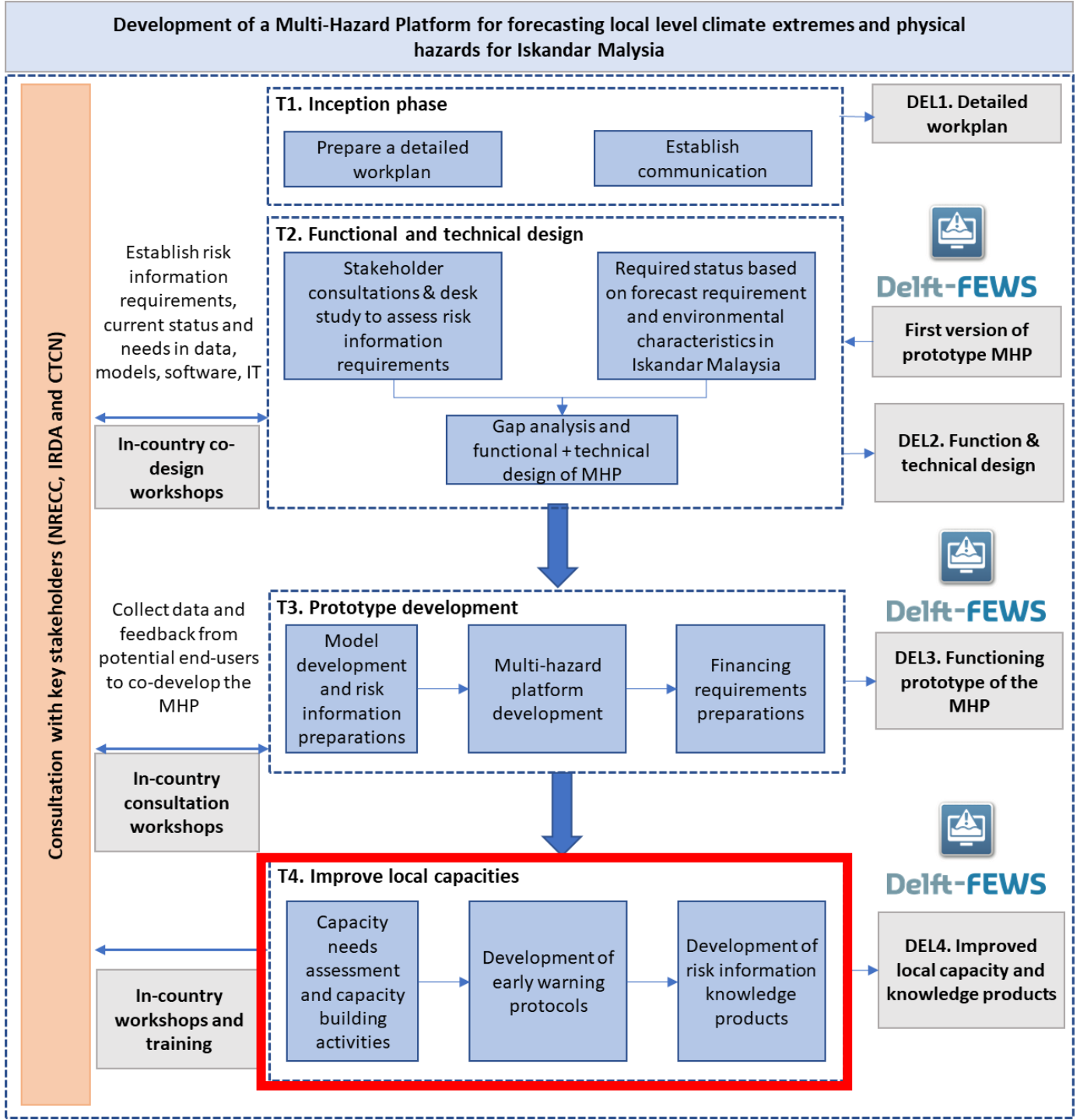
Next Phase

Now:

End of Phase 3 + start of phase 4

Next:

- Capacity needs assessment
- Development of Early Warning Protocol examples
- Develop knowledge product examples



Q&A Session

Session with Data Provider

Overview of Requested and Received Data (1)

Data	Data Provider	Acquisition Status	Serves As	Remark
Administration data				
Administration boundary	IRDA	Collected	Base map at Map Display and Spatial Data Display	-
Topographic data				
Bathymetry for Pulai and Johor River	NAHRIM	Collected	Used to refine flood model	Vertical reference need to be clarified
Digital Terrain Model	JUPEM	Collected	Used to build flood model	Vertical reference need to be clarified
Meteorological data				
Rainfall data (from rain gauge)	MetMalaysia	Collected	Input for flood model	1. Protocol to send data continously needs to be defined 2. More stations need to be added
Rainfall estimate from radar	MetMalaysia	Not yet collected	Input for flood model	1. Protocol to send data continously needs to be defined 2. Would be nice to have to fill the missing data from rain gauge
Rainfall estimate from satellite imagery	GPM+	Collected	Input for flood model	-
Forecast rainfall data	MetMalaysia	Collected	Input for flood model	Protocol to send data continously needs to be defined.
Forecast rainfall data	GFS+	Collected	Input for flood model	-
Temperature data	GFS+	Collected	Input for producing heat stress early warning	-

Overview of Requested and Received Data (2)

Data	Data Provider	Acquisition Status	Serves As	Remark
Hydrological data				
River basin boundary	JUPEM	Collected	Base map at Map Display and Spatial Data Display	-
Water level data	DID	Collected	Calibrating and validating flood model	Protocol to send data continously needs to be defined.
Discharge data	DID	Not available	Calibrating and validating hydrological model	1. Protocol to send data continously needs to be defined. 2. Would be nice to get the data to calibrate hydrological model
River networks	DID	Collected	Base map at Map Display and Spatial Data Display	-
Tidal data (measurement)	JUPEM	Collected, historical 1. Kukup (1986-2022) 2. Johor Bahru (1984-2014)	Boundary condition for running flood model	1. Protocol to send data continously needs to be defined. 2. Would be nice to get the data to calibrate flood model
Historical tidal data	GTSM+	Collected	Boundary condition for running flood model	-
Forecast tidal data	GTSM+	Collected	Boundary condition for running flood model	-
Flood maps	DID	Collected, hotspot flood map from 2000-2010	Base map at Map Display and Spatial Data Display	-
Sea level rise projection	NAHRIM	Collected	Showing which area is prone to flooding due to sea level rise	-

Overview of Requested and Received Data (3)

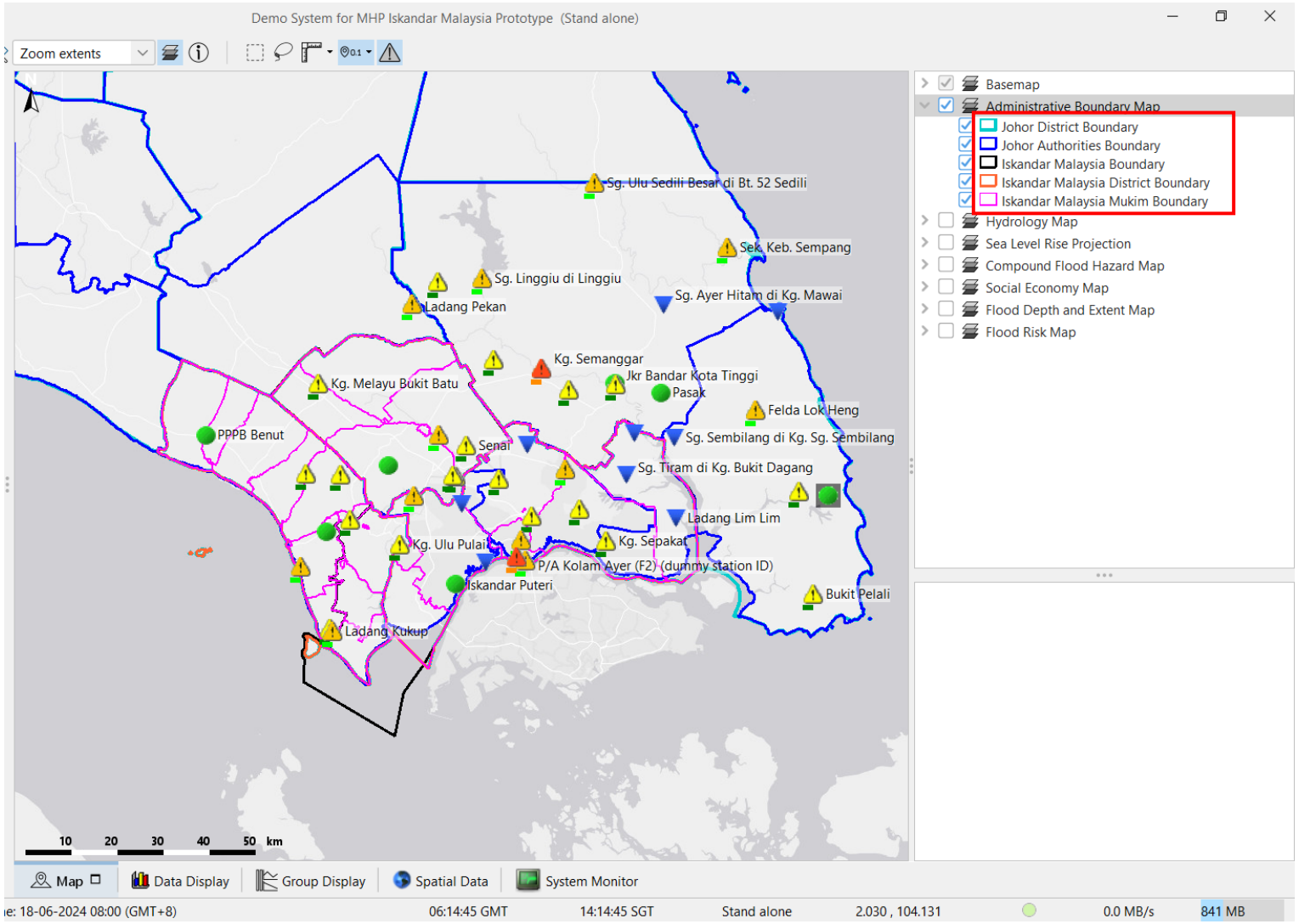
Data	Data Provider	Acquisition Status	Serves As	Remark
Exposure & building vulnerability data				
Building footprint	OSM+Open Buildings	Collected	Basic data for risk calculation	-
Building function	OSM	Collected. Support from local data will improve the risk assessment.	Determining building damage function	need further detail local data
Critical Infrastructure (Schools, Hospitals, etc)	Google Earth	Collected. Support from local data will improve the risk assessment.	Determining vulnerability	need further detail local data
Building damage function	JRC report (Huizinga, De Moel, & Szewczyk, 2017)	Collected. Support from local data will improve the risk assessment.	Determining building damage function	need further detail local data
Building valuation	Construction cost report for Malaysia 2022	Collected	Calculating damage and risk	-

Overview of Requested and Received Data (4)

Data	Data Provider	Acquisition Status	Serves As	Remark
Demographic & Socio-economic data				
Population distribution per village (mukim level)	DOSM	Collected for 2010 & 2020 (mukim level)	Basic data to estimate impacted population	further detail data per building will improve result
Number of households	DOSM	Collected for 2010 & 2020 (mukim level)	Basic data to estimate impacted household	further detail data per building will improve result
Gender distribution	DOSM	Collected for 2010 & 2020 (mukim level)	Determining vulnerability	further detail data per building will improve result
Age distribution	DOSM	Collected for 2010 & 2020 (mukim level)	Determining vulnerability	further detail data per building will improve result
Disabled people	DOSM	Not available	Determining vulnerability	data availability will help response team to plan
Income level	DOSM	Not available	Determining vulnerability	data availability will help to assess the equity risk
Poverty rate	DOSM	Collected for 2019 & 2022 (district level)	Determining vulnerability	further detail data will help to assess the equity risk
Gini Index	DOSM	Collected for 2019 & 2022 (district level)	Determining vulnerability	further detail data will help to assess the equity risk
Health status (aggregated per village)	DOSM	Not available	Determining vulnerability to health	data availability will help response team to plan

IRDA

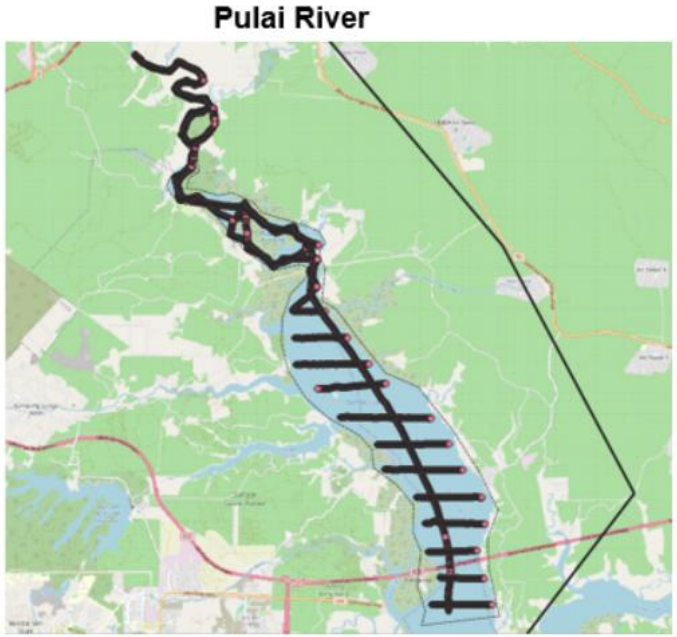
- Administration data is used as a base layer in MHP-IM that can be toggle on and off.



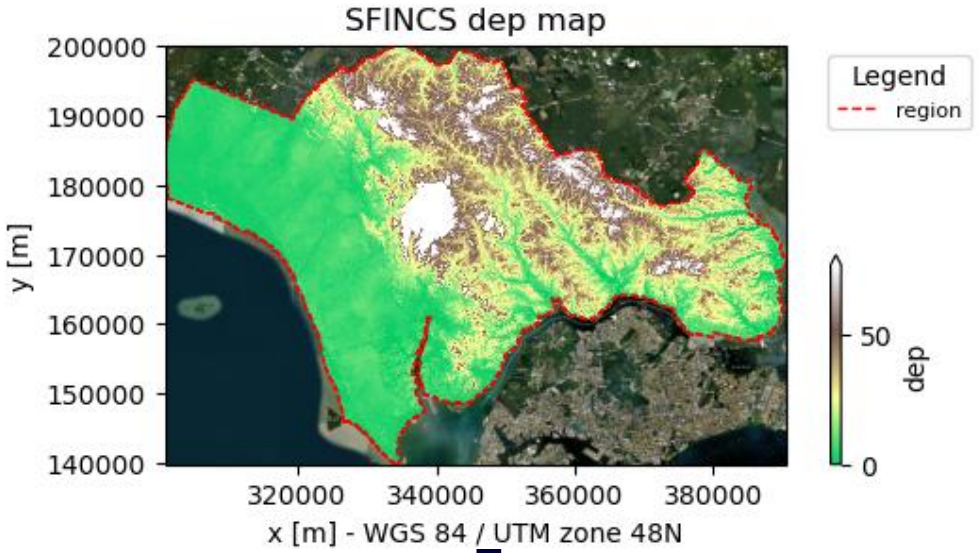
NAHRIM (1)

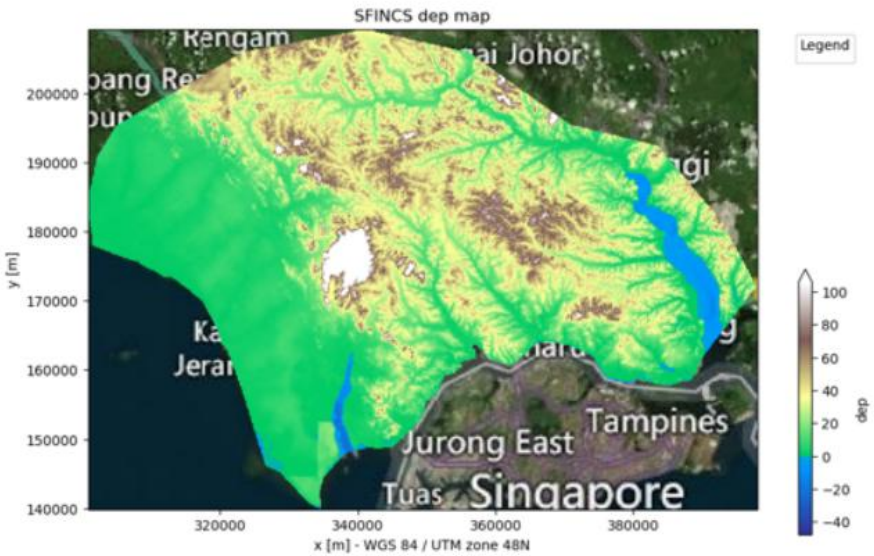
- Obtained bathymetry data for Pulai River (2022) and Johor River (2023).
- Used to refine bathymetry data for hydrodynamic modelling using SFINCS.

Spatial variation view of the geojson contain the depth values



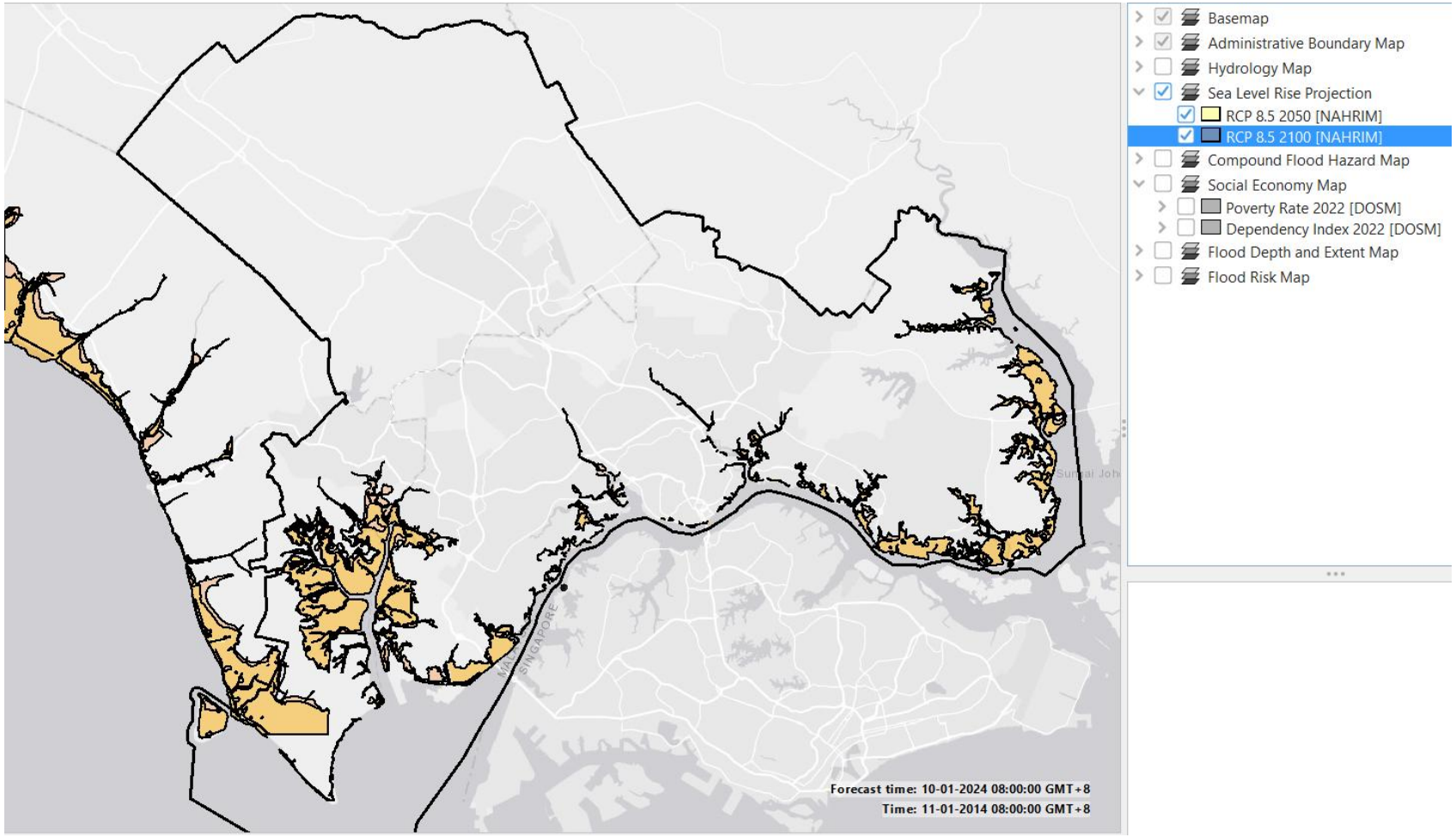
Spatial variation of the point shapefile that contain the depth values (z)





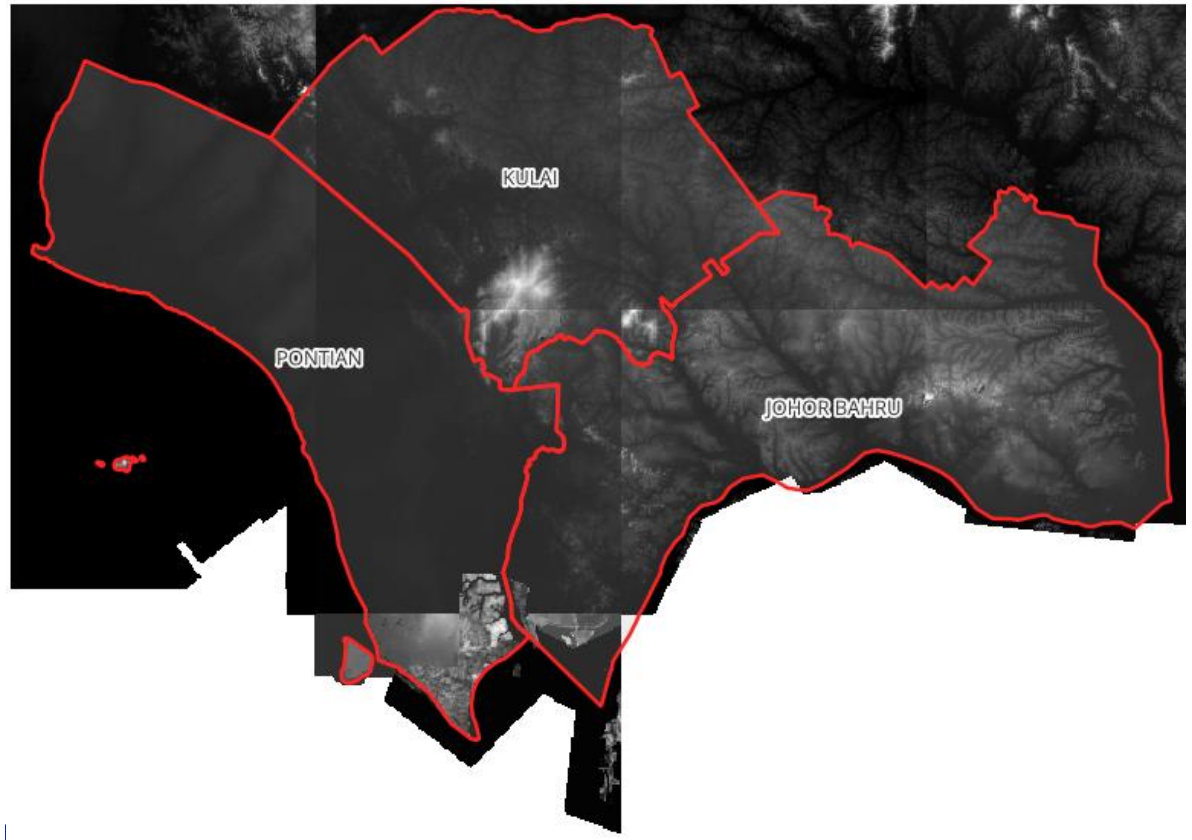
NAHRIM (2)

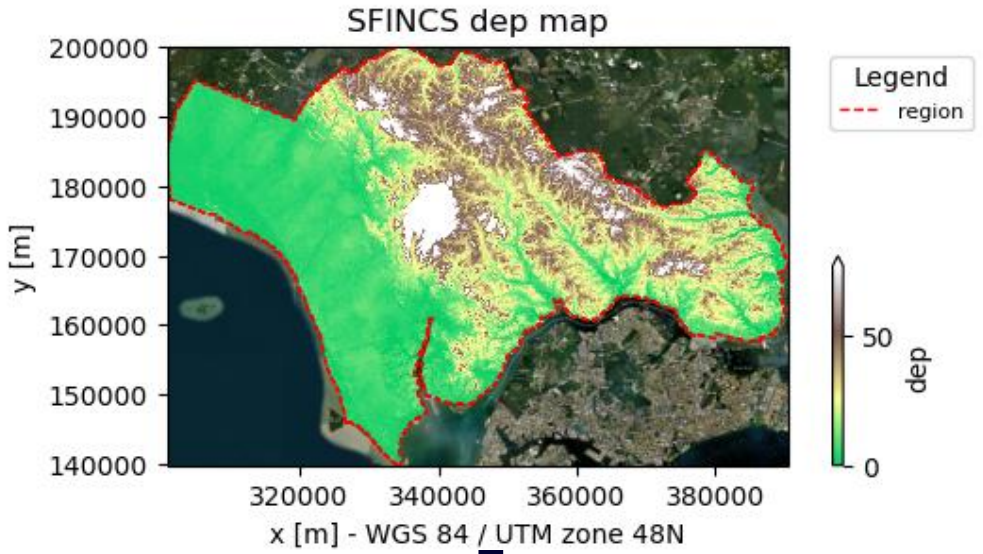
- Flood risk information:
  Sea level rise projection map

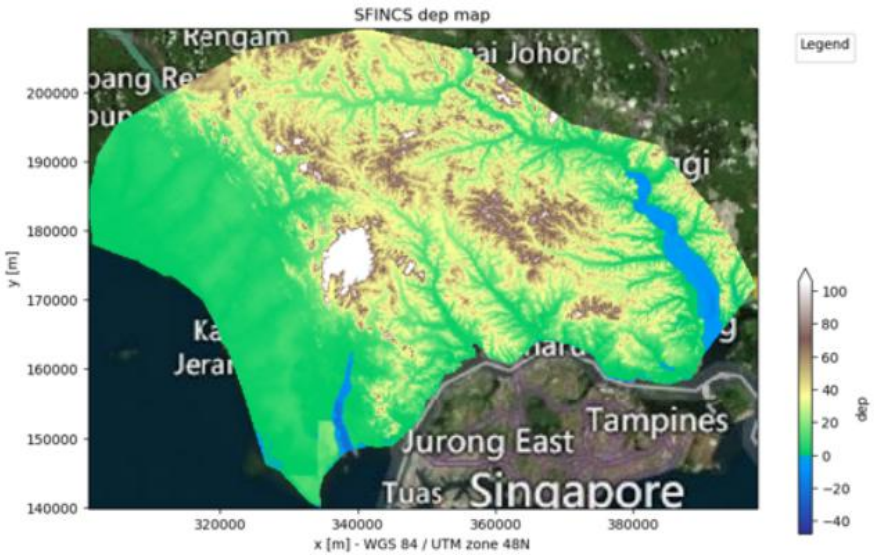


JUPEM (1)

- Obtained ~10x10 m elevation data covering whole Iskandar Malaysia.
- Used to build SFINCS model with cell size of 100x100m.

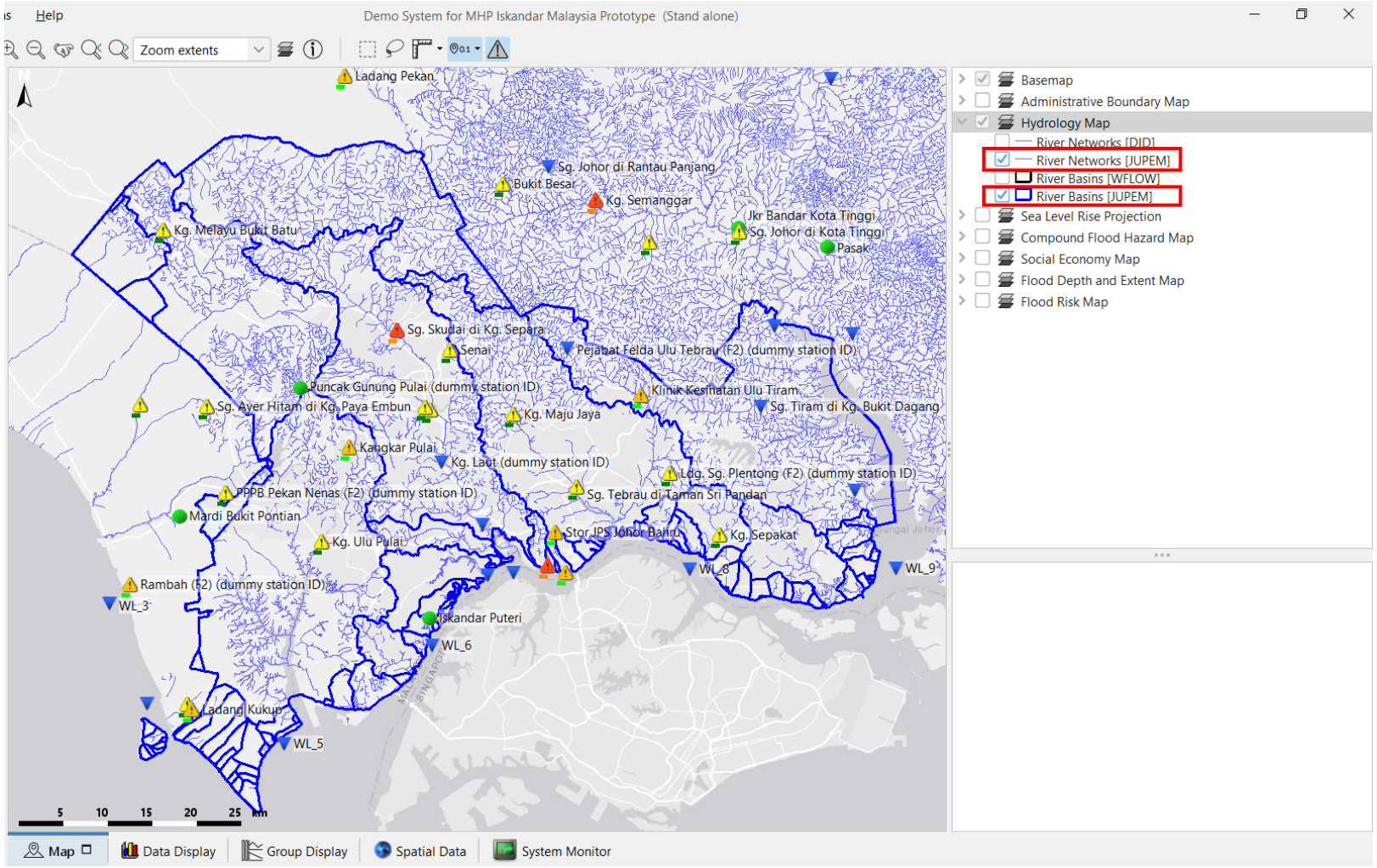






JUPEM (2)

- River network and river basin maps are added as a base map.

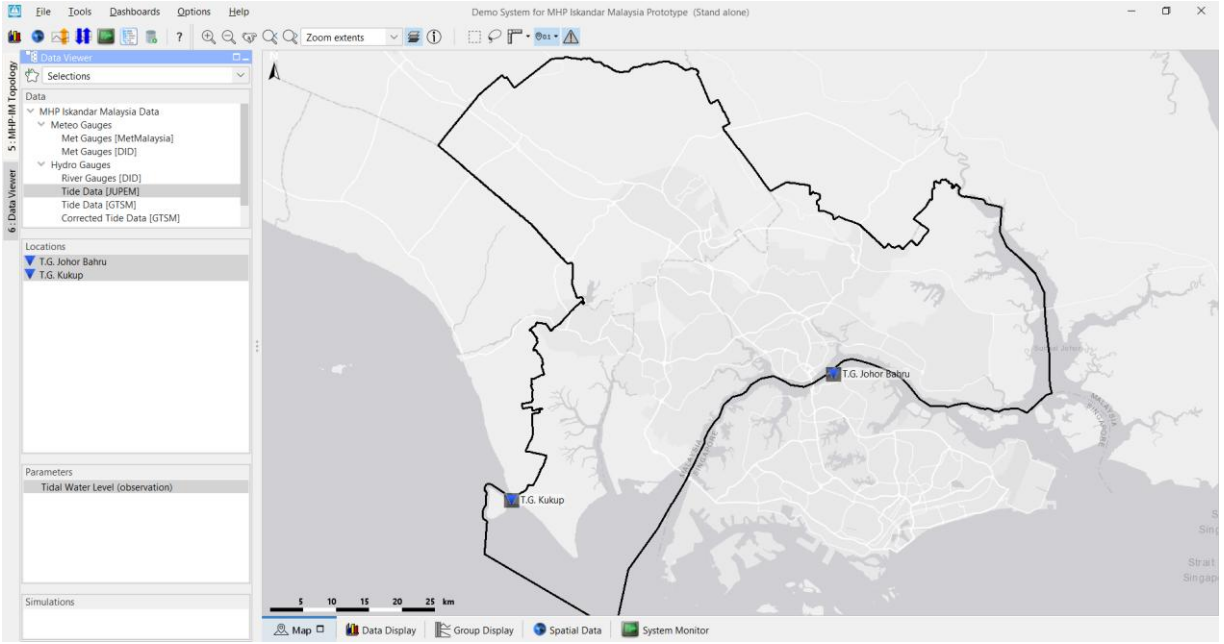


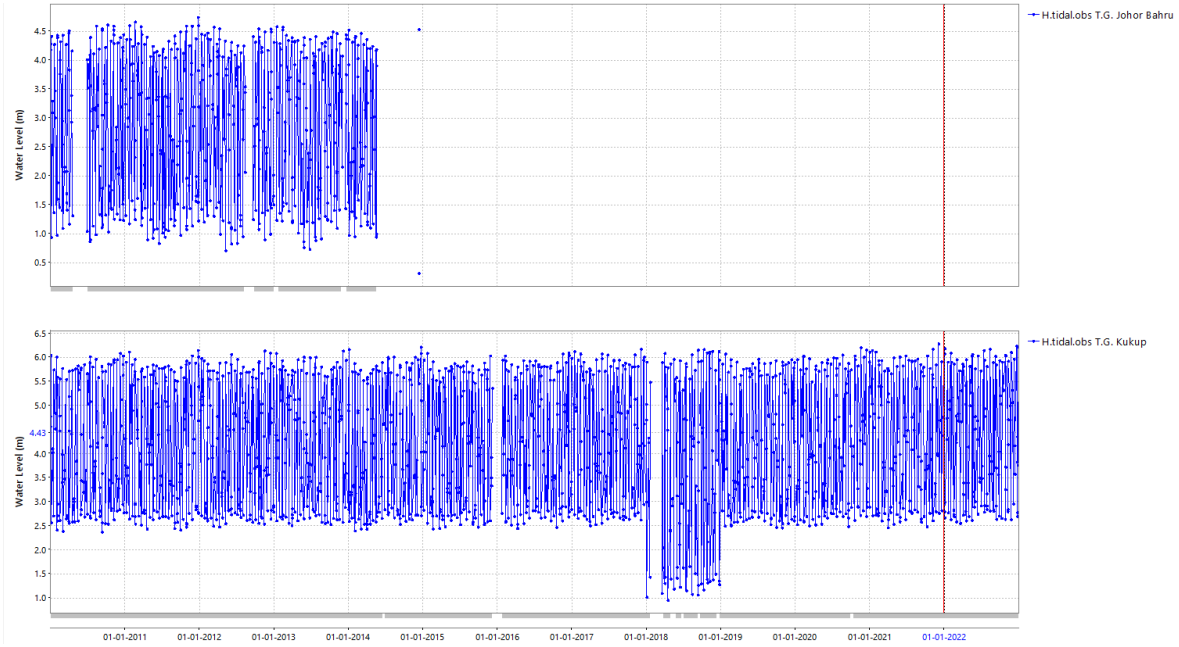
JUPEM (3)

- Providing hourly historical tidal water level information

1. Kukup (1986-2022)
2. Johor Bahru (1984-2014)

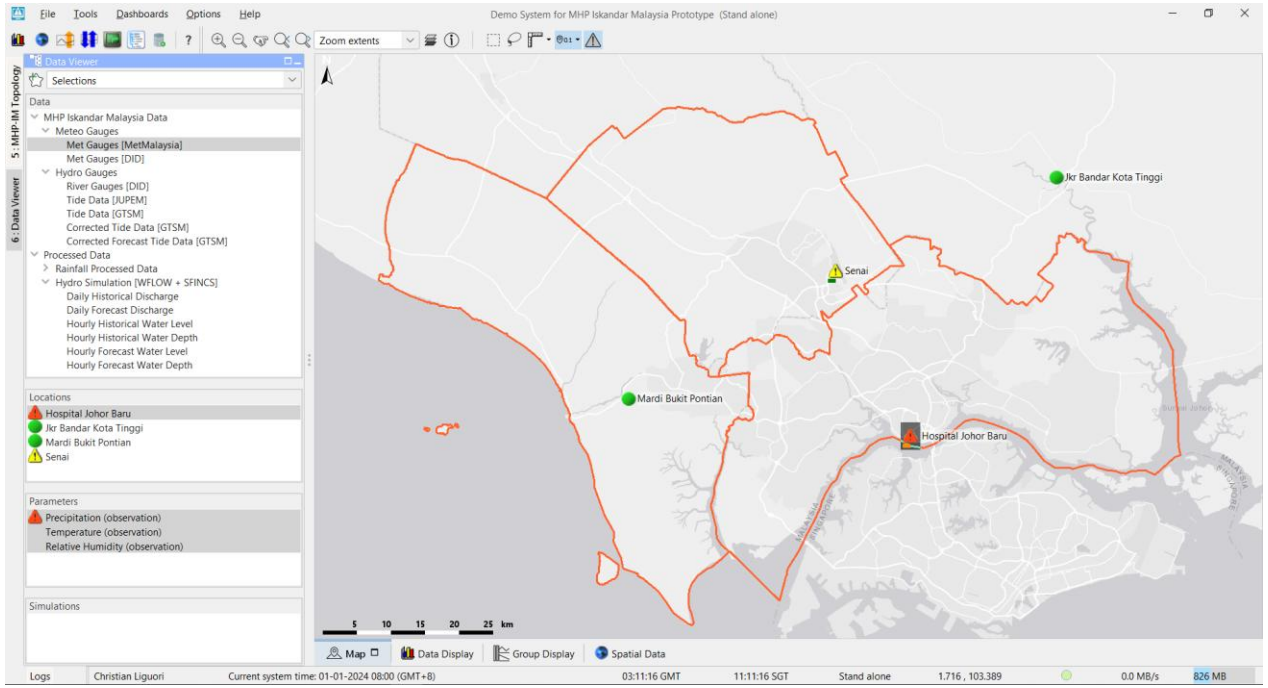
- This data is used to adjust global sea water level data provided from Global Tide and Surge Model (GTSM) that later be used as downstream boundary condition for flood modelling.

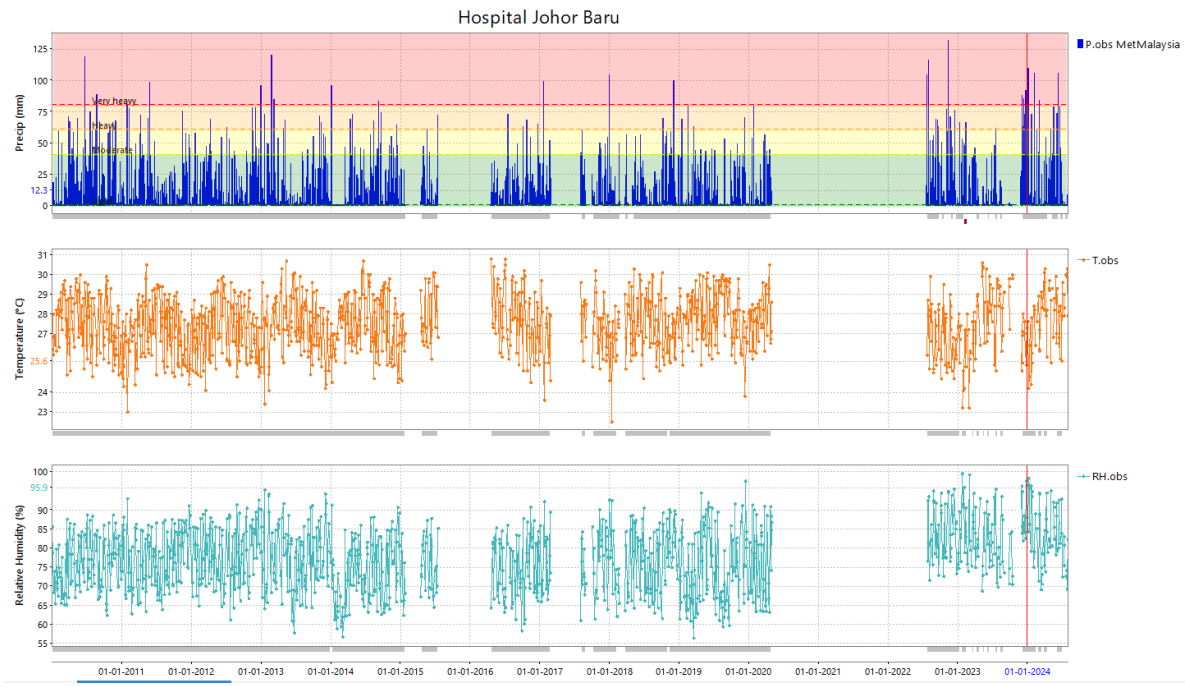




MetMalaysia (1)

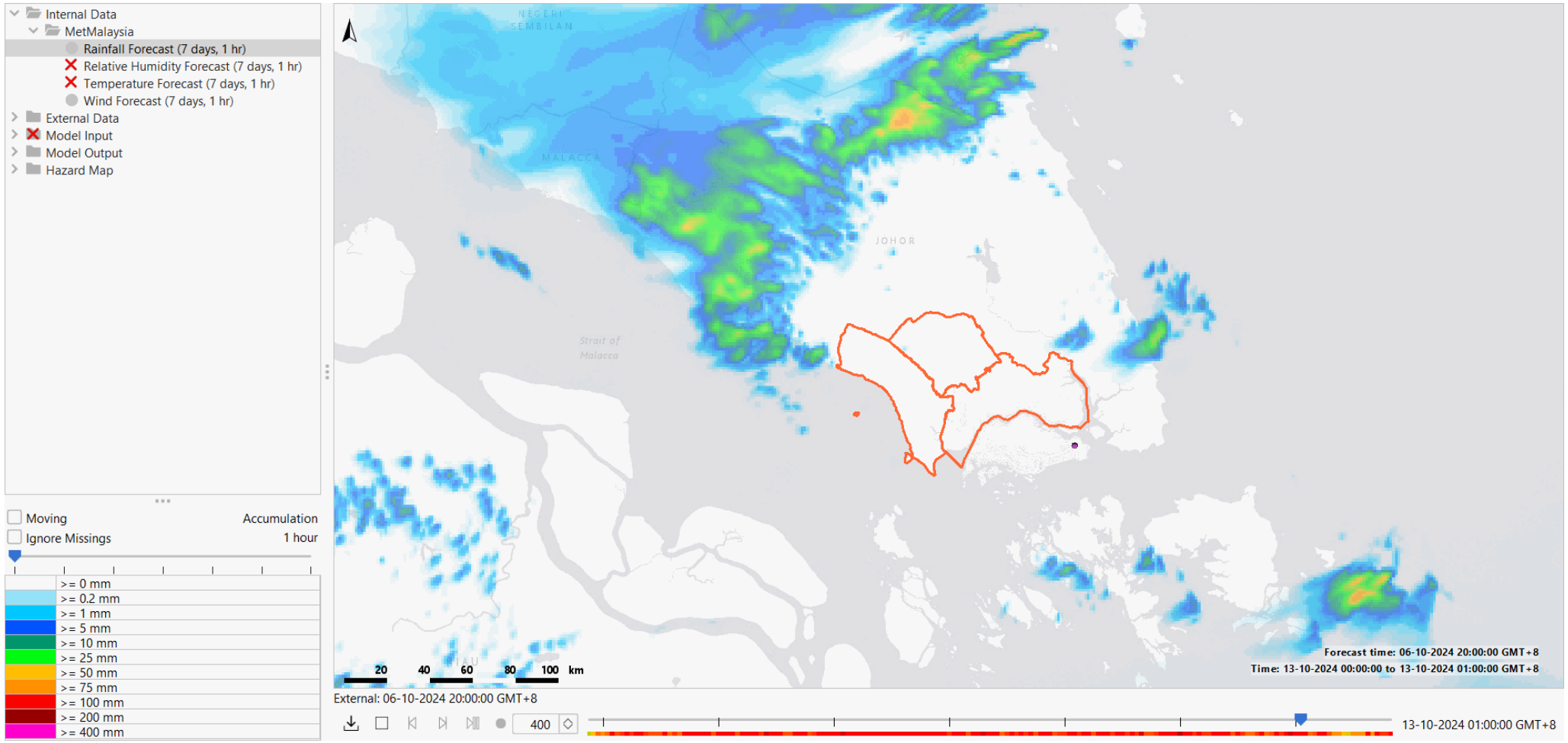
- Provides 4 meteo stations
- Daily data from : 2010 – 2024
- Used for:
  - Rainfall-runoff simulation using wflow model





MetMalaysia (2)

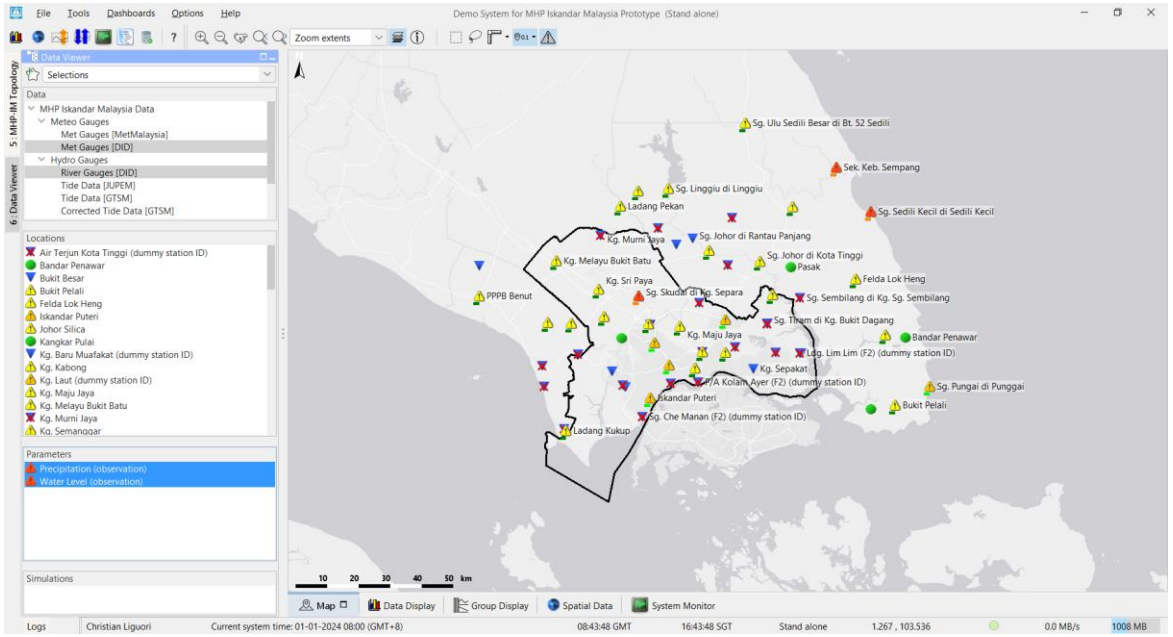
Meteo forecast for a 7-hour forecast horizon with an hourly timestep on 6 Oct 2024 20:00:00 GMT+8.

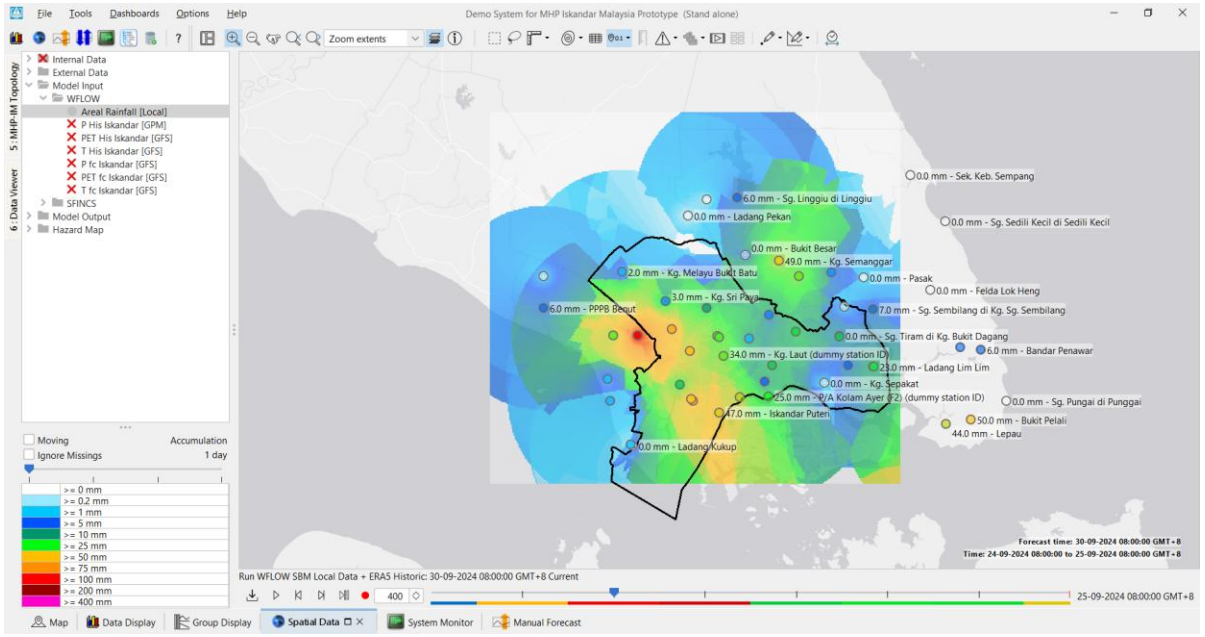


DID (1)

- Provides hourly data for 61 meteo stations and 26 hydro stations
- Meteo data: 2016 - 2024
  Hydro data: 2010 – 2024

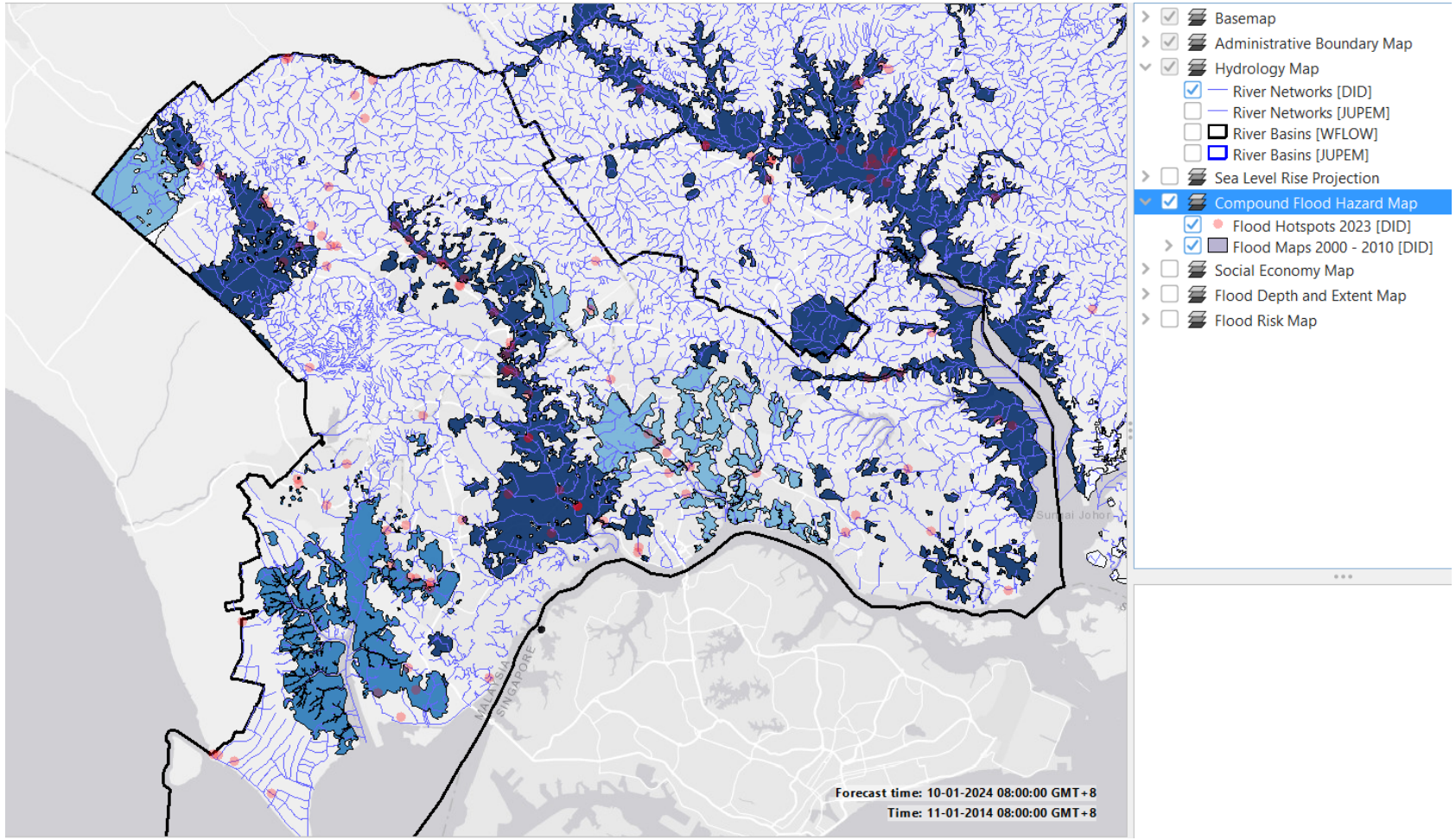
- Rainfall data from DID are used to translate rainfall into runoff that will be used as upstream boundary condition for flood modelling.





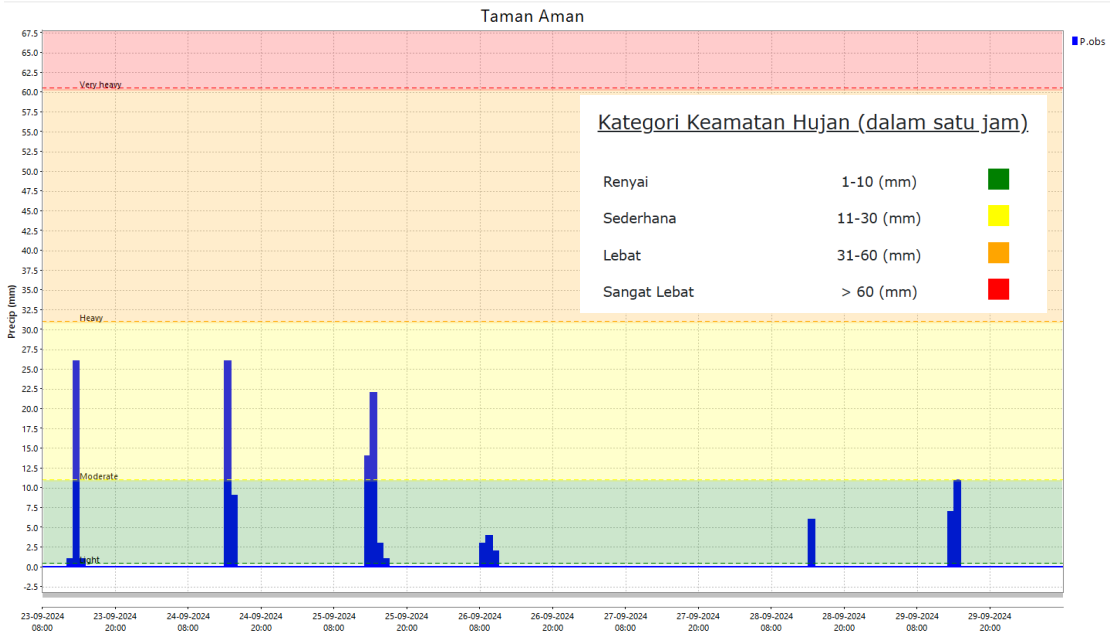
DID (2)

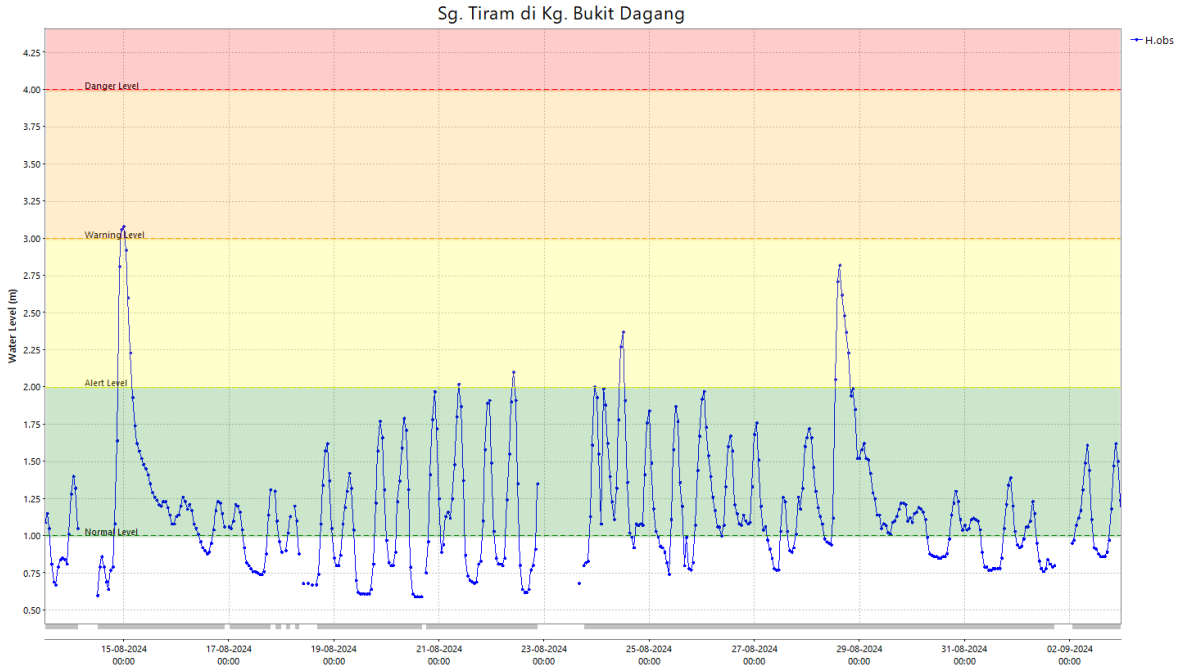
- River networks map
- Flood information: Hotspot flood maps from 2000-2010



DID (3)

- From Public Info Banjir website, we obtain water level and rainfall threshold for issuing warning.





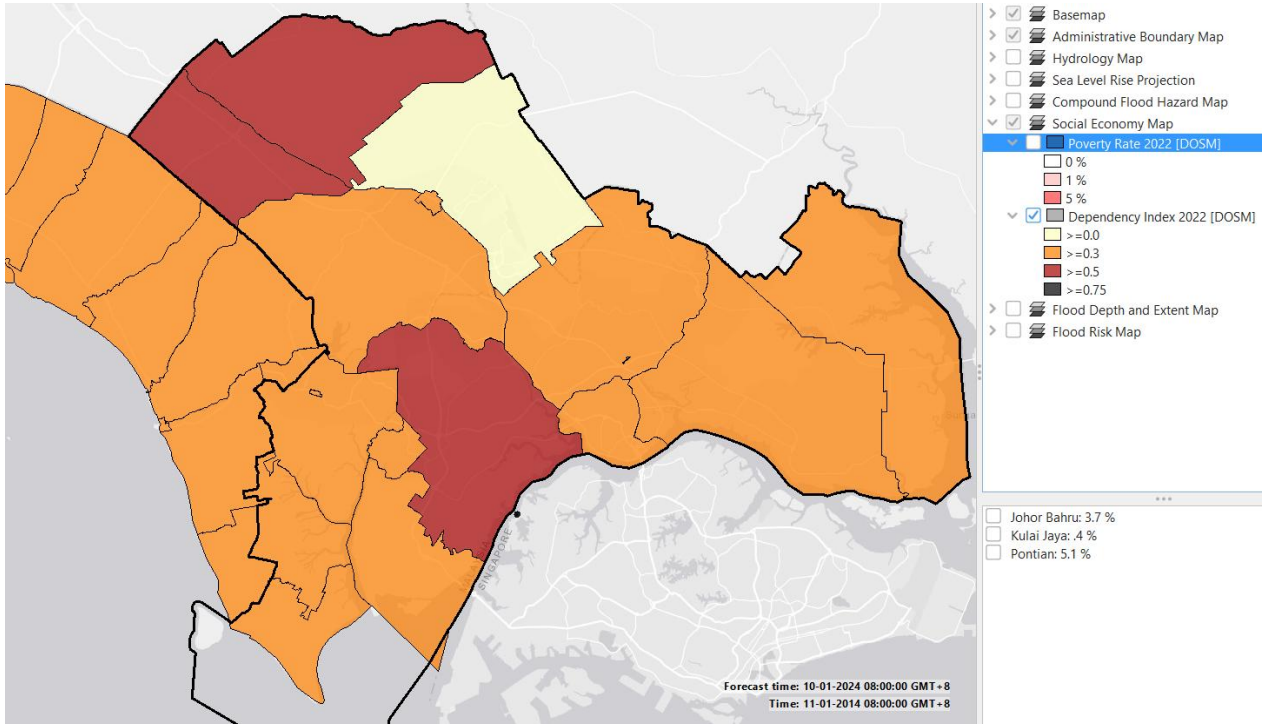
Data Aras Air

Utama / Aras Air / Data Aras Air

Negeri: Johor **Daerah:** Johor Bahru **Stesen:** All

Bil.	ID Stesen	Nama Stesen	Daerah	Lembangan	Sub Lembangan	Kemaskini Terakhir	Aras Air (m) (Graf)	Tahap Nilai Ambang			
								Normal	Waspada	Amaran	Bahaya
1	11111222	Sg. Tiram di Kg. Bukit Dagang	Johor Bahru	Sungai Johor	Sg. Tiram	17/04/2025 16:45:00	1.73	1.00	2.00	3.00	4.00
2	1536413	Sg. Skudai di Kg. Laut	Johor Bahru	Sungai Skudai	Sg. Skudai	17/04/2025 16:45:00	0.82	1.00	2.30	2.60	3.00
3	1537401	Sg. Tebrau di Kg. Maju Jaya	Johor Bahru	Sungai Tebrau	Sg. Tebrau	17/04/2025 17:00:00	5.38	7.90	8.20	8.80	9.40
4	1537402	Sg. Tebrau di Taman Sri Pandan	Johor Bahru	Sungai Tebrau	Sg. Tebrau	17/04/2025 17:00:00	-0.03	1.00	1.80	2.00	2.30
5	1538401	Sg. Plentong di Klinik Desa Plentong	Johor Bahru	Sungai Tebrau	Sg. Plentong	17/04/2025 17:00:00	0.57	1.00	3.00	3.50	4.00
6	7239550	Kolam Air di Nusa Duta	Johor Bahru	Sungai Danga	Sg. Danga	17/04/2025 16:45:00	0.86	3.00	4.00	5.00	6.00

DOSM (1)



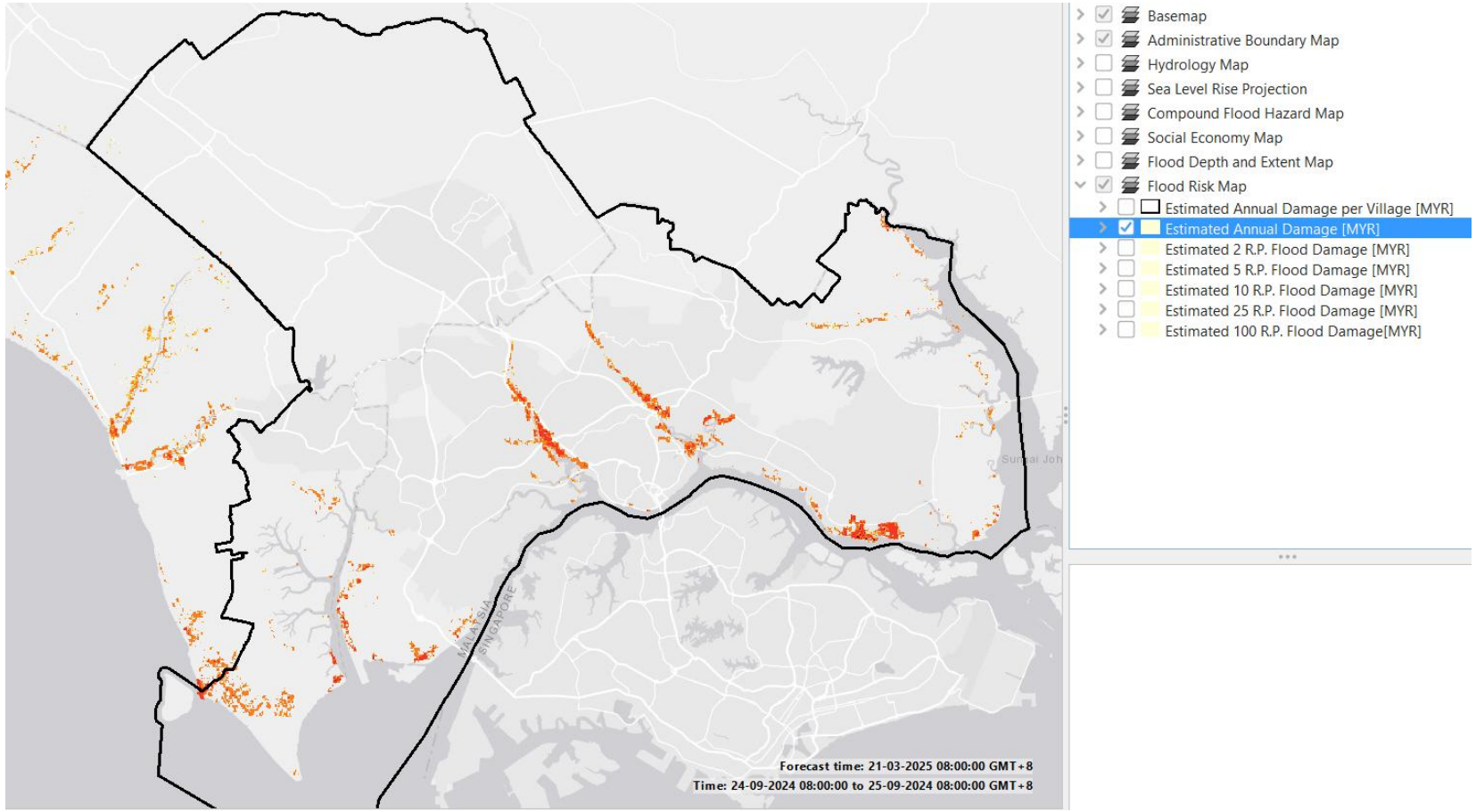
- Social economy map:
  - Poverty rate 2022
  - Dependency Index 2022

- The following maps are obtained and used to estimate flood impact:
  - Population distribution per village (2010 & 2020)
  - Number of house holds (2010 & 2020)

- The following maps are obtained and used to produce vulnerability map:
  - Gender distribution (2010 & 2020)
  - Age distribution (2010 & 2020)
  - Poverty rate (2019 & 2022) district
  - Gini Index (2019 & 2022) district

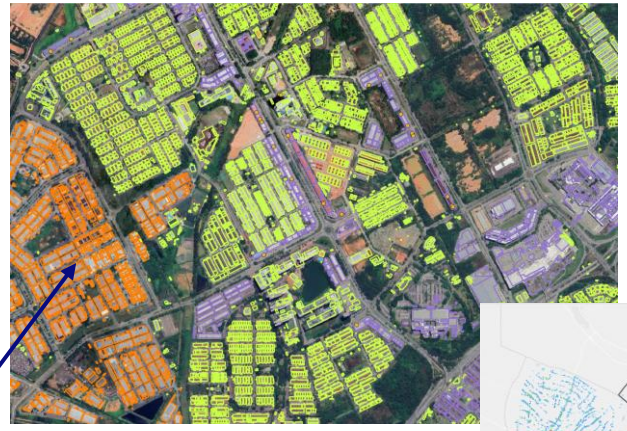
DOSM (2)

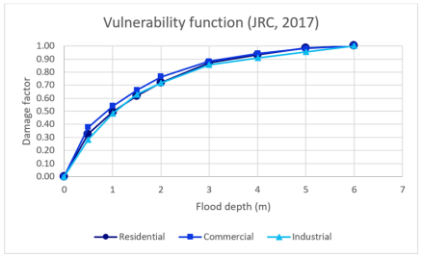
- All the maps obtained from DOSM, together with the flood maps produced by the flood model generate flood risk map and estimated flood damage under various return periods.

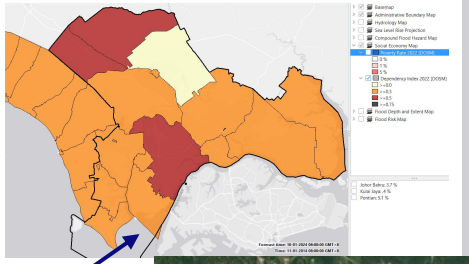


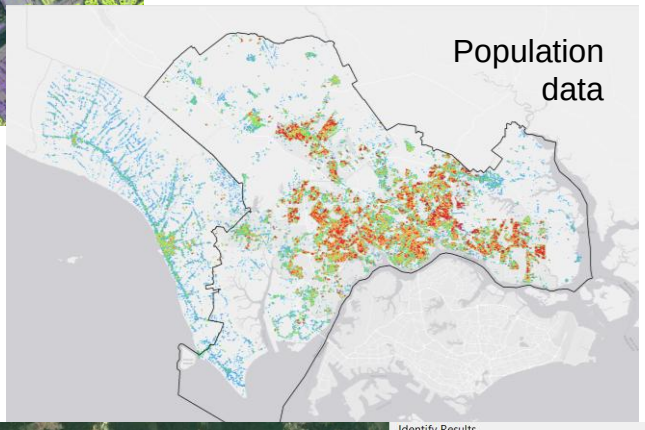
Socio-economic data usage

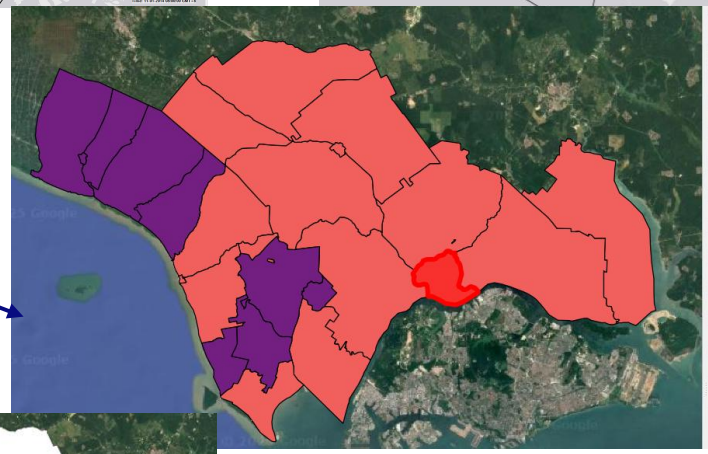
Building & vulnerability data	Source	Remark
Building footprint	OSM+Open Buildings	Collected
Building function	OSM	Collected. Support from local data will improve the risk assessment.
Critical Infrastructure (Schools, Hospitals, etc)	Google Earth	Collected. Support from local data will improve the risk assessment.
Building damage function	JRC report (Huizinga, De Moel, & Szewczyk, 2017)	Collected. Support from local data will improve the risk assessment.
Building valuation	Construction cost report for Malaysia 2022	Collected
Demographic & Socio-economic data		
Population distribution per village (mukim level)	DOSM	Collected for 2010 & 2020 (mukim level)
Number of households	DOSM	Collected for 2010 & 2020 (mukim level)
Gender distribution	DOSM	Collected for 2010 & 2020 (mukim level)
Age distribution	DOSM	Collected for 2010 & 2020 (mukim level)
Disabled people	DOSM	Not available
Income level	DOSM	Not available
Poverty rate	DOSM	Collected for 2019 & 2022 (district level)
Gini Index	DOSM	Collected for 2019 & 2022 (district level)
Health status (aggregated per village)	DOSM	Not available

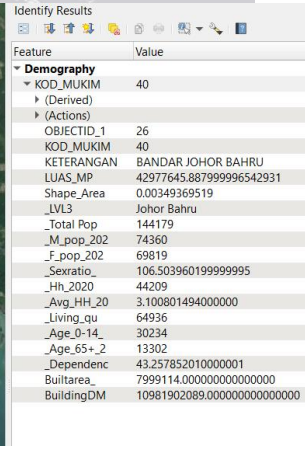












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