DEVELOPMENT OF A MULTI-HAZARD PLATFORM (MHP) FOR FORECASTING LOCAL LEVEL CLIMATE EXTREMES AND PHYSICAL HAZARDS FOR ISKANDAR MALAYSIA

Report for task 4.1 and 4.2

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1 ABBREVIATIONS

The lists of abbreviations are as below:

JPS	: Department of Irrigation and Drainage (Jabatan Pengairan dan Saliran)
MetMalaysia	: Malaysian Meteorological Department
MHP-IM	: Multi-Hazard Platform – Iskandar Malaysia
NADMA	: National Disaster Management Agency
PlanMalaysia	: Department of Town and Country Planning
PRABN JPS	:National Flood Forecasting and Warning Center, Department Irrigation and Drainage Malaysia

2 INTRODUCTION

The Multi-Hazard Platform – Iskandar Malaysia (MHP-IM) is designed to enhance disaster risk management and climate resilience through integrated data collection, analysis, and early warning systems. This Training Needs Assessment (TNA) evaluates the current human resource capacities of key organizations, including MetMalaysia, JPS, PlanMalaysia, and ICT Johor, to identify gaps in knowledge and skills and propose a comprehensive capacity-building plan. The assessment leverages survey data to ensure the MHP-IM can be effectively implemented, with a particular focus on gender-sensitive approaches to address disparities in technical roles.

This report provides a detailed analysis of organizational roles, technical expertise, and training needs, incorporating data from organizational and individual capacity surveys. It also emphasizes Activity 4.2, which focuses on building gender-sensitive institutional and technical capacities to support impact-based forecasting and early warning systems. Based on data collected from organizational surveys and individual staff capacity assessments, this report outlines the roles, technical expertise, and training needs required to operationalize the MHP-IM effectively.

The MHP-IM aims to:

1. Collect and exchange meteorological, hydrological, and seismological data for analysis, forecasting, and early warning.
2. Provide data and warnings to support various sectors.

3. Enhance understanding of regional weather, climate, and hydrological conditions.
4. Foster research and international cooperation.
5. Develop curricula to ensure a skilled workforce.

The Key roles needed to sustain the operation of the platform include IT Helpdesk Technician, Network and Computer Systems Administrator, Data Engineer, Equipment Maintenance Technician, Hydro-met Observer, Hydrologist, and Meteorologist.

3 APPROACH

Training Needs Assessment (TNA) Overview

The TNA is based on the following sources:

Survey Responses: Four sets of questionnaire surveys were distributed to gather data on organizational and technical expert capacities.

Organizational capacity was assessed using two sets of questionnaires:

(i) Capacity and Organizational Needs

(ii) Organization Division Capacity (Set Q1)

Technical capacity was evaluated using:

(i) All Divisions Staff's Capacities (excluding IT) (Set Q2)

(ii) IT Staff's Capacities (Set Q3)

MHP-IM Mission and Vision: The capacity needs assessment was aligned with the platform's objectives, which include the collection and analysis of meteorological and hydrological data for forecasting and early warning purposes.

Assessment Process

The assessment process involved the following steps:

(i) Collecting data from relevant staff and organizations.

(ii) Analyzing skill levels (Basic, Fair, Advanced) to identify gaps and propose appropriate training programs.

(iii) Identifying key tasks and job profiles required for the operation of the MHP-IM.

(iv) Drafting job descriptions, specifying the required knowledge and skills.

(v) Identifying the division and staff responsible for each relevant task.

(vi) Assessing current knowledge and skills of identified staff and determining existing gaps.

(vii) Recommending training programs for groups of staff, tailored by job role and proficiency level.

Targeted Respondents

The targeted institutions for the assessment included:

Department of Irrigation and Drainage – National Flood Forecasting and Warning Centre (JPS PRABN)

Department of Irrigation and Drainage Johor (JPS Johor)

MetMalaysia Headquarters

MetMalaysia Johor

PLANMalaysia Johor

Majlis Bandaraya Johor Bahru (MBJB)

Majlis Bandaraya Iskandar Puteri (MBIP)

Majlis Perbandaran Pasir Gudang (MPPG)

Majlis Perbandaran Kulai (MPKu)

Majlis Daerah Pontian (MDP)

Johor State Government – Management Division (SUK)

Johor State Government – Ministry of Housing and Local Government Division (SUK - KPKT)

Johor State Government – ICT Division (SUK - ICT Johor)

These organizations were identified based on their potential to host and manage the MHP-IM, as recommended during previous stakeholder engagement sessions. All were formally invited via email and phone to participate in the survey.

Organizations that Responded

A total of eight organizations responded to the survey, providing input via completed questionnaires and verbal interview sessions:

Department of Irrigation and Drainage (JPS PRABN)

Department of Irrigation and Drainage Johor (JPS Johor)

MetMalaysia Johor (on behalf of MetMalaysia HQ)

PLANMalaysia Johor

Majlis Bandaraya Johor Bahru (MBJB)

Majlis Bandaraya Pasir Gudang (MBPG)

Pejabat Daerah Johor Bahru

SUK Johor – ICT Division

Representatives from these organizations also assisted in distributing the survey questionnaires to selected staff members.

Survey Participation Summary

The total number of respondents was 32, distributed across the different questionnaire sets as follows:

Capacity and Organizational Needs Questionnaire: 7 respondents

Set Q(1): Organization Division Capacity: 5 respondents

Set Q(2): All Divisions Staff's Capacities (excluding IT): 18 respondents

Set Q(3): IT Staff's Capacities: 2 respondents

A detailed breakdown of the assessment results is provided in the next section of this report.

4 TASKS REQUIRED AND JOB DESCRIPTION

This section outlines the various profiles needed for the development and operation of the MHP to effectively accomplish its mission. The job descriptions correspond to the profiles needed and the detailed job descriptions are presented below. The following job profiles are critical for MHP-IM:

Job	Description
IT Helpdesk Technician	Assists in maintaining IT systems and supports staff with technical issues.
Network and Computer Systems Administrator	Manages LAN/WAN, servers, and system monitoring; ensures resource availability.
Data Engineer	Manages hydro-met data collection, storage, and dissemination; develops data tools.
Equipment Maintenance Technician	Ensures proper functioning of weather and hydrological stations.
Hydro-met Observer	Observes and communicates weather and hydrological data.
Hydrologist	Analyzes hydrological data, issues forecasts, and warnings.
Meteorologist	Analyzes meteorological data, provides forecasts, and issues warnings.

Detailed job descriptions are provided below.

Job	**Description**
IT helpdesk technician	The IT helpdesk technician assists the Network and Computer Systems Administrator to ensure the smooth daily running of all components of information systems. This includes operating and maintaining IT systems and infrastructure (software, hardware and network). He/she also supports other division staff with IT-related technical issues.
Network and Computer System Administrator	The Network and Computer System Administrator install, configure, maintain, update and upgrade local area network (LAN), wide area network (WAN), data communications network, operating systems, and physical and virtual servers. Perform system monitoring and verify the integrity and availability of hardware, network, and server resources and systems. Review system and application logs and verify completion of scheduled jobs, including system backups. Analyse network and server resource consumption and control user access. Install and upgrade software and maintain software licenses.

Data Engineer	The Data Engineer will ensure the continuity of collection, storage and archiving of hydro-met data, including observations, numerical models results, data from WMO/GTS and WMO/WIS channels. Apply programming skill for development of data extraction and manipulation tools/websites and new data products to support users' data needs. In charge of data sharing and dissemination.
Equipment maintenance technician	The Equipment maintenance technician oversees the proper functioning hydrological and weather stations.
Hydro-met Observer	The Hydro-met Observer is in charge of the data observation at weather and hydrological stations and its communication to the different divisions.
Meteorologist	The Meteorologist is in charge of observation data analysis and provides and disseminates weather forecasts and warnings pertinent to the area of forecast responsibility.
Hydrologist	The Hydrologist is in charge of hydrological data analysis, forecast, warning and dissemination.
Quality Manager	The Quality Manager is the lead auditor of the quality management system, he describes and assesses the procedures.

5 ASSESSMENT OF ORGANISATIONAL AND TECHNICAL CAPACITY

This section addresses the current capacities and needs of potential organisations to host and use the platform, as well as the capacity of their respective divisions.

5.1 ASSESSMENT OF ORGANISATIONAL NEEDS AND CAPACITIES FROM EACH ORGANISATION

Based on the responses from the questionnaire surveys (Figure 1), the following organisations were identified to be able to act as the primary user and pilot-host of the platform.

i. PlanMalaysia (Johor)

ii. Jabatan Pengairan Saliran (JPS PRABN)

PlanMalaysia (Johor) responded by suggesting that the platform may be integrated under the Urban Observatory Johor system, while one respondent from JPS PRABN suggested that

in order for the system to be implemented by JPS, the system should be aligned with the Integrated River Basin Management program run by JPS. While JPS Johor did not respond to be able to act as the host, but agreed to provide support particularly in terms of data.

DID provided information on their available systems and platforms for monitoring the risks of extreme weather and disasters, including:

Integrated Forecasting Operation System (IFOS)

National Flood Forecasting and Warning System (NAFFWS)

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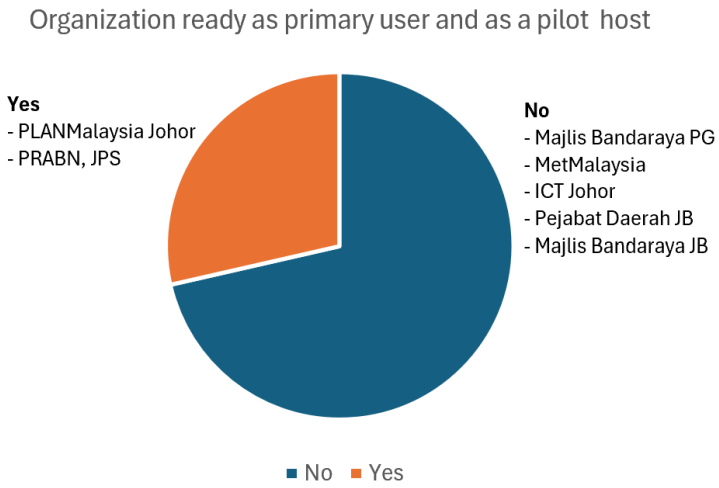


Figure 1: Feedback on the readiness of organisations as the main user and host

MetMalaysia has indicated its willingness to support the system by providing input on climate observation and forecast data. A government-to-government agreement should be initiated to facilitate this implementation. Several organizations expressed their support for the system and shared their expectations regarding the implementation and effectiveness of the MHP-IM platform. The feedback is presented in Table 1 below:

Table 1: Feedback on organizations' expectations of the MHP-IM platform

Organisation	What are your organisation's expectations regarding the implementation and effectiveness of the MHP-IM platform? *Apakah harapan organisasi anda terhadap pelaksanaan dan keberkesanan platform MHP-IM?*
MBPG	Dapat membantu agensi Kerajaan *(Can assist government agencies)*
MetMalaysia	Satu sistem amaran awal yg berkesan dan sampai kepada orang awam (*An effective early warning system that reaches the public*)

ICT Johor	Platform dapat membantu mengesan bencana dan mencadangkan tindakan yang perlu diambil segera berdasarkan analisa data (*The platform can help detect disasters and suggest immediate actions based on data analysis*)
PLANMalaysia Johor	Dapat membantu mengurangkan risiko dan impak kepada Masyarakat (*Can help reduce risks and impacts on the community*)
PRABN, JPS	Platform MHP-IM dapat membantu agensi pengurusan bencana membuat perancangan dan ambil tindakan segera (*The MHP-IM platform can assist disaster management agencies in planning and taking prompt action*)
Pejabat Daerah JB	diharap mampu meramal bencana lebih awal (*Hoped to be able to predict disasters earlier*)

A question was also posed regarding each organisation's role in disaster management or extreme climate risk in Iskandar Malaysia. The responses are illustrated in Figure 2. Three (3) organisations identified their role as being in policy and planning, another three (3) associated themselves with monitoring and forecasting, and one (1) identified their role in disaster operations management. The three organisations involved in monitoring and forecasting are MetMalaysia, JPS, and MBJB. MBJB is represented by its Johor Bahru Integrated Operations Control Centre (JBIOCC).

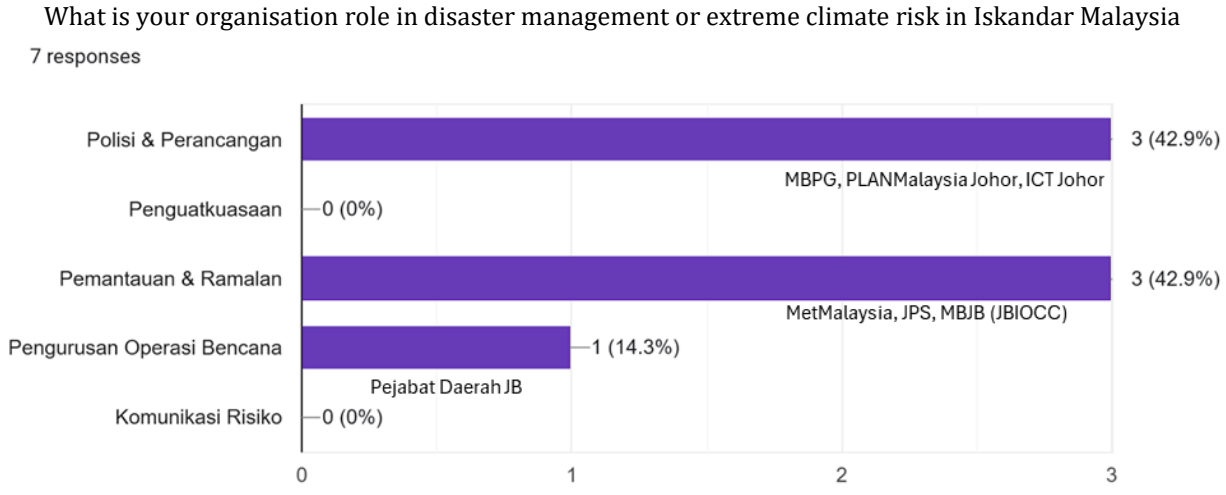


Figure 2: Feedback on organisation role in disaster and extreme climate risk management

A question on the organisation's specialised technical officers' availability was included in the questionnaire. The feedback is presented in Table 2. The table presents the involvement of several organisations across six key functional areas related to disaster and extreme climate risk management. Among the organisations, MetMalaysia stands out as the only agency involved in all six key functional areas. PRABN, JPS (both entries) are highly involved, particularly in technical and operational aspects such as GIS, early warning systems, and data analytics, though not in weather forecasting. However, most local authorities (e.g., MBPG, Pejabat Daerah JB) have limited roles, primarily in community communication, if any. ICT Johor and Pejabat Daerah JB currently play no active role in these specific disaster-related capacities while PLANMalaysia Johor appears to be involved only in spatial/GIS planning.

Table 2: Organisations' specialised technical officers' availability

Does your organization have specialized technical officers in the following areas?
Adakah organisasi anda mempunyai pegawai teknikal khusus dalam bidang berikut?

Organisation	Weather Forecast	Disaster Risk Management	Geographical Information System (GIS)	Early warning system	Community Risk communication	Data and analytic
MBPG	No	No	No	No	Yes	No

MetMalaysia	Yes	Yes	Yes	Yes	Yes	Yes
ICT Johor	No	No	No	No	No	No
PLANMalaysia Johor	No	No	Ya	No	No	No
PRABN, JPS (1)	No	Yes	Yes	Yes	Yes	Yes
Pejabat Daerah JB	No	No	No	No	No	No
PRABN, JPS (2)	No	No	Yes	Yes	Yes	Yes

A question regarding the organisations' training and capacity support needs was also included in the questionnaire. The feedback is presented in Table 3. Based on the responses, four out of six organisations are not currently using any systems or platforms for monitoring the risks of extreme climate events or physical disasters.

However, the responses also indicate that there are several systems or platforms available for such monitoring, including the following:

Johor Urban Observatory

Integrated Forecasting Operation System (IFOS)

National Flood Forecasting and Warning System (NAFFWS)

Table 3:Organisations' training or capacity support needs

Organisation	What type of training or capacity support does your organization need to support the implementation and use of MHP-IM? *Apakah jenis latihan atau sokongan kapasiti yang diperlukan oleh organisasi anda bagi menyokong pelaksanaan dan penggunaan MHP-IM?*
MBPG	Simulasi pengurusan bencana

MetMalaysia	Latihan teknikal mengenai penggunaan platform MHP, Analisis dan tafsiran data risiko iklim, Simulasi pengurusan bencana, Penilaian impak iklim setempat
ICT Johor	Penilaian impak iklim setempat
PLANMalaysia Johor	Latihan teknikal mengenai penggunaan platform MHP, Analisis dan tafsiran data risiko iklim, Komunikasi risiko kepada masyarakat, Simulasi pengurusan bencana, Penilaian impak iklim setempat, Latihan train-the-trainer (melatih jurulatih dalaman)
PRABN, JPS (respondent 1)	Latihan teknikal mengenai penggunaan platform MHP, Analisis dan tafsiran data risiko iklim, Penilaian impak iklim setempat
Pejabat Daerah JB	Latihan teknikal mengenai penggunaan platform MHP, Komunikasi risiko kepada masyarakat, Simulasi pengurusan bencana, Penilaian impak iklim setempat
PRABN, JPS (respondent 2)	Latihan teknikal mengenai penggunaan platform MHP, Analisis dan tafsiran data risiko iklim, Penilaian impak iklim setempat

5.2 ASSESSMENT OF ORGANISATIONS DIVISIONS' CAPACITY

An assessment of the organisations' divisional capacities is presented in this section. The assessment involved:

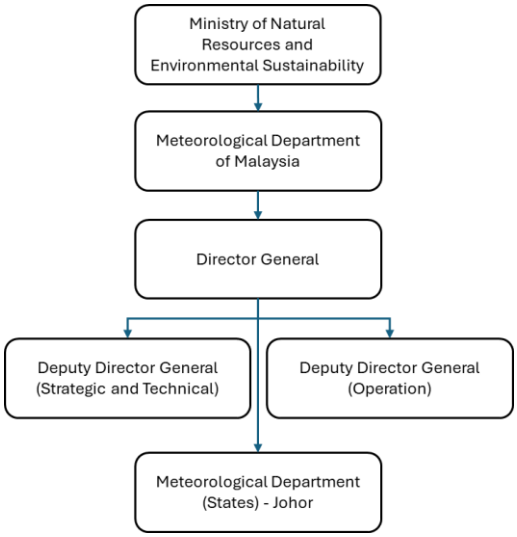
i. Identifying the division within each organisation associated with the MHP-IM

ii. Identifying the number of staff within the identified division

For this specific questionnaire, Set Q(1): Organisation Division Capacity, only five (5) organisations responded. The organisations structures are shown in Figure3 and their responses are listed in Table 4. BNased on Table 4, JPS PRABN is the most well-equipped agency in terms of both division specialization and staff numbers. MetMalaysia Johor on the other hand is strong in meteorological and observational capacity but lacks dedicated divisions for forecasting and hydrology at the state level. JPS Johor has moderate capacity in hydrology and disaster-related roles while, PLANMalaysia Johor and ICT Johor have limited relevant technical human resources. This shows that there is a clear need to enhance cross-agency coordination and fill capacity gaps, especially in forecasting and hydrology divisions.

Organisation structure

Meteorological Department of Malaysia



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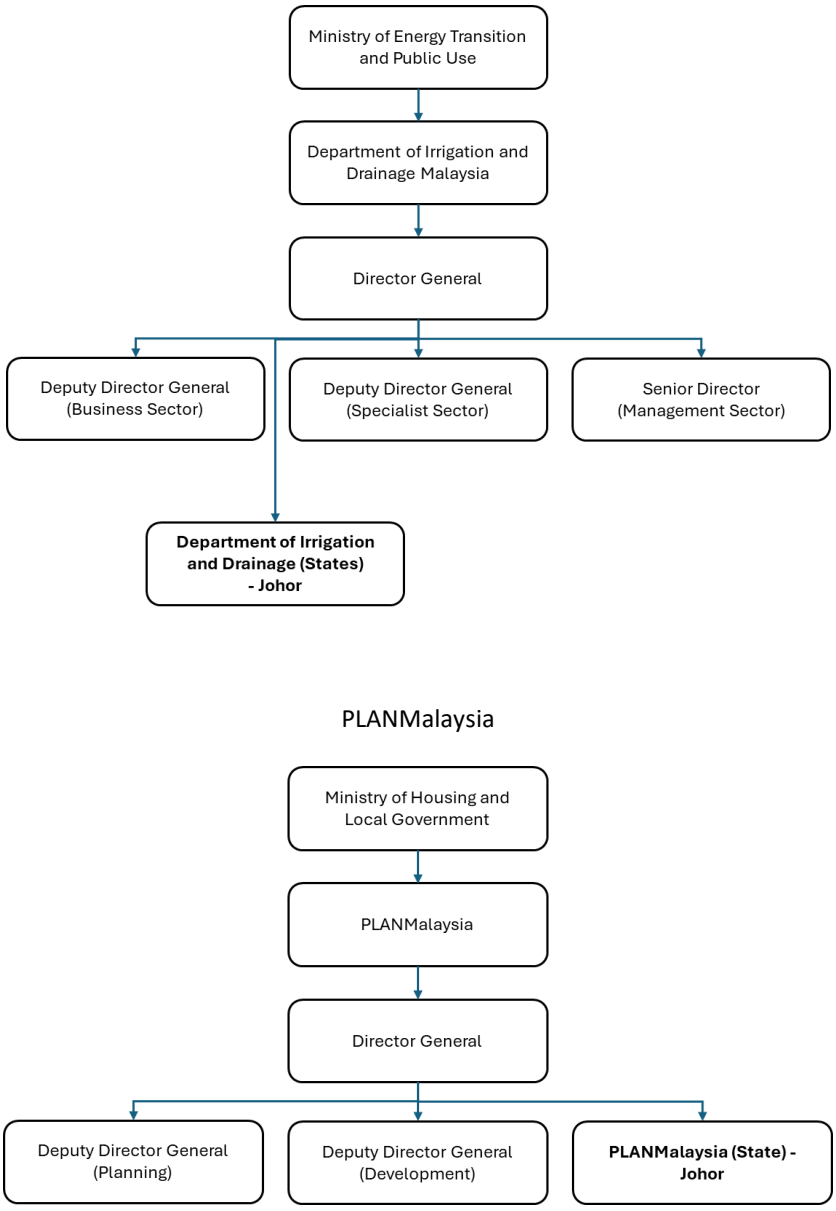
Department of Irrigation and Drainage Malaysia



Figures 3: The organizational structure of METMalaysia, DID and PLANMalaysia

Table 4: Organisations division capacity

Organisation	Meteorology Division	Weather Forecasting & Early Warning Division (or Similar)	Hydrology Division (or Similar)	Other Division (e.g. Disaster Division or similar division which relates to disaster hazard)
METMalaysia Johor	29 (All staff)	0	0	weather observation - 23 staff
ICT@johor	0	0	0	0
PLANMalaysia Johor	0	0	0	Johor Urban Observatory - 4 staff
JPS Johor	0	0	3	3
JPS PRABN	0		Data management and project management section - 20 staff. Flood forecasting and warning section - 30 staff	Instrument, communication and maintenance section - 15 staff

5.3 ASSESSMENT ON ALL DIVISIONS STAFF CAPACITIES

Questionnaires tailored to job descriptions in relation to meteorology, hydrology, disaster management, and IT divisions were distributed to staff as part of Questionnaire Set (Q2) and Set (Q3). According to the divisions identified in the Set (Q1) questionnaire on Organisation Division Capacity, only a few organisations proceeded to Set (Q2) and Set (Q3) for further data collections on staff capacities on each identified division. This is because only the divisions with expertise in operating the MHP-IM responded. The organisations that proceeded to respond to Set Q2 and Set Q3 are as follows:

1. Malaysian Meteorology Department (METMalaysia Johor)
2. Department of Irrigation and Drainage Malaysia (JPS Johor)
3. Department of Irrigation and Drainage Malaysia (JPS PRABN)
4. PlanMalaysia

5. ICT Johor

The skill levels are categorized as:

Basic: Limited knowledge requires introductory training.
Fair: Moderate knowledge needs consolidation and improvement.
Advance: High proficiency requires minimal or advanced training.

This section evaluates the division-level roles of participating organizations in supporting the MHP-IM. Based on the survey data collected from the five organizations (Table 5), capacities were assessed based on division responsibilities in meteorology, hydrology, disaster management, and related divisions. Not all but a representative of each division staff has responded to the questionnaire.

Table 5: Division responsibilities in meteorology, hydrology, disaster management, and other related functions.

Organization	METMalaysia Johor	ICT Johor	PlanMalaysia Johor	JPS Johor	JPS PRABN
Meteorology	All	0	0	0	0
Weather Forecasting & Early Warning Division (or Similar)	MetMalaysia HQ on weather forecasting	0	0	0	Flood forecasting section (30 staff)
Hydrology	0	0	0	Hydrology section (3 staff)	0
Other Division	Weather Observation (23 staff)	0	Johor Urban Observatory (4 staff)	Flood Management (3 staff)	Data management and project management section (20 staff) Instrument, communication

					and maintenance section (15 staff)
Total Staff responded in survey Q(2) and Q(3) (representative)	10	1	2	1	6

From Table 5 it is evident that:

a. JPS holds the most significant capacity in hydrology, with both technical and disaster management functions.
b. MetMalaysia leads meteorological observation but has limited personnel.
c. ICT Johor and PlanMalaysia play administrative or planning roles with limited technical expertise in hazard management.
d. Fragmentation across roles and uneven expertise presents coordination challenges for implementing the MHP-IM.
e. PlanMalaysia has an existing platform- the Johor Urban Observatory which may be a potential for the MHP-IM. However there are needs of additional capacities which are explained further in this report.

In terms of general capacity, MetMalaysia demonstrates a strong focus on monitoring and forecasting, with all respondents reporting expertise in meteorology and early warning systems. JPS shows significant hydrological expertise, with three staff members involved in hydrology and disaster management roles. PLANMalaysia is primarily focused on policy and planning, with limited direct involvement in disaster management. ICT Johor appears to serve mainly administrative functions, with no direct role in disaster management.

An analysis of the organisations' knowledge levels (Table 6) shows that more than 66.7% reported moderate knowledge of climate change and disaster forecasting. MetMalaysia and JPS were the only two organisations that rated their knowledge as "High." Staff experience ranges from 3 to 29 years, with senior personnel—such as those from JPS (average of 17 years)—demonstrating advanced skills.

Table 6: Responses on knowledge of climate change and disaster forecasting

Organisation	Knowledge of climate change and disaster forecasting
MBPG	Moderate
MetMalaysia	High
ICT Johor	Moderate
PLANMalaysia Johor	Moderate
PRABN, JPS (respondent 1)	High
Pejabat Daerah JB	Moderate
PRABN, JPS (respondent 2)	High

Questions related to challenges faced by organisations in terms of staff capacity and knowledge revealed the following issues:

a. Frequent staff rotations disrupt continuity of expertise (e.g., JPS identified job rotation as a barrier to sustaining technical knowledge).

b. Lack of interdepartmental coordination hinders effective collaboration (e.g., MBPG highlighted coordination challenges between departments).

c. Limited staffing resources constrain the ability to adopt and manage new platforms (e.g., MetMalaysia cited insufficient staffing as a limitation).

Based on the responses, several key training needs were identified across the participating organisations:

Local climate impact assessment – 83.3%

Technical training on the use of the MHP-IM platform – 66.7%

Disaster management simulation – 66.7%

Analysis and interpretation of climate risk data – 50%

Communication of risks to the community – 33.3%

Train-the-trainer programs to build internal training capacity – 16.7%

Training on local climate impact assessment, technical use of the MHP-IM platform, and risk communication were the most frequently cited needs (e.g., 4 out of 6 organisations requested these).

Preferred training modes included:

Face-to-face sessions (5 organisations)

Online synchronous training (2 organisations)

Blended learning approaches (2 organisations)

These preferences indicate a strong inclination towards interactive and practical learning formats, particularly for technical and community-focused topics.

Staff Capacities (Non-IT)

Individual-level data collected from 19 non-IT staff (Table 7) provided detailed insights into the job-specific experience and skill levels. Respondents were grouped by their role, and their self-assessed expertise levels were classified as Basic, Fair, or Advanced.

Table 7: Demographic composition of interviewees.

ITEMS		Number of Staff
Gender	Male	13
	Female	6
Age	29 -30 years old	2
	31-35 years old	5
	36-40 years old	2
	41-45	7
	46-50	1
	50-55	1

Education Level	Secondary School Education	2
	STPM/ Matriculation/ Vocational Training/ Certifications	1
	Diploma	8
	Bachelor's Degree	6
	Master's Degree	2
Years of Experience	3–4 years	7
	5–10 years	3
	11-15 years	1
	16–20 years	6
	21-30 years	2

Table 7 shows the demographic composition of the interviewees. The data represents a total of 19 staff members, with breakdowns across gender, age, education level, and years of experience. The workforce among the respondents is male-dominated, with two times more males than females. Most respondents are between 31 and 45 years old (75% of the total), indicating a relatively experienced and mid-career workforce. The majority of staff (73%) hold a Diploma and Bachelor's Degree, with only 2 staff having university-level qualifications of Master's. This suggests a workforce that is mostly technical or vocationally trained and academically oriented. Half of the respondents are relatively early and mid in their careers, with 3–10 years of experience. However, there is also a significant portion (42%) with over 10 years of experience, showing a good balance between junior and senior staff respondents.

The respondents (19 non-IT staff) were primarily from MET Malaysia, ICT Johor, PLANMalaysia Johor, DID Johor, and DID PRABN. They represented various divisions within their respective organisations, as shown in Table 8.

METMalaysia

Staff from MET Malaysia Johor reported consistent "Fair" expertise in the use of instruments for testing, maintenance, repair, inspection, and calibration, with 16–20 years of experience. Meanwhile, staff from the Meteorology Division demonstrated expertise in Quality Control, Analysis, Forecasting, Weather Alerts, and End-User Production, as illustrated in Figure 4. Their experience ranged from 4 to 23 years and reflected a mix of advanced and fair levels of expertise. There is a consistent intermediate (Fair) proficiency across key domains, especially in quality control, analysis, and forecasting. However, expertise in end-user product development was consistently lower, pointing to a need for targeted training in public communication and impact-based alerting. Advanced expertise is observed through expertise from METMalaysia and JPS particularly for Hydro-met, Meteorologist and Hydrologist divisions.

Table 8: Division in each organisation as identified from respondents.

Organization	METMalaysia Johor	ICT Johor	PlanMalaysia Johor	JPS Johor	JPS PRABN
Division responded (number of respondents)	Meteorology Division (8) Equipment Maintenance Division (2)	-	Smart city unit (1)	Flood Management Division (1)	National Flood Forecasting and Warning Centre (5)

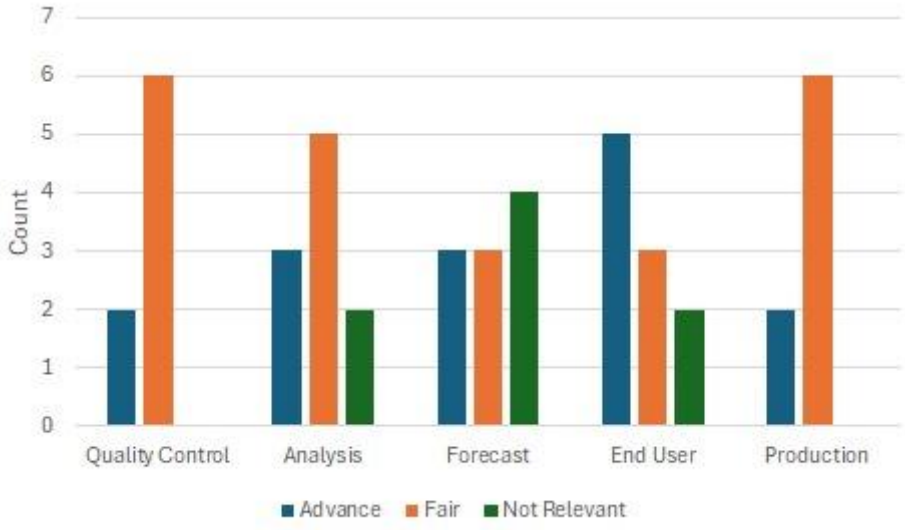


Figure 4: Feedback on MetMalaysia Johor respondents' expertise

DID

The expertise levels of non-IT staff from various divisions—namely Instrument Maintenance, Hydro-Met Observer, Hydrologist, and Meteorologist—in relation to their assigned tasks are shown in Table 9.

Staff in the Instrument Maintenance division reported predominantly Basic expertise across most tasks, including maintenance, repair, inspection, and calibration of instruments. Only the task of using test instruments was rated slightly higher, at the Fair level. This indicates

that while the team has a foundational understanding of their technical responsibilities, there may be a need for upskilling in advanced instrument handling and servicing.

In contrast, the Hydro-Met Observers demonstrated a consistently Fair level of expertise across all five tasks: use of data formats, reading, validation, communication, and maintenance. This suggests a well-developed operational capacity within this division, particularly in data handling and observational functions.

The Hydrologist division was rated Basic for all five tasks, including quality control, analysis of river and rain gauges, modelling, forecasting, and addressing alerts or warning issues. The results indicate a need for targeted training to build expertise in hydrological analysis and forecasting to better support flood risk and water management activities.

The Meteorologist division showed a mix of Basic and Fair expertise. While tasks such as analysis, forecasting, and weather alerts were rated Basic, Quality Control and End User Production were rated Fair, implying some moderate experience in delivering final meteorological products and ensuring their quality.

Overall, the findings suggest that while certain divisions such as the Hydro-Met Observers possess a good level of operational expertise, others—particularly Hydrologists and Instrument Maintenance staff—may benefit from technical capacity-building efforts. These insights help inform future training programmes under the MHP-IM initiative.

Table 9: Feedback on JPS Johor respondent expertise

Division	Task	Expertise Level
Instrument Maintenance	Use of Test Instrument	Advance
	Maintenance of Instrument	Fair
	Repair of Instrument	Basic
	Inspection of Instrument	Advance
	Calibration of Instrument	Fair
	Use of Data Format	Advance

Hydro-Met Observer	Reading	Advance
	Validation	Fair
	Communication	Advance
	Maintenance	Fair
Hydrologist	Perform Quality Control	Advance
	Analysis of River Gauge, Forecast and Rain Gauge	Advance
	Modelling	Fair
	Forecasting	Fair
	Alert/Warning Issue	Advance
Meteorologist	Quality Control	Fair
	Analysis	Fair
	Forecast	Basic
	Weather Alert	Fair
	End User Production	Fair

PLANMalaysia

The expertise levels of staff from different divisions (Instrument Maintenance, Hydro-Met Observer, Hydrologist, and Meteorologist) in relation to their assigned tasks are shown in table 10.

Based on the interview conducted to 1 (one) staff from PLANMalaysia, it is found that staff have foundational skills in instrument maintenance, with slightly higher competence in using test instruments. Staff in the Hydro-Met Observer division demonstrate consistent, moderate expertise across all key tasks, suggesting reliable operational capability. In the

Hydrology division staff are at the entry or foundational level in performing complex hydrological tasks, potentially requiring further training. Meanwhile, in the Meteorology division staff show basic proficiency in most meteorological functions, with moderate experience in quality control and delivering outputs to users. Generally most divisions show basic expertise, especially in technical and analytical tasks. Hydro-Met Observers are the most consistently skilled group, all rated at the Fair level while, Meteorologists and Instrument Maintenance staff show a mix of basic and fair proficiency, while Hydrologists may benefit most from capacity building.

Table 10: Feedback on PLANMalaysia Johor respondent expertise

Division	Task	Expertise Level
Instrument Maintenance	Use of Test Instrument	Fair
	Maintenance of Instrument	Basic
	Repair of Instrument	Basic
	Inspection of Instrument	Basic
	Calibration of Instrument	Basic
Hydro-Met Observer	Use of Data Format	Fair
	Reading	Fair
	Validation	Fair
	Communication	Fair
	Maintenance	Fair
Hydrologist	Perform Quality Control	Basic
	Analysis of River Gauge, Forecast and Rain Gauge	Basic
	Modelling	Basic
	Forecasting	Basic
	Alert/Warning Issue	Basic

Meteorologist	Quality Control	Fair
	Analysis	Basic
	Forecast	Fair
	Weather Alert	Basic
	End User Production	Fair

DID PRABAN

There are 4 (four) key divisions within DID PRABAN as identified by 5 staff interviewed. The levels of expertise among staff from four key divisions—Instrument Maintenance, Hydro-Met Observation, Hydrology, and Meteorology—based on their respective tasks is outlined in Figure 5. Instrument Maintenance Division staff generally possess basic skills in tasks such as maintenance, repair, inspection, and calibration of instruments. Only the use of test instruments is rated at a fair level, indicating limited expertise in more technical areas. Hydro-Met Observers consistently show a fair level of expertise across all tasks, including data handling (format use, reading, validation), communication, and maintenance. This indicates a moderate and reliable skill level, with potential readiness for operational roles.

Hydrologists show basic expertise across all tasks, including quality control, river and rain gauge analysis, modelling, forecasting, and alert/warning handling. This suggests limited capacity in hydrological analysis and highlights a need for targeted training. Meteorologists show a mix of basic and fair expertise. While their skills in quality control and end-user production are rated fair, other essential tasks like forecasting, weather alerts, and analysis are only at the basic level. This implies moderate experience in output production but limited analytical forecasting skills.

Only the Hydro-Met Observer division displays consistent moderate (fair) capabilities. Other divisions, particularly Hydrologists and Instrument Maintenance, show largely basic skills and would benefit from technical training. This highlights specific areas for capacity building under the MHP-IM framework.

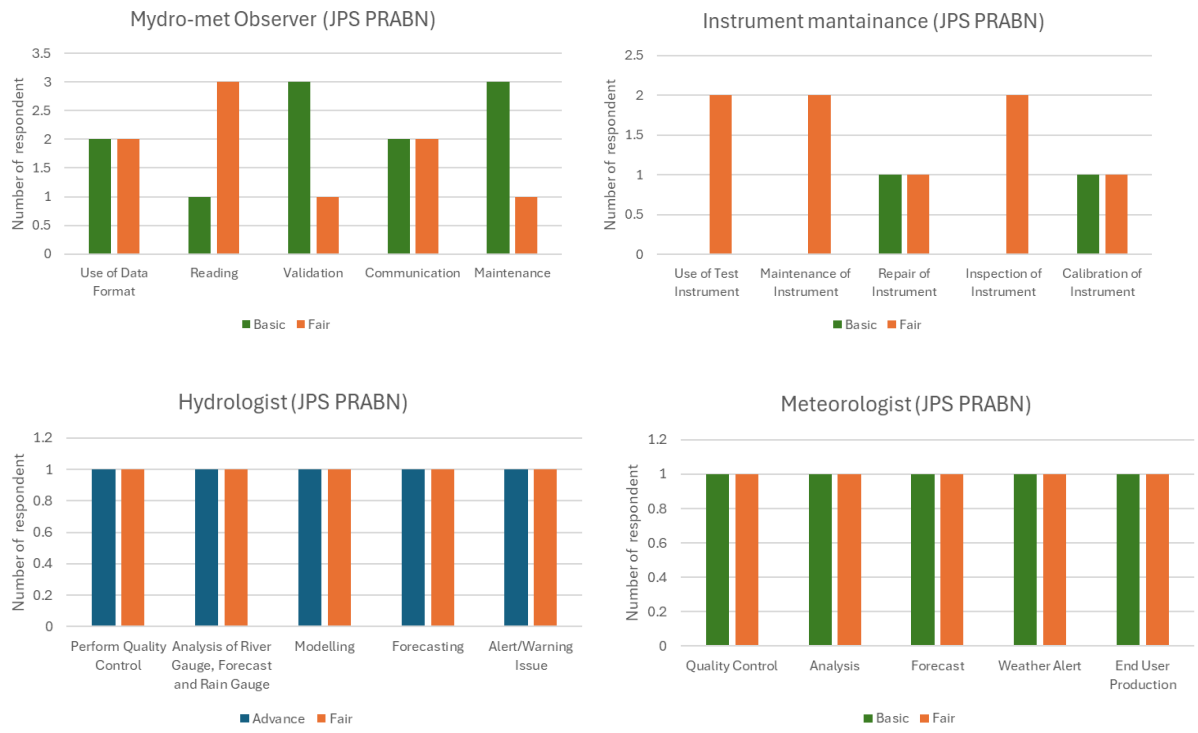


Figure 5: Feedback on JPS PRABN respondent expertise

Software/Hardware/Instrument

As reported by the 19 respondents, among the software used by the staff in their daily tasks are Linux, Aws, AlmalLinux and Automatic Weather Systems, INFOWORKS, Naffws Gui, Supermap. This shows that the staff have technical competencies in system administration, cloud computing, and environmental monitoring.

The list below shows the instruments available in the organisation which can support MHP-IM according to the respondents in the organization that can support MHP-IM.

1. Rain gauges
2. Data Acquisition and Processing Units (Microcontrollers and Data Loggers/RTC/power supply system)
3. Hydromet tools (rain gauges/WL sensors/flow velocity/soil moisture sensor)
4. Water Level Sensor
5. Communication modules (data transmitter

6. servers
7. notification/alert systems
8. radio
9. etc)
10. Flow velocity
11. Soil moisture sensor
12. ceilometer

The organisation is equipped with a comprehensive suite of hydrometeorological (Hydromet) instruments that are capable of supporting MHP-IM. These instruments enable real-time environmental monitoring, data acquisition, and early warning system functionalities, which are crucial for managing and mitigating natural hazards such as floods, droughts, and storms. The detail list of Hydromet Equipment and Tools are as follows:

1. Rain Gauges
2. Water Level Sensor
3. Flow Velocity Sensors
4. Soil Moisture Sensor
5. Data Acquisition and Processing Units

    - Microcontrollers
    - Data Loggers
    - Real-Time Clocks (RTC)
    - Power Supply System

6. Communication Modules

    - Data Transmitters
    - Servers
    - Notification/Alert Systems
    - Radio Systems

7. Hydromet Tools Set
   (Combination of Rain Gauges, WL Sensors, Flow Velocity, and Soil Moisture Sensors)

This array of equipment provides the technical foundation needed to:

(i) Support multi-hazard detection and monitoring (especially hydrological hazards such as floods)
(ii) Enable real-time data flow into the MHP-IM platform
(iii) Facilitate decision-making and early warning dissemination
(iv) Enhance disaster preparedness and response in the Iskandar Malaysia region

Instrument Maintenance Technician

According to two respondents from MetMalaysia Johor, they have dedicated maintenance consultants (external-expertise) responsible for the maintenance of their equipment. The MetMalaysia staff reported to possess fair skills in using, maintaining, and calibrating instruments such as rain gauges and hydro-met instruments (Figure 6).

Limited expertise is found across all skills (e.g., respondents rated repair as "Fair"). However, they have dedicated external expertise from maintenance consultants. This shows that knowledge revision and consolidation for maintenance and calibration and introductory training for repair are needed.

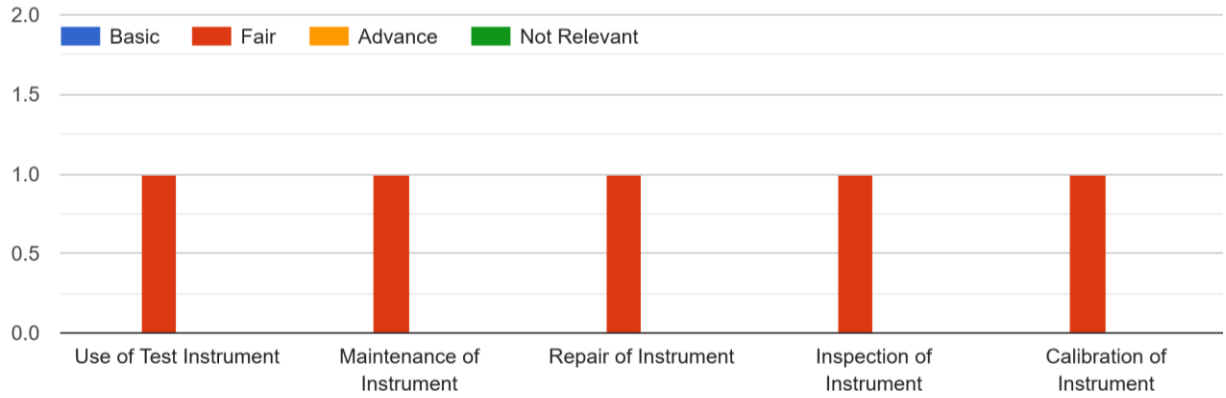


Figure 6: Expertise level of the "Equipment Maintenance" Technicians (Equipment Maintenance Division)- both respondents "FAIR"

There are 6 respondents reported in the Other Division associated with Equipment Maintenance Technician. Most of them are from the JPS Johor and JPS PRABN organisation with one respondent from PLANMalaysia Johor. These respondents are not working in a specific Equipment Maintenance Division but their work is associated with the workscope for Equipment Maintenance. JPS Johor staff reported to possess advanced skills for the test and inspection of instruments. While most of JPS PRABN and PLANMalaysia has basic and fair skills for test, maintenance, repair, inspection and calibration of instruments such as rain

gauges, water levels, hydro-met tools, etc. (Figure 7). Limited expertise in repairing skill (e.g., respondents rated repair as "Fair"). This indicates knowledge revision and consolidation for maintenance and calibration and introductory training for repair are needed.

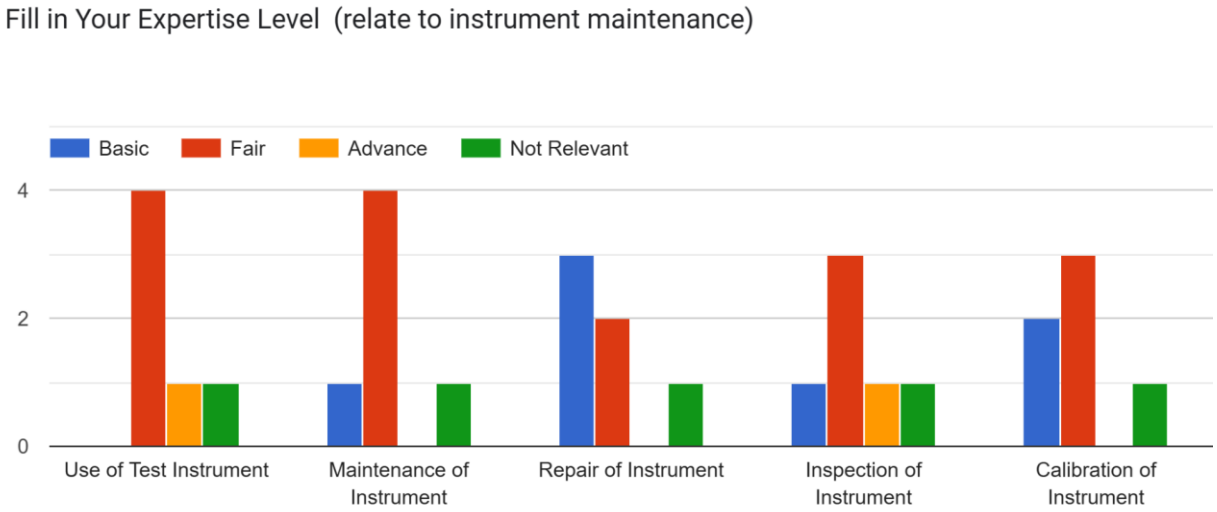


Figure 7: Expertise level of the "Equipment Maintenance" Technicians (Other Division)

5.4 IT CAPACITIES

Limited data are available; only two respondents—from ICT Johor and PLANMalaysia Johor—reported having dedicated IT staff, as these were the only organisations that provided feedback regarding the availability of personnel assigned to disaster monitoring-related tasks.

Only PLANMalaysia Johor reported basic to fair expertise in **help desk technician** roles (Table 11), indicating a potential gap in IT support capacity for disaster monitoring within other organisations.

Table 11: Skills for Help Desk Technicians (PLANMalaysia Johor)

Skills	Level
Linux	Basic
Windows	Fair

Network	Basic
Computer Hardware	Basic

One respondent from ICT Johor, with 15 years of experience, reported advanced skills in network and computer system administration, including Windows, networking, databases, Linux, and web development. Meanwhile, a respondent from PLANMalaysia Johor, with one year of experience, reported advanced skills in web development, but only basic to fair levels in the other areas (Table 12).

Only ICT Johor possesses advanced skills across all relevant work areas, highlighting a significant limitation in the technical capacity required to operate and maintain the MHP-IM system.

Table 12: Skills for Network and Computer Systems Administrator

Skills	ICT Johor	PLANMalaysia Johor
Windows	Advance	Basic
Database	Advance	Fair
Network	Advance	Basic
Linux	Advance	Basic
Web development platform/Virtualization/Container	Advance	Advance

Only PLANMAlaysia Johor has the expertise as fair and basic as **Data Engineer/Programmer** (Table 13). This indicates a potential gap in data management expertise for MHP-IM.

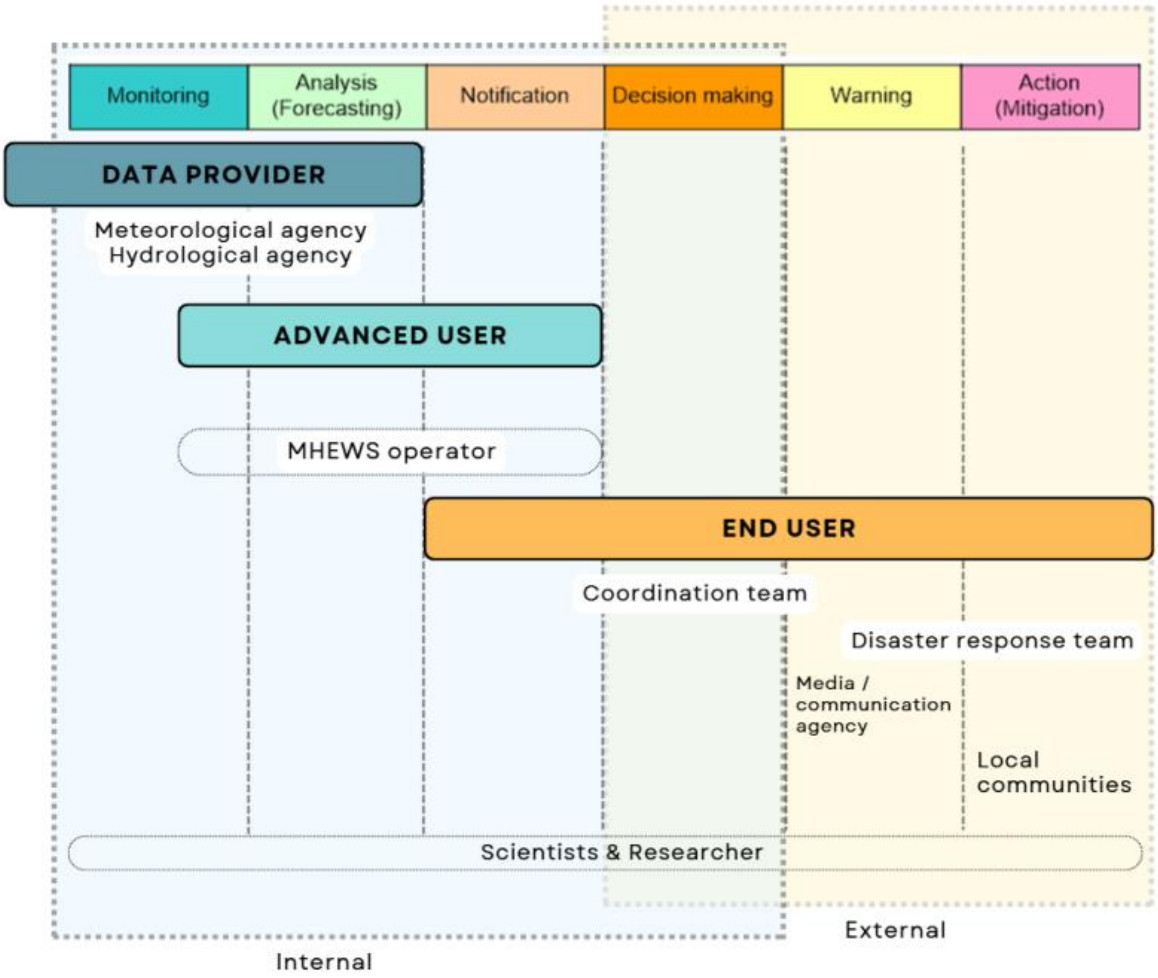
Table 13: Skills for Data Engineer/Programmer

Skills	PLANMalaysia Johor
Database	Basic
CMX	Fair
Programming	Fair

Web development platform/Virtualization/Container	Fair
Hydromet data	Basic

5.5 SUMMARY OF CURRENT GAP FROM CAPACITIES AND NEEDS

For each job profile, the table below (Table 14) presents the group's skill levels, identified weaknesses, and the necessary knowledge required to effectively fulfil their roles.



* DATA PROVIDER = METMAlaysia and DID
* ADVANCED USER- PLANMalaysia, Johor under Urban Observatory Johor
* MHEWS= MHP-IM

* END USER = all stakeholders in IM
* Coordination and disaster response team – all Local Authorities

Summary of Job Profile

Job Profile	Group	Weaknesses	Training Needs
IT Helpdesk Technician	Basic to Fair	Potential gap in this role.	Introduction to Linux, Windows, and Network support
Network and Computer Systems Administrator	Advanced	Only ICT Johor responded as advanced skill across the work type	Knowledge revision and consolidation of Windows Database, Network, Linux, Web development platform/Virtualization/Container ; introductory Cloud Services training
Data Engineer	Basic to Fair	Only PLANMalaysia Johor responded to the required skills. Potential gap in data management expertise	Introduction to database management, programming, and hydro-met data handling
Equipment Maintenance Technician	Majority Basic to Fair	Limited advanced maintenance skills	Introductory repair training; consolidation of maintenance and calibration training
Hydro-met Observer	Majority Basic to Fair	Limited advanced Hydro-met observer skills Advanced skills are available in JPS PRABN only	Consolidation of data handling skills and improvement in maintenance expertise.

Hydrologist	A variety of basic, fair, and advanced	Only expertise from JPS Johor and JPS PRABN has the advanced skills for a hydrologist.	Advanced training in modelling; consolidation of forecasting and warning issuance skills.
Meteorologist	Fair/Advance	Weak end-user production skills	Training in risk communication and tailored forecasting (in relation to end-user production)

6 GENDER-SENSITIVE INSTITUTIONAL AND TECHNICAL CAPACITIES FOR MHP-IM

Based on the survey data, the focus is on developing gender-sensitive institutional and technical capacities to implement the MHP-IM with impact-based forecasting. Key findings and recommendations include:

1. **Gender Representation**:
   a. The data shows unbalanced gender distribution among respondents (e.g., 9 males and 3 females in non-IT staff responses, 1 female in IT staff responses).
   b. Female representation in technical roles (e.g., Hydrologist, Meteorologist) is lower, with only 1 female respondent in JPS's hydrology division.

   Recommendation: Develop targeted training programs to encourage female participation in technical roles, such as hydrology and IT, to ensure gender equity. Below is the detail recommendations:

   - Training opportunities should prioritize female staff in meteorology, hydrology, and IT fields.
   - Mentorship should be initiated, leveraging experienced female staff to coach junior female employees.
   - Training formats should be flexible (e.g., blended learning) to accommodate caregiving responsibilities.
   - Gender-sensitive materials and evaluation frameworks should be adopted across all workshops.

2. **Technical Capacities**:
   a. Organizations like MetMalaysia and JPS have strong technical capacities in meteorology and hydrology, respectively, but gaps exist in data engineering and IT support for MHP-IM.
   b. PlanMalaysia and ICT Johor lack direct disaster management expertise, limiting their contribution to technical implementation.

Recommendation: Prioritize technical training in data engineering, hydrological modelling, and advanced forecasting for MetMalaysia and JPS staff. Offer introductory IT training for non-technical organizations to enhance platform adoption.

3. **Institutional Capacities**:
    a. Challenges such as frequent staff rotations (JPS) and coordination issues (MBPG) hinder sustained capacity building.
    b. Only one organization (PlanMalaysia) expressed willingness to be a pilot user, citing potential to reduce community risk.

    Recommendation: Establish a cross-agency task force to improve coordination and knowledge retention. Use PlanMalaysia's pilot site to test MHP-IM and develop best practices.

4. **Training Approach**:
    a. Preferred training modes include face-to-face and blended learning, with specific needs for technical MHP-IM usage, data analysis, and risk communication.

    Recommendation: Design gender-sensitive workshops incorporating impact-based forecasting and early warning systems. Include train-the-trainer programs to build internal capacity, particularly for female staff.

5. **Impact-Based Forecasting**:
    a. The data highlights a demand for effective early warning systems (e.g., MetMalaysia and JPS emphasized this need).

    Recommendation: Develop training modules on impact-based forecasting, focusing on data analysis, risk communication, and early action protocols. Use simulations to enhance practical skills.

This plan will leverage the prototype MHP-IM for hands-on training, ensuring stakeholders understand its application in disaster risk reduction. By addressing gender disparities and technical gaps, the capacity-building plan will enhance the platform's effectiveness in Iskandar Malaysia.

Gender-Sensitive Recommendations

To address these disparities, the capacity-building plan incorporates the following gender-sensitive strategies:

1. **Targeted Recruitment and Training**:
    a. Develop outreach programs to encourage female participation in technical training for roles like Hydrologist, Meteorologist, and Data Engineer. For example, workshops could be designed to attract female graduates in STEM fields.
    b. Offer scholarships or incentives for women to pursue certifications in hydrological modelling, data engineering, and IT systems administration.
2. **Mentorship and Leadership Programs**:
    a. Establish mentorship programs pairing female staff with experienced mentors (e.g., the female JPS respondent with 17 years of experience could mentor junior female staff).
    b. Promote female representation in leadership roles within MHP-IM implementation teams to enhance visibility and influence.
3. **Gender-Sensitive Training Design**:
    a. Incorporate gender-sensitive content in training modules, addressing barriers such as work-life balance, which may disproportionately affect female staff due to societal expectations.
    b. Use inclusive language and case studies in training materials to ensure relevance for all genders.
4. **Flexible Training Modes**:
    a. Offer blended learning options (preferred by 2 organizations) to accommodate female staff who may have caregiving responsibilities, enabling asynchronous participation.
    b. Provide flexible work arrangements and policies that support gender equity (e.g., childcare, anti-harassment protoco, chedule face-to-face sessions (preferred by 5 organizations) at times that consider family commitments.

Technical Capacities

1. **Current State**:
    a. **MetMalaysia**: Strong meteorological expertise, with 8 respondents reporting fair to advanced skills in forecasting and early warning systems. However, end-user production skills need improvement.
    b. **JPS**: Advanced hydrological capacities, but limited modelling expertise hinders comprehensive forecasting.

c. **PlanMalaysia and ICT Johor**: Limited technical expertise in disaster management, restricting their role in MHP-IM's technical implementation.

d. **Data Engineering Gap**: No respondents identified as Data Engineers, a critical role for data integration and dissemination.

2. **Recommendations**:

a. Prioritize technical training in hydrological modelling (JPS) and end-user production (MetMalaysia) to enhance forecasting accuracy.

b. Introduce data engineering training across organizations to build capacity for data management, a core MHP-IM function.

c. Offer introductory IT training for PlanMalaysia and ICT Johor to enable basic platform support.

Institutional Capacities

1. **Challenges**:

a. Frequent staff rotations (JPS) disrupt knowledge retention, particularly affecting female staff who may face additional career interruptions.

b. Coordination issues (MBPG) limit cross-agency collaboration, impacting platform adoption.

c. Only PlanMalaysia expressed willingness to be a pilot user, citing potential to reduce community risk.

2. **Recommendations**:

a. Establish a cross-agency task force with gender-balanced representation to improve coordination and knowledge sharing.

b. Use PlanMalaysia's pilot site to test MHP-IM, ensuring female staff are included in testing and feedback processes.

c. Develop retention strategies, such as continuous training programs, to mitigate the impact of staff rotations, particularly for female employees.

Training Approach

Preferences: Organizations prioritize face-to-face (5 respondents) and blended learning (2 respondents) for technical training in MHP-IM usage, data analysis, risk communication, and impact assessment.

Gender-Sensitive Approach:

a. Include train-the-trainer programs to build internal capacity, with a focus on empowering female staff as trainers to enhance their leadership roles.

b. Use simulations and case studies tailored to local contexts (e.g., flood risks in Iskandar Malaysia) to ensure relevance for all participants.

c. Ensure training venues are accessible and safe for female staff, addressing potential logistical barriers.

Impact-Based Forecasting

1. **Demand**: MetMalaysia and JPS emphasized the need for effective early warning systems that reach the public.
2. **Recommendations**:
    a. Develop training modules on impact-based forecasting, focusing on data analysis, risk communication, and early action protocols.
    b. Engage female staff in designing communication strategies to ensure messages are inclusive and reach diverse community groups, including women and marginalized populations.
    c. Use simulations to train staff on real-time forecasting and warning issuance, with scenarios that consider gender-specific impacts (e.g., women's roles in community evacuation).

Implementation Plan

1. **Workshops and Training**:
    a. Conduct gender-sensitive workshops using the MHP-IM prototype, ensuring at least 50% female participation.
    b. Include modules on impact-based forecasting, data analysis, and risk communication, with practical exercises tailored to female staff's needs.
2. **Monitoring and Evaluation**:
    a. Track gender participation in training programs and monitor career progression of female staff in technical roles.
    b. Evaluate the effectiveness of gender-sensitive strategies through feedback from female participants.
3. **Pilot Program**:
    a. Leverage PlanMalaysia's willingness to serve as a pilot site, ensuring female staff are involved in testing and refining the platform.

b. Use pilot results to develop best practices for gender-inclusive implementation across other organizations.

This activity ensures that MHP-IM implementation is equitable and effective, addressing gender disparities while building technical and institutional capacities. By prioritizing female participation and tailored training, the platform will enhance disaster resilience in Iskandar Malaysia.

7 CONCLUSION

The Training Needs Assessment (TNA) for the Multi-Hazard Platform – Iskandar Malaysia (MHP-IM) provides a comprehensive understanding of current institutional and human resource capacities across key stakeholder agencies. The assessment identified significant strengths in meteorology and hydrology within MetMalaysia and JPS, respectively. However, it also revealed critical gaps in data engineering, IT support, instrument maintenance, and public-oriented forecasting.

Equally important are the institutional challenges that are frequent job rotations, coordination barriers, and limited technical capacities in agencies such as ICT Johor and PlanMalaysia, that may hinder the seamless implementation of MHP-IM. The findings underscore the need for a structured, inclusive, and gender-sensitive capacity-building plan that not only addresses technical training but also strengthens institutional cooperation.

Furthermore, the underrepresentation of women in technical roles highlights the importance of intentional strategies to enhance gender equity in disaster risk management. This includes targeted training, flexible delivery models, and leadership pathways for female professionals.

By translating capacity needs into actionable training programs, impact-based forecasting protocols, and localized IEC materials, this report lays the foundation for sustainable MHP-IM implementation. The proposed recommendations ensure that all stakeholder groups, from national agencies to at-risk communities are equipped with the knowledge and tools to act early, reduce risk, and build resilience.

Ultimately, this assessment supports a proactive, inclusive, and integrated approach to disaster preparedness and response in Iskandar Malaysia, positioning the MHP-IM as a transformative system for climate-resilient development.