

DARI HULU KE HILIR

A REPORT ON

INDIGENOUS KNOWLEDGE
FOR DISASTER RISK
MANAGEMENT ALONG
THE LANGAT RIVER BASIN

A PROJECT BY

MATCH
MALAYSIAN HUMANITARIAN COORDINATION & ACTION TEAM

GERIMIS

Dari Hulu Ke Hilir: A Report on Indigenous Knowledge for Disaster Risk Management Along the Langat River Basin

First Edition. 2025.

Copyright © MATCH Foundation & GERIMIS, 2025

All Rights Reserved. No part of this publication may be reproduced, distributed, or transmitted in any form or by any means, including photocopying, recording, or other electronic or mechanical methods, without the prior written permission. For permission requests, write an email to hello@matchfoundation.my

Project Team

Ci Yan Sara Loh, GERIMIS
Sia Wen Di, GERIMIS
Sharon Yap Li Hui, GERIMIS
Sheila Julis, MATCH Foundation

Acknowledgements

We would like to convey our sincerest gratitude to the Temuan communities of KOA Bukit Tadam and KOA Paya Lebar for their immense warmth, support, and collaboration in the successful completion of the *Dari Hulu Ke Hilir: A Report on Indigenous Knowledge for Disaster Risk Management Along the Langat River Basin* project.

We extend our heartfelt appreciation to Tok Batin Hadi a/I Jembik and JPKKOA Chairman Soeb bin Miah of KOA Bukit Tadam, and Tok Batin Aning a/I Embong and JPKKOA Chairman Azroy bin Aba of KOA Paya Lebar, as well as members of JPKKOA and the villagers of both communities for their patience, care, and friendship throughout our research period. We also thank the communities for sharing with us their stories, community-based flood and resource management efforts, and hopes for the future, that are rooted in the generational wisdom of their ancestral lands and rivers.

We would also like to thank the federal, state and district JAKOA offices for supporting our project.

We are also grateful to MATCH's participating NGO partners, especially Malaysian Red Crescent Society, for sharing their time and thoughts; and for their continuous collaboration beyond the project. Additionally, we would like to express our sincere thanks to the following subject matter experts: Dr Colin Nicholas (COAC), Reita Rahim (Gerai OA), Dr Zanisah Man, Tam Kar Lye, Dr Kamal Solhaimi Fadzil, and Dr Sia Mal Kong.

Financial support for the research, preparation and publication of this document was provided by the German Federal Ministry for Environment, Nature Conservation and Nuclear Safety, and Consumer Protection (BMUV) through the GEF Small Grants Programme (SGP), implemented by the United Nations Development Programme (UNDP). Printing of this report is made possible with the support of Yayasan Hasanah.

A project by



Supported by



Federal Ministry
for the Environment, Nature Conservation,
Nuclear Safety and Consumer Protection



INTERNATIONAL
CLIMATE
INITIATIVE

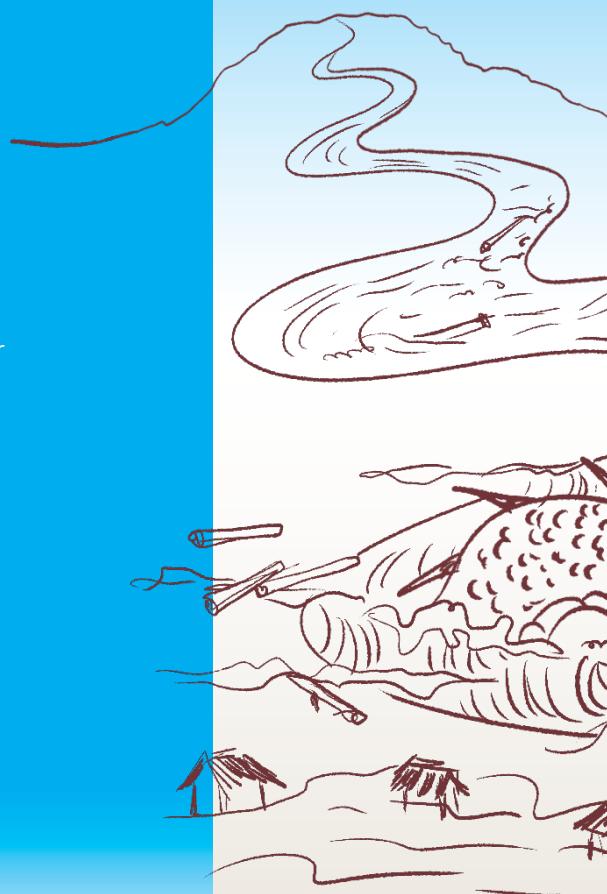


SGP The GEF
Small Grants
Programme



YAYASAN
HASANAH
a foundation of Khazanah Nasional

based on a decision of
the German Bundestag



DARI HULU KE HILIR

A REPORT ON
INDIGENOUS KNOWLEDGE
FOR DISASTER RISK
MANAGEMENT ALONG
THE LANGAT RIVER BASIN



EXECUTIVE SUMMARY

This report examines the Indigenous knowledge, Systems and Protocols (ISP) of two Temuan villages along the Langat River basin in the context of flood management: Kampung Orang Asli Paya Lebar (upstream, in Hulu Langat) and Kampung Orang Asli Bukit Tadam (downstream, in Kuala Langat).

This project was initiated as a response to meet the need for an existing module on disaster management in Malaysia that is specifically curated for the Orang Asli. This is crucial as Indigenous communities are among the most vulnerable and impacted long-term by increasingly frequent, unpredictable and extreme flooding in the greater Klang Valley. The project aims to understand and document the Temuan's historical and contemporary experiences, knowledge and perspectives on best practices for disaster management; and share the community's recommendations for contextualised and community-based disaster management.



Our research found that during the initial stages of floods, when external flood aid had yet to arrive, the Orang Asli are self-reliant on their own Indigenous knowledge, systems and protocols (ISPs). These ISPs are dependent on their intimate and multi-generational relationships with their ecological niches. Among the key Indigenous systems and protocols are a reliance on Indigenous leadership and governance, early warning systems and *semangat gotong-royong* (communal spirit), that are all rooted in Indigenous rights to their land and self-determination.

Findings also highlighted that respect and recognition of ISPs enable for better coordination

of aid and other disaster management efforts during response, recovery, preparedness and mitigation phases. This is because communities' Indigenous knowledge of their environment that shapes these systems and protocols also informs flood management. This highlights the complementary nature of Indigenous knowledge and western scientific knowledge.

Based on our findings, we recommend the following actions:

1. Mainstream and Prioritise Orang Asli Knowledge, Practices, and Leadership in Disaster Management
2. Enhance Aid Delivery for Orang Asli Communities through Early, Coordinated, and Community Mapping-based Approaches
3. Comprehensive Flood Management and Long-Term Resilience Building for Orang Asli Communities
4. Improve Communication and Socialisation of Disaster Management Policies and Mechanisms for Orang Asli Communities
5. Integrate Indigenous Knowledge in Mitigation and Land Use Planning for Orang Asli Communities
6. Inclusion of JAKOA as a Key Stakeholder in District, State, and National Disaster Command Centres (PKOB)

These interventions are essential in supporting the Temuan and other Orang Asli communities towards building flood resilience; and towards incorporating Indigenous knowledge, Systems and Protocols into flood management.

Our team acknowledges the heterogeneity of Orang Asli communities and their experiences, and that this project focuses specifically on the experiences of two particular Orang Asli villages in Hulu Langat and Kuala Langat. Thus, our aim is for the report to serve as a guide, to be adapted for working with other Orang Asli communities towards building context-specific disaster management.

CONTENTS

Page

2	Acknowledgements
4	Executive Summary
6	Acronym
8	Glossary
9	List of Figures and Tables

1 Introduction

11	1.1 The Project
11	1.2 Project Objectives
12	1.3 Context
14	1.4 Methods
	1.4.1 Fieldwork with the Orang Asli
	1.4.2 Fieldwork with External Stakeholders
	1.4.3 Participatory Planning and Action: Community-Based Disaster Risk Management (CBDRM) Planning with Paya Lebar and Bukit Tadam Villagers

2 The Orang Asli, Floods and Indigenous Knowledge

17	2.1 The Orang Asli
18	2.2 The Orang Asli and Floods
19	2.3 Definition of Indigenous Knowledge
20	2.4 The Role of Indigenous Knowledge in Disaster Management

3 Bukit Tadam and Paya Lebar Findings

22	3.1 The Temuan and the Langat River Basin
23	3.2 Hulu Findings — KOA Paya Lebar
	3.2.1 About KOA Paya Lebar
	3.2.2 Types of Floods
	3.2.3 Perceptions of Floods
	3.2.4 What Happened During the 2021 Flood
	3.2.5 Timeline of 2021 Flood

	3.2.6 Flood Aid Social Networks
	3.2.7 Community Resource Mobilisation
	3.2.8 Summary of Findings
40	3.3 Hilir Findings
	— KOA Bukit Tadam
	3.3.1 About KOA Bukit Tadam
	3.3.2 Types of Floods
	3.3.3 Perceptions of Floods
	3.3.4 What Happened During the 2021 Flood
	3.3.5 Timeline of 2021 Flood
	3.3.6 Flood Aid Social Networks
	3.3.7 Community Resource Mobilisation
	3.3.8 Summary of Findings

59	3.4 Aspirations for External Stakeholder Support
-----------	--

4 Recommendations & Conclusion

61	4.1 Government & NGOs
62	4.2 Indigenous Systems and Protocols: Before, During And After Floods
67	4.3 Conclusion

5 References

ACRONYMS

APM	Angkatan Pertahanan Awam Malaysia; Malaysia Civil Defence Department	ISP	Indigenous Knowledge, Systems, and Protocols; Kearifan, Sistem, dan Kearifan, Sistem, dan Protokol Orang Asli
BMUV	Kementerian Alam Sekitar, Pemuliharaan Alam Sekitar, Keselamatan Nuklear dan Perlindungan Pengguna untuk Kementerian Persekutuan Jerman; German Federal Ministry for Environment, Nature Conservation and Nuclear Safety, and Consumer Protection	IPCC	Panel Antara Kerajaan tentang Perubahan Iklim; Intergovernmental Panel on Climate Change
BN	Barisan Nasional	JAKIM	Department of Islamic Development Malaysia; Jabatan Kemajuan Islam Malaysia
BPR	Bantuan Baik Pulih Rumah; House Repair Assistance	JAKOA	Jabatan Kemajuan Orang Asli, Department of Orang Asli Development
BUDIMAS	Yayasan Budimas; The Budimas Charitable Foundation	JBPM	Jabatan Bomba dan Penyelamat Malaysia; Fire and Rescue Department of Malaysia
CBA	Adaptasi Berasaskan Komuniti; Community-Based Adaptation	JKM	Jabatan Kebajikan Masyarakat; Department of Social Welfare Malaysia
CBDRM	Program Pengurusan Risiko Bencana Berasaskan Komuniti; Community-Based Disaster Risk Management	JPKKOA	Jawatankuasa Pembangunan dan Keselamatan Kampung Orang Asli; Orang Asli Village Development and Security Committee
COAC	Pusat Keprihatinan Orang Asli; Center for Orang Asli Concerns	JPS	Jabatan Pengairan dan Saliran; Department of Irrigation and Drainage
DRR	Pengurangan Risiko Bencana; Disaster Risk Reduction	KASA	Kementerian Alam Sekitar dan Air; Ministry of Environment and Water
EXCO	Ahli Majlis Mesyuarat Kerajaan Negeri; The Selangor State Executive Council	KEMAS	Jabatan Kemajuan Masyarakat; Community Development Department
FGD	Perbincangan Kumpulan Fokus; Focus Group Discussion	KIR	Ketua Isi Rumah; Head of Household
FPIC	Prinsip Izin, Maklum Awal, Bebas dan Telus; Free, Prior, Informed Consent	KKM	Kementerian Kesihatan Malaysia; Ministry of Health Malaysia
GEF	Global Environment Facility	KLIA	Lapangan Terbang Antarangsa Kuala Lumpur; Kuala Lumpur International Airport
HOAG	Hospital Orang Asli Gombak; Gombak Orang Asli Hospital	KOA	Kampung Orang Asli, Orang Asli Village
ICCA	Kawasan dan wilayah tanah pemuliharaan dan adat Orang Asli dan komuniti tempatan; Indigenous peoples' and community conserved areas and territories	KOSPEN	Komuniti Sihat Pembina Negara; Healthy Communities, Building the Nation
IK	Indigenous Knowledge; Kearifan Orang Asal	LUAS	Lembaga Urus Air Selangor; Selangor Water Management Authority

ACRONYMS

(Continued)

MAIS	Majlis Agama Islam Selangor; Selangor Islamic Council	PKD	Pejabat Kesihatan Daerah; District Health Office
MERCY	MERCY Malaysia, Malaysia Medical Relief Society	PKOB	Pusat Kawalan Operasi Bencana; Floods Operations Control Center
MBI	Menteri Besar Selangor Incorporated	PPS	Pusat Pemindahan Sementara; Temporary Evacuation Center
MIC	Malaysian Indian Congress	PRA	Penilaian Turut-Serta Luar Bandar; Participatory Rural Appraisal
MPKJ	Majlis Perbandaran Kajang; Kajang Municipal Council	PTB	Pelan Tindakan Banjir; Flood Action Plan
MPKL	Majlis Perbandaran Kuala Langat; Kuala Langat Municipal Council	RELA	Jabatan Sukarelawan Malaysia; Malaysia Volunteers Corps Department
MRCS	Persatuan Bulan Sabit Merah; Malaysian Red Crescent Society	RTB	Rancangan Tanah Belia; Youth Land Development Plan
NADMA	Agensi Pengurusan Bencana Negara; National Disaster Management Agency	SGP	Program Geran Kecil GEF; GEF Small Grants Programme
NGO	Badan Bukan Kerajaan; Non-Governmental Organisation	SYABAS	Air Selangor; Pengurusan Air Selangor Sdn Bhd
NRECC	Kementerian Sumber Asli dan Kelestarian Alam; Ministry of Natural Resources and Environmental Sustainability	UKM	Universiti Kebangsaan Malaysia; National University of Malaysia
NSC	Majlis Keselamatan Negara Malaysia (MKN); National Security Council	UNDP	Program Pembangunan Pertubuhan Bangsa-Bangsa Bersatu; United Nations Development Programme
OA	Orang Asli	UNDRR	Pejabat Pertubuhan Bangsa-Bangsa Bersatu untuk Pengurangan Risiko Bencana; United Nations Office for Disaster Risk Reduction
OKU	Orang Kurang Upaya; Persons with Disability	UNEP	Program Alam Sekitar Pertubuhan Bangsa-Bangsa Bersatu; United Nations Environment Programme
PAS	Pan-Malaysian Islamic Party	WaSH	Air, Sanitasi, Kebersihan; Water, Sanitation, Hygiene
PBOA	Pasukan Bergerak Hospital Orang Asli Gombak; Gombak Orang Asli Hospital Mobile Team		
PDRM	Polis Diraja Malaysia; Royal Malaysia Police		
PDT/DO	Pejabat Daerah dan Tanah; District and Land Office		
PGA Cheras	Pasukan Gerakan Am Cheras; Cheras General Operations Force (Light infantry arm of the PDRM)		

GLOSSARY

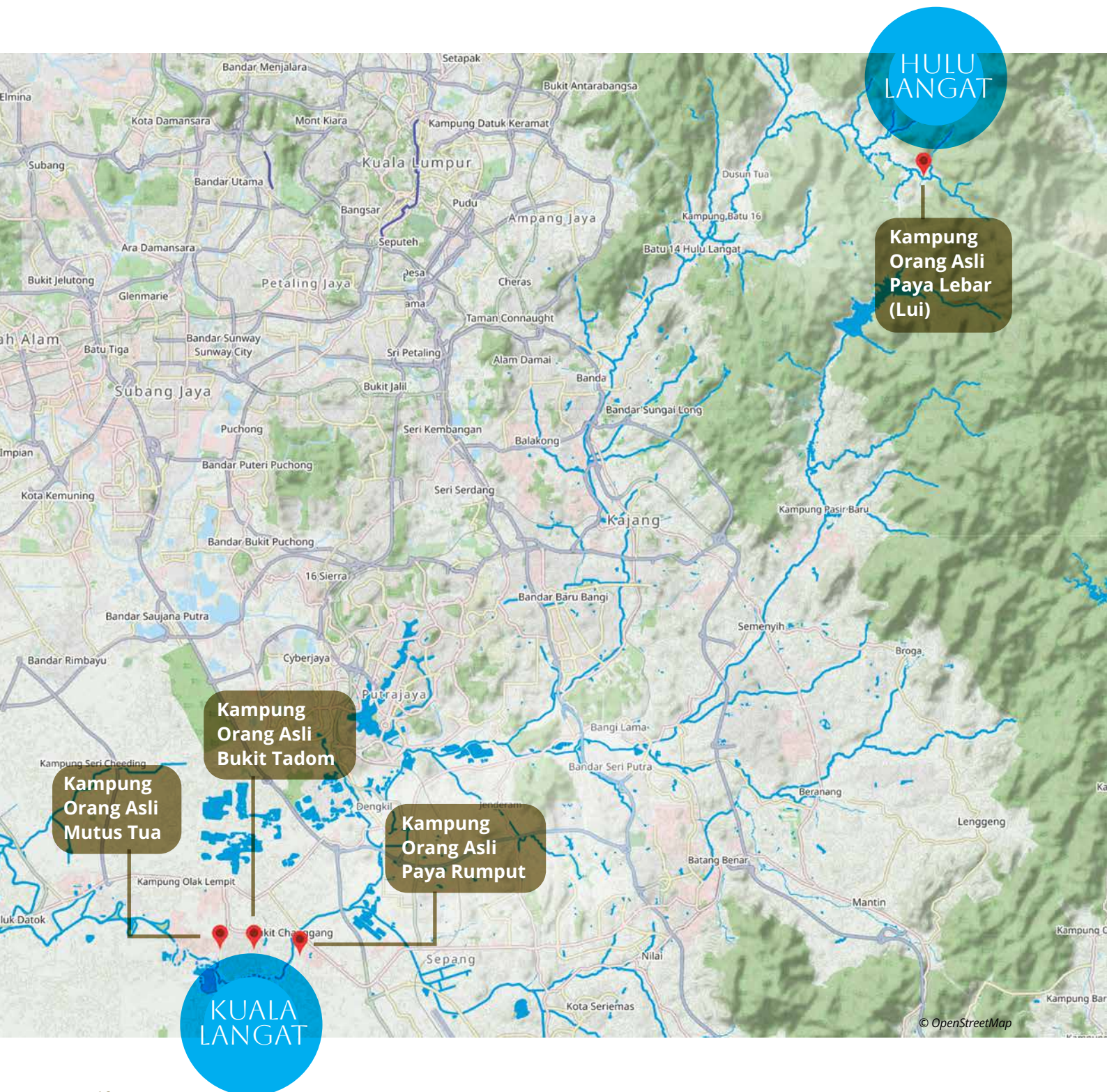
Adat	Traditions and customs that inform Orang Asli governance; customary law
Air	Water or stream
Arahan MKN 20	Malaysia Disaster Management Directive under the National Security Council; also Malaysia Disaster Management Policy and Mechanism
Arahan NADMA 1	NADMA Disaster Management Directive, Policy and Mechanism
Balai adat	A communal space used by Orang Asli communities for gatherings, ceremonies, and the exercise of customary laws and governance
Banjir kilat	Flash floods
Banjir lumpur	Mud floods; mud slides; A type of flash flood resulting in extreme levels of mud
Banjir termenung	Stagnant floods, where the water does not subside for days or weeks at a time
Bela tandak	Caring for the water source ; “tandak” also means collection chamber
Bukit	Hill
Dasar Pengurusan Bencana Negara	Upcoming Malaysia disaster management mechanism
Dewan	Hall
Dusun	Ancestral orchard
Hilir	Malay for “downstream or downriver”
Hulu	Malay for “upstream or upriver”
Kampung	Village
Kawasan adat	Areas of cultural and historical significance
Kebun	Privately-owned farms
Kencing tikus	Leptospirosis

Kuala	Estuary
Lembaga Adat	Council of Elders
Mimpi	Dreams from ancestors
Moyang	Ancestors and/or Guardian
Musim mewah	An abundant season
Naga	Serpent- or dragon-like creatures
Orang Asli	Original or First Peoples of Peninsular Malaysia
Orang Asal	Indigenous Peoples of Malaysia; incorporating the Orang Asli of Peninsular Malaysia and the Natives of Sabah and Sarawak. Also refers to Indigenous Peoples of the world
Pengerusi	JPKKOA chairperson
Peronda kampung	Community patrollers
Pondok	Shelter
Sewang	A traditional community dance usually performed during rituals or celebratory events. Also performed today as an arts and cultural performance for various audiences including tourists
Surau	Prayer hall
Sungai	River
Tabung kilat	Flood preparedness funds
Tangki lurus	Water truck
Temuan	A sub-ethnic group of the Proto Malay Orang Asli of Peninsular Malaysia
Tok Batin	Village chief
Wilayah Tanah Adat	Customary land and territories

LIST OF FIGURES AND TABLES

<i>Page</i>	Figures	
26	Figure 1	Map showing KOA Paya Lebar, situated in a valley surrounded by steep mountain ridges and extensive river network
31	Figure 2	Long-term and during floods only aid social networks in KOA Paya Lebar
33	Figure 3	Community flood map highlighting source of flood, high and low-lying areas of the village, and current and suggested flood mitigation measures. The flood inundated both high and low-lying areas, with homes in the low areas being the worst affected due to the higher water levels
41	Figure 4	Map showing KOA Bukit Tadam, KOA Paya Rumput, and KOA Mutus Tua, situated along the Langat River and surrounded by encroaching development
43	Figure 5	Map showing rain water flowing from upstream, high tide, and surrounding developments on higher ground merging and stagnating in KOA Bukit Tadam, KOA Paya Rumput, and KOA Mutus Tua
49	Figure 6	Long-term and during floods only aid social networks in KOA Bukit Tadam
56	Figure 7	Map of KOA Bukit Tadam's existing and proposed mitigation efforts, including the suggested locations for a new screw pump. This map also shows the proposed PPS on Bukit Tadam (Tadam hill)
	Tables	
25	Table 1	Types of floods at KOA Paya Lebar
37	Table 2	Types of community early warning systems at KOA Paya Lebar
38	Table 3	Summary of findings at KOA Paya Lebar
42	Table 4	Types of floods at KOA Bukit Tadam
55	Table 5	Types of community early warning systems at KOA Bukit Tadam
57	Table 6	Summary of findings at KOA Bukit Tadam

DARI HULU KE HILIR: A REPORT ON INDIGENOUS KNOWLEDGE FOR DISASTER RISK MANAGEMENT ALONG THE LANGAT RIVER BASIN





Villagers fishing at one of the ancestral rivers of the Temuan at KOA Bukit Tadam

1.1 The Project

The *Dari Hulu Ke Hilir: A Report on Indigenous Knowledge for Disaster Risk Management Along the Langat River Basin* project was initiated to meet the need for an existing module on disaster management in Malaysia that is specifically curated for the Orang Asli. This is crucial as Indigenous communities are among the most vulnerable and impacted long-term by increasingly frequent, unpredictable and extreme flooding in the greater Klang Valley.

We worked with two partner communities along the Langat River basin, Kampung Orang Asli Paya Lebar and Kampung Orang Asli Bukit Tadam, to document Temuan historical and contemporary experiences, knowledge and perspectives on best practices for disaster management. This project aims to provide recommendations for contextualised and community-based disaster and natural resource management in the form of a report, capacity building with Orang Asli communities and other stakeholders through knowledge sharing and exchange, and ongoing advocacy to government, non-government and community stakeholders. All findings, aspirations and recommendations are reported based on collaborative fieldwork with the two communities.

1.2 Project Objectives

Objective 1:

To understand and document generational Indigenous Knowledge (IK) of two upstream and downstream Orang Asli (OA) communities of the ecological niche of Langat River Basin. In particular, their biodiversity and environmental knowledge, and how these communities conserve and manage their forest and river ecosystem.

Objective 2:

To formalise IK that will improve, complement and contextualise disaster mitigation and preparedness modules, strategies, guidelines and action by local humanitarian actors and district-level government agencies.

1.3 Context

Globally, disasters are increasing in frequency and intensity due to our changing climate. According to the Intergovernmental Panel on Climate Change's Climate Change Synthesis Report (IPCC, 2023), rises in greenhouse gases have increased the frequency and intensity of extreme weather events, such as drought and floods, among others. These lead to loss of livelihoods and displacement, loss of lives and injuries, and place a large burden on societies, economies and the environment (UNEP, 2024). Notably, flooding often exacerbates existing vulnerabilities especially among marginalised communities.

In Malaysia, floods are one of the most significant disasters, with total losses amounting to RM 800 million in 2023, a total of 983 flood incidents in 2022, and a total of 192,707 disaster victims recorded (Rahman, 2022). 2021 saw even higher numbers, where there were 1057 flood incidents and 206,643 individuals affected by disasters, in large due to Tropical Depression 29W. This tropical depression took an unexpected turn, resulting in four days of unprecedented rainfall in Peninsular Malaysia's West Coast. Debris flow inundated homes and highways, over 40,000 people were displaced, over 50 lives taken, and up to RM 6.1 billion (USD 1.3 billion) was accounted for in losses (Rahman, 2022). Selangor's districts suffered the most due to their denser, urbanised environment; and unpreparedness for severe flooding. This was one of the nation's worst floods since 2014's Bah Kuning, which was one of the worst floods in Malaysia's history that inundated the East Coast of Peninsular Malaysia. Bah Kuning was named as such due to its high mud content, and was considered a "tsunami-like disaster" (Omran et al., 2018). Both events exposed a lack of preparedness at multiple levels of disaster management (Lim, 2021).

1.3.1 Disaster Management Context

Since the devastating 2014 and 2021 floods, the government has undergone the process of reviewing the National Security Council



Muddy houses at KOA Paya Lebar post-2021 flood

Directive No. 20 (MKN, 2012) that governs disaster management and relief. Efforts to grow Malaysia's capacity for disaster preparedness, especially in the face of increasing climate-exacerbated disasters include introducing a National Policy for Disaster Risk Reduction (Zahid, 2024; Gimino, 2023). As a result, NADMA has recently launched the NADMA Directive No. 1 (NADMA, 2024), the revised guideline for disaster management in Malaysia. Disaster management in Malaysia is still highly centralised, with the main focal point agency NADMA coordinating disasters within a three-level disaster management system – federal, state and district level committees (MKN, 2012), with support from its multisectoral partners.

Multi-stakeholder collaborations are key to effective disaster management in Malaysia, such as through the Rakan NADMA coalition that currently consists of 156 NGO partners (NADMA, 2023). International humanitarian organisations, NGOs and private sector stakeholders are often among the first responders during floods, and their efforts serve to complement the government's disaster management mechanisms. Members of the humanitarian sector are also key drivers of contextualised and community-based disaster management. They also encourage disaster management to focus beyond immediate response to recovery, mitigation and preparedness, largely through the adoption of global policies and emergency funding requirements.



Flooded houses at KOA Paya Rumput at the end of 2021

The United Nations' Sendai Framework for Disaster Risk Reduction 2015–2030, that Malaysia is party to, recommends: “To ensure the use of traditional, indigenous and local knowledge and practices, as appropriate, to complement scientific knowledge in disaster risk assessment and the development and implementation of policies, strategies, plans and programmes of specific sectors, with a cross-sectoral approach, which should be tailored to localities and to the context” (UNDRR, 2015, 15).

In the context of Malaysian disaster management, emergencies are officially declared by the district disaster management committee, who then determine the amount of support needed from other levels and bodies, depending on the severity of the disaster (Arahan NADMA 1, 2024).

While these systems have managed to contextualise preparedness and response, this report posits that there are communities beyond the district level, namely, Peninsular Malaysia's Orang Asli communities, who also require localisation of disaster management to their contexts, and whose flood and resource management knowledge and practices we can learn from. This resonates with the Minister of Natural Resources, Environment and Climate Change (NRECC) of Malaysia, Nik Nazmi's statement that NRECC aims to more actively include the Orang Asli community in efforts to ensure environmental sustainability (Bernama, 2023).

1.3.2 Definitions of Disaster Management

These definitions of the stages of the disaster management cycle are based on our discussions with the community. We prioritise acknowledging the community's existing disaster management efforts based on Indigenous Knowledge, Systems, and Protocols (ISP), and complementing these with external knowledge and practices. We also acknowledge that the boundaries between stages are often blurred, and are unique to the particular local community and context:

Preparedness: We define preparedness as measures taken to better equip the community to handle the impacts of disasters that may come in the future and long-term. These involve initiatives that are community- and household-wide, and can include capacity building, planning, and infrastructural enhancements (i.e. building bunds, raising homes, or household items).

Mitigation: Mitigation in our context speaks to proactive disaster prevention measures that are designed to prevent disasters or reduce their impacts, and that go beyond the purview of the community. Such as, advocacy for changes in land use policy, infrastructural prevention methods such as the installation of new water pumps, improving drainage systems, or restoring wetlands.

Response: This stage focuses on immediate interventions that anticipate long-term recovery. This stage utilises community mapping and preparedness initiatives by the community, rapid assessments, and involves communication with and coordination through local leadership, to address immediate concerns such as WaSH, food and basic necessities, shelter, and health.

Recovery: This stage involves restoring the lives of affected communities, and building on immediate response towards long-term recovery. This involves cleaning, repairing and rebuilding infrastructure, addressing longer term health concerns as a result of floods (i.e. leptospirosis, dengue, and trauma), restoring livelihoods, and strengthening community resilience.

1.4 Methods

1.4.1 Fieldwork with the Orang Asli

This study is based on fieldwork with community members of Kampung Orang Asli Paya Lebar and Kampung Orang Asli Bukit Tadam. In line with the principles of FPIC (Free, Prior and Informed Consent), while introducing the project, timelines, and goals, the researchers emphasised the importance of working together with the community to shape the project design, implementation, monitoring and evaluation. Our data collection primarily involved participatory rural appraisals, participant observation, focus group discussions and semi-structured interviews. Researchers presented findings back to the community in an iterative process, as we intended for this project to be part of a longer collaboration with the communities towards community-based disaster risk management.

1. Participatory Rural Appraisal (PRA)

Participatory rural appraisal is a combination of methods that empower rural communities to share knowledge and experiences, towards participatory planning and action, as well as monitoring and evaluation (Chambers, 1996). Our team conducted the following methods:

Needs Assessment

We conducted two exercises with two groups of 8-10 men and women respectively. The goal was to discuss gender-specific perspectives and experiences relating to the three stages of floods: before, during and after. This exercise provided us with baseline knowledge of the community's experiences that guided our further engagements with the community.



Transect Walks

We conducted transect walks with both communities to better understand their ecological niches, and the community's relationship with their landscapes. In KOA Paya Lebar, during harvest season, we followed community members to their fruit orchards, and learned how they harvested the fruits; and also learned of the impacts that the floods had on their orchards. We were also invited to the *bela tandak* communal activity (caring for the water source) to learn more about the community's water resource governance, their communal spirit, and how they are affected during and after the floods. This also enabled us to better understand their landscapes and waterscapes, and visualise their stories.

In KOA Bukit Tadam, we followed community elders to important fishing areas, and partook in this important harvesting activity. Along the way, we were introduced to key areas in and around the landscape such as their oil palm orchards, the Langat River and its tributaries, important flora and fauna to the community's livelihoods, key development areas, and how these were all affected by floods.

Community Mapping

Community mapping involved three maps: 1) the first intended to understand the community's knowledge and histories of their ancestral lands; 2) The second map documented important areas during the floods and existing flood management strategies, and 3) The third map highlighted future aspirations for flood management in their village. Community mapping also served as a process of coming together to discuss the importance of IK, and of sharing this knowledge with future generations.



Roundtable with Orang Asli from the Broader Langat River Basin

Social Network Analysis

As we engaged with the two OA communities over these months, we documented data on the community's various social networks. We sought to understand the kinds of support they received and from whom, during all stages of the flood management cycle.

II. Semi-Structured Interviews and Focus Group Discussions (FGD)

After the PRAs, our research team conducted semi-structured interviews and informal focus group discussions with members of the community, to gather more in depth data on the highlighted concerns during the PRAs. We also engaged with elders to gain in-depth historical and cultural understandings of the village and of floods.



KOA Paya Lebar (FGD)

III. Roundtable with Orang Asli from the Broader Langat River Basin

We brought together community members from KOA Bukit Tadam, KOA Paya Lebar, and other Orang Asli villages across the Hulu and Kuala Langat River Basin. We shared preliminary findings, received feedback from the community, and discussed similar experiences, challenges, and opportunities for working together and thinking through flood management at the river basin broader community level. We also invited experts who work with Orang Asli communities, who offered valuable insights. The roundtable discussion findings are included in Chapter 3, and form the basis of the recommendations.



KOA Bukit Tadam (FGD)



Roundtable with MATCH Foundation and Malaysian Red Crescent Society

1.4.2 Fieldwork with External Stakeholders

I. Semi-structured Interviews and Focus Group Discussions (FGD)

Semi-structured interviews were conducted with members of the KitaMATCH network and representatives from government agencies relevant to flood management. Our goal was to gain a deeper understanding of disaster management in Malaysia, and to learn about stakeholders' perspectives on Indigenous knowledge and OA-specific guidelines.

II. Roundtable with MATCH Foundation and Malaysia Red Crescent Society

Our team and village representatives of KOA Bukit Tadam and KOA Paya Lebar presented project findings to MATCH Foundation and Malaysian Red Crescent Society leadership. We highlighted the two communities' unique flood experiences; the importance of Indigenous knowledge and practices in the communities' flood resilience; the connectivity of the river from upstream to downstream; and the kinds of support the community requires from external stakeholders.

1.4.3 Participatory Planning and Action: Community-Based Disaster Risk Management (CBDRM) Planning with KOA Paya Lebar and KOA Bukit Tadam Villagers

A CBDRM session was held at KOA Paya Lebar, facilitated by MRCS. Villagers engaged in hands-on activities and discussions on flood preparedness strategies, including basic first aid, emergency response coordination, and mental health support during crises. At KOA Bukit Tadam, efforts are focused on strengthening ongoing support and fostering long-term collaboration to build local resilience and reduce disaster risks.

2.1 The Orang Asli (OA)

The term “Orang Asli” translates to “Original People”, an umbrella term that refers to the 19 culturally and linguistically distinct Indigenous subgroups in Peninsular Malaysia (Endicott, 2016). Based on the British colonial categorisation and carried forward by JAKOA, the OA are grouped into three main groups—Semang/Negrito, Senoi, and Proto-Malay. Legally, a person is considered an Orang Asli when satisfying a set of conditions defined in Section 3 of the Orang Asli Act 1954 (Act 134). The Orang Asli number at 215,215 as of 2023, making up less than 1% of the national population, effectively identifying them as one of the minority groups in Malaysia (JAKOA, 2023).

Traditionally, the OA had subsistence economies supplemented by trade or sale of forest products (Endicott, 2016). However, in the 1980s, encroachment and introduction of natural resource extraction, large-scale development projects, and government-sponsored regroupment/resettlement schemes saw the breakdown of their traditional ways of life and livelihoods. Today, the majority of OA are rubber and oil palm smallholders while some engage in wage labour. There are also a number of professionals such as academicians and lawyers among them (Nicholas, 2022). Those who still have access to land and healthy forests, especially in interior areas, still maintain their traditional practices and knowledge such as hill paddy or millet cultivation, and hunting and gathering. Those with dwindling access to their ancestral lands and forests also continue to hold onto and pass on their Indigenous knowledge to future generations.

Presently, the Malaysian government has not recognised many of the OA customary territories due to structural challenges and multiple conflicting laws that govern people, lands, forests, and natural resources (Leonie et al., 2015). As such, the OA are among the most vulnerable communities in Malaysia. However, the OA continue to find ways, rooted in their Indigenous knowledge and practices, to adapt and be resilient in the face of these socio-economic and environmental transitions.



Temuan group performing sewang



2.2 The Orang Asli and Floods

Floods are the most common disasters in Malaysia. They are becoming increasingly frequent, intense and unpredictable, because of a combination of intensifying development and climate change (Muhamad & Shaidin, 2022). OA ancestral lands are often located on floodplains and/or flood prone areas. As a result, the Orang Asli are among the most exposed and affected by floods in the short and long term. Moreover, their land is often subjected to encroachment by development and resource extraction. This can also be traced back to histories of migration of the OA from coastal areas to the interiors due to conflict with outsiders (Endicott, 2016). This compounds the existing vulnerability of the OA, who are already among

the most socioeconomically and politically marginalised. Affected OA communities also tend to experience longer periods of recovery.

Despite this, the OA continue to demonstrate resilience in facing floods. This is exemplified especially by those living by rivers or in peat areas, who have generations of experience living with floods. During the 2021 floods, OA communities relied on community-based Indigenous and also Western scientific knowledge. Social networks built over the long-term were

also crucial to supporting their flood response in the short- and long-term. Importantly, as access to external support was delayed by flooded access roads and power cuts, the community's Indigenous knowledge and practices were key to their evacuation and survival.



Villager of KOA Paya Lebar showed us the location of the old drain, Air Putus River (Lui River used to flow through here), and their village graveyard

2.3 Definition of Indigenous Knowledge (IK)

The terms “Indigenous knowledge”, “traditional knowledge”, and “local knowledge” are frequently used interchangeably, though Indigenous and traditional knowledge are considered subsets of local knowledge (Along et al., 2022; Blaikie et al., 1997). Local knowledge stems from a community’s place-based relationship with the environment that is typically reflected in daily practices.

Traditional knowledge encompasses oral histories and practices shared across generations within a particular community while Indigenous knowledge is rooted in the traditions of Indigenous peoples, originating from long-standing cultural ties or ancestral ownership of a place (UNDRR, 2023; Hadlos et al., 2022; Cuaton & Su, 2020; Rai & Khawas, 2019).

However, the term “traditional knowledge” often carries a static implication, suggesting it does not change over time. This has led researchers, and scholars to prefer the term Indigenous knowledge (IK), which emphasises its adaptive and autochthonous nature (Matti & Ögmundardóttir, 2021; Rai & Khawas, 2019). IK is a dynamic and evolving system that continually responds and adapts to environmental changes and modern innovations. IK draws on the skills, problem solving techniques, and deep cultural traditions of Indigenous communities (Knopf, 2015; Chikaire et al., 2012; Battiste, 2005).

Chikaire et al. (2012) further describes IK as a form of local knowledge unique to a particular culture, shaped by accumulated experiences, informal experiments, and a deep connection to the lived environment. The IPCC (2019) similarly emphasises that IK emerges from sustained interaction with the environment. IK is traditionally unwritten, passed down orally from generation to generation (Nicholas, 2012; Mercer et al., 2010). According to UNDRR (2023), IK holders are deeply connected to their local environment, which guides their decision-making regarding resource management, social relationships, cultural practices, and spirituality.

For the Orang Asli, they have developed and established Indigenous systems and protocols through accumulated generational knowledge and experience of their environment. Indigenous knowledge, systems, and protocols are central to their survival as a people, enabling resourcefulness and resilience while preserving the environment within their ancestral lands (Nicholas, 2022; 2012). The report, therefore, employs the terms Indigenous Knowledge (IK) and Indigenous Knowledge, Systems, and Protocols (ISP) to document the Orang Asli Temuan’s strategies and resilience related to disaster risk management.

2.4 The Role of Indigenous Knowledge in Disaster Management

2.4.1 Importance of Indigenous Knowledge (IK) in Disaster Risk Reduction

Globally, local and Indigenous knowledge are increasingly acknowledged and advocated to be included into disaster risk reduction and management (Shaw et al., 2008; Scott et al., 2013; Hiwasaki et al., 2014; Rai & Khawas, 2019; UNDRR, 2023).

According to Along et al. (2022), local knowledge, within which IK is included, helps local communities deal with the flood risk that is contextual in nature. The keyword here is “contextual”, which holds the key to building sustainable policies in minimising the impact of disasters. While external knowledge, especially from government and humanitarian organisations, is useful, the knowledge may

not apply to specific flood and ecological contexts. The intimate connections between the communities and their ecological niche have equipped communities to have the knowledge and techniques to foresee, mitigate the impacts of, react to, and restore from floods. This is also known as Community-based Adaptation (CBA) (Danraka et al., 2024).

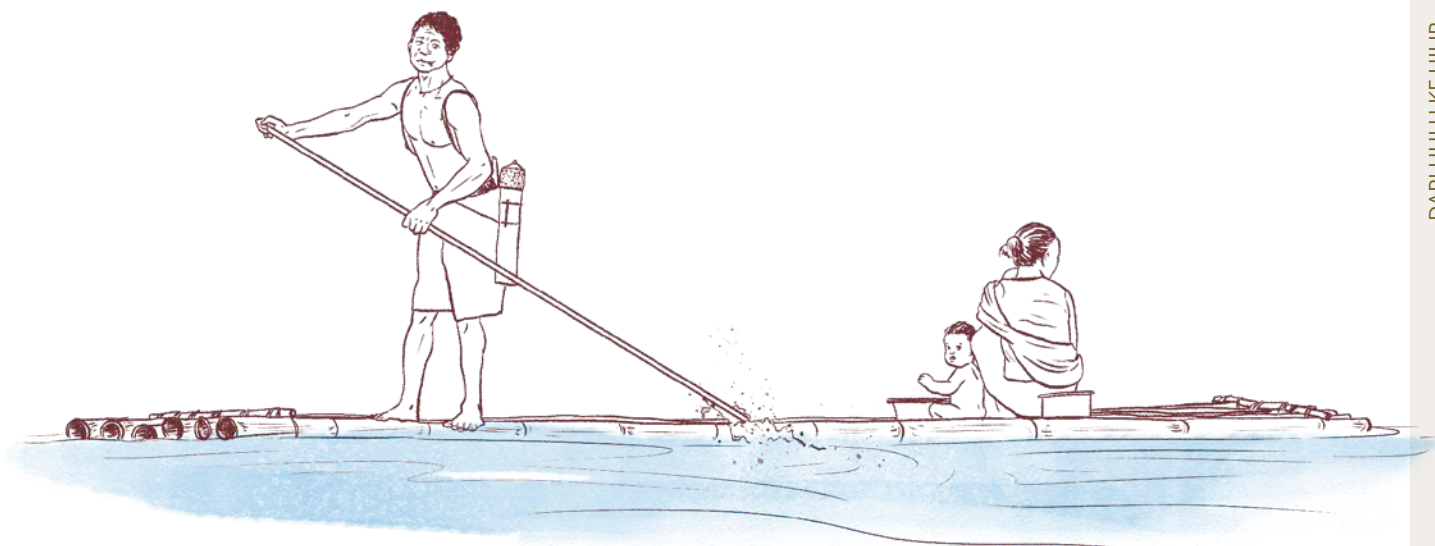
Key to flood Disaster Risk Reduction (DRR), are Indigenous community-based techniques such as flood forecasting, flood early warning, flood adaptation, and coping strategies that are developed from years of experience living with the peculiarities of their various environmental conditions (Danladi et al., 2018; Ismail-Zadeh et al., 2017; Sidle et al., 2017; Mwaura, 2008; Nyong et al., 2007). As such, IK systems are significant sources of disaster resilience in both theory and practice as IK is based on past learning and experiences of natural hazards. These provide an important component that complements structural and scientific approaches. Haque et

al. (2016) state that national strategies should incorporate community-based participation and IK to develop efficient adaptation and socioecological flood resilience systems.

Therefore, integrating IK in DRR through engaging with affected communities could provide valuable, locally-rooted guides for mapping risks and vulnerabilities of the community. This could lead to the development of holistic strategies for community resilience as well as reduction of economic loss and financial burden to all stakeholders (Rahsidi et al., 2017).



Villagers from KOA Paya Lebar shared their local knowledge related to flood



Bamboo raft built for evacuation during the floods

2.4.2 Case Studies Across Asia-Pacific

Although IK has yet to be formally integrated into disaster management strategies in Malaysia, researchers across the Asia-Pacific region have highlighted IK's critical role in enhancing community resilience. Rooted in deep, generational understanding of local environments and guided by strong communal values, IK has been vital in reducing disaster risks, enabling effective response, and supporting coping mechanisms during emergencies.

In Papua New Guinea, Indigenous communities have developed food security strategies to cope with disasters. Villagers plant hardy crops such as bananas and taro that can survive flooding, and grow yam and taro on mountainsides as a food source when they need to temporarily seek shelter on higher grounds (Sithole et al., 2015). In West Papua and the Philippines, communal spirit plays a vital role in disaster response. In West Papua, villagers support one another during crises, sharing resources and knowledge so everyone knows the best action plans or where to regroup (Mercer & Kelman, 2008). In the Philippines, voluntary collective action locally termed as *bayanihan*, guides mutual aid, especially during disasters, as people come together to help, empathize, and share each other's burdens (Hiwasaki et al., 2014).

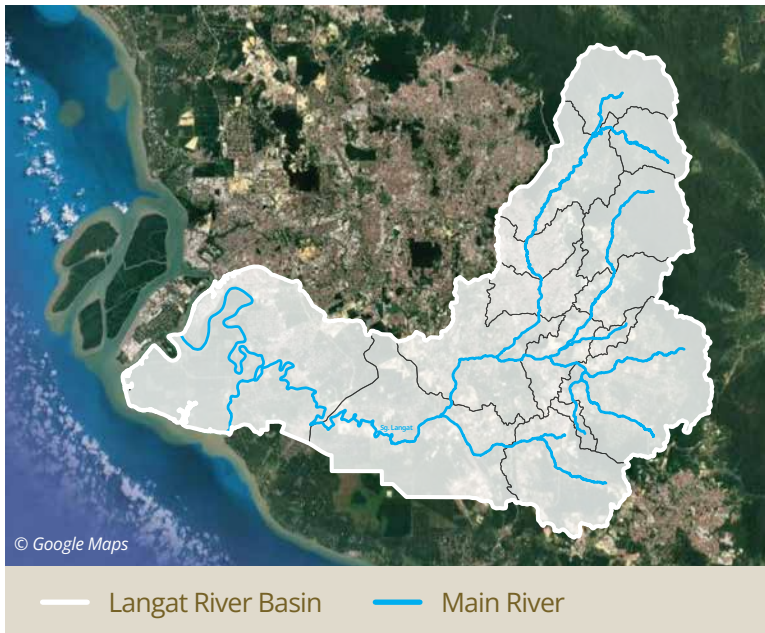
Closer to home, Abdullah et al. (2023) highlight the Batek community's coping strategies and survival skills during the 2014 devastating flood in Kelantan. These include the Batek's knowledge of bamboo raft-building, knowledge of edible plants while they found refuge up on a hill before

receiving aid from relief teams, and strong moral values of helping and sharing. The researchers concluded that comprehensive knowledge and experience sharing from the Orang Asli can enhance future emergency preparedness plans, and recommended that a similar study can expand to include cultural, spiritual, financial or psychological elements to enrich their findings.

Ayob et al. (2016) wrote about the Temiar community's IK on food sources during the 2014 monsoon flood. The authors examined the types of plants and tubers used as alternative food sources by the affected Temiar villagers when they evacuated to nearby hills to escape the flood. Due to access to the village being inundated by floodwaters, accessibility to basic needs such as food, medicine and relief centres were cut off. Meanwhile, the villagers face delayed food aid as well as reduced food trade, particularly for rice, salt, canned food and sugar. The Temiar community tapped into their IK and looked for alternative food sources of edible, wild plants and tubers.

These studies underscore the importance of IK, which is deeply embedded in the daily lives of communities and central to their resilience in the face of natural hazards. These knowledge offer practical, locally grounded strategies that enhance community security and well-being before, during, and after disasters. Integrating IK into flood management policies not only enriches existing approaches in participatory and sustainable ways but also fosters community ownership and empowerment in reducing disaster risk.

BUKIT TADOM AND PAYA LEBAR FINDINGS



3.1 The Temuan and the Langat River Basin

The *Dari Hulu ke Hilir* project collaborated with the Temuan Orang Asli of the Langat River Basin, Selangor, to document their ISPs and IK. The Temuan belong to the Proto-Malay group, and constitute the fourth largest Indigenous group among the Orang Asli population of Peninsular Malaysia. They inhabit the western parts of Peninsular Malaysia, mostly living in the states of Selangor and Negeri Sembilan, as well as in Pahang, Malacca, and Johor (Carey, 1976).

Temuan villages are often formed from a number of closely related nuclear families, bound by kinship and affinal ties (Gomes, 1979). These families' houses are usually built close to one another within the village. Temuan villages are traditionally governed by a headman, the Tok Batin who governs matters concerning customs and traditions. Today, they are also led by a JAKOA-sanctioned Village Development and Security Committee (JPKKOA) that oversees administrative and community development matters.

In the past, Temuans practised swidden farming, including both wet and dry rice cultivation alongside other crops, supplemented by hunting, fishing, and gathering, as well as trading of forest products with external groups (Dunn, 1975). Today, they plant

rubber or oil palm, cultivate fruit trees and other crops, run small businesses, or engage in wage labour whether in the private or public sectors. In the case of the Temuans of the Langat River Basin, their socio-ecology and -economy vary from upstream to downstream, according to the diverse landscape and land use change along the Langat River.

The Langat River Basin, approximately 183.65km long, and covering an area of 2,663 km², flows through the states of Selangor and Negeri Sembilan, as well as the Federal Territories of Kuala Lumpur and Putrajaya—making it the largest river basin in Selangor. The Langat River originates from Gunung Nuang in Hulu Langat and drains into

the Straits of Malacca at Kuala Langat. Its main tributaries are the Labu, Beranang, and Semenyih Rivers, and around 40 smaller tributaries flow into Langat River - including the Lui River. As one of the main rivers in Selangor, with two reservoirs, Semenyih Dam and Langat Dam, the Langat river is one of the essential water sources for the state. Besides water supply, the river is also utilised for ecotourism, fishing, irrigation, effluent disposal, and sand mining.

The Langat River basin has undergone significant changes over recent decades from forested rainwater catchments to extensive agricultural, residential, commercial, and industrial developments—significantly altering the Temuan's way of life. These changes also led to flash floods becoming the predominant type of flooding in the region, especially during the year-end intermonsoon period (Ahmed et al., 2016; Lim et al., 2023). Communities in the Langat River Basin were severely affected by, and continue to recover from the 2021 end-of-year floods. These were caused by Tropical Depression 29W, which brought with it four days of unprecedented rainfall. Many villages upstream were damaged by flash floods. Meanwhile, downstream communities experienced weeks of stagnant floods as water from the entire river basin made its way downstream, and met with the high tide phenomena in the Straits of Malacca.

Hulu Findings — KOA Paya Lebar

3.2 Hulu Findings — KOA Paya Lebar

3.2.1 About KOA Paya Lebar



Kampung Orang Asli Paya Lebar

Kampung Orang Asli (KOA) Paya Lebar is located in Batu 23, Hulu Langat, Selangor. By road, it is only accessible via a metal bridge across Lui River, a tributary of Langat River. The village is led by Tok Batin Aning bin Embong, Chairman Azroy bin Aba and members of the JPKKOA. Its population is estimated to be at 400 people with around 70 families. KOA Paya Lebar (14 acre) is gazetted as Orang Asli Reserve under Section 7, Act 134.

The village is in a valley approximately 100m above sea level, surrounded on three sides by steep mountain ridges rising about 1100m above sea level. Lui River flows right by KOA Paya Lebar and is fed by three big rivers upstream — Leweng, Sekeu, and Ropok — and many smaller streams.

Previously, the village was located in a wide and marshy valley where the Temuan villagers once cultivated rice in flooded plains. However, they stopped cultivation in the 2000s when it became difficult to irrigate their fields due to river

siltation. According to Tok Batin Aning, floods devastated the irrigation system in the past. Eventually, the rice fields were reclaimed by sand and the villagers

moved to where they are located today. Similar to the past, the village is structured where families related through kinship have their respective houses built close to one another.



Tok Batin Aning

Today, the Temuan of KOA Paya Lebar are settled agriculturalists with *dusun* (ancestral orchards) and *kebun* (privately-owned farms), which consist of rubber trees, fruit trees, and edible crops. The community also tends home gardens. Their ancestral lands are located in the Hulu Langat Forest Reserve. Most of the KOA Paya Lebar villagers depend on earnings from rubber tapping, selling banana leaves and other crops, and fruit tree cultivation and sales of the harvest during the fruit season. The remaining villagers work in factories and in civil service.

The community is highly dependent on the streams and rivers for clean water. In KOA Paya Lebar, water access comes in two forms:

1. The communal gravity-fed water system with its catchment from the Sekeu River, which supplies water to all homes.
2. Household-owned gravity-fed water systems with catchments from other streams and springs, installed by households with the resources to do so.

This reliance on varied water sources is reflected in their customs (*adat*) and belief systems that emphasise stewardship and care for their lived environment and ecosystem.

3.2.2 Types of Floods

Flooding is rare in KOA Paya Lebar. However, when floods do occur, they bring severe consequences, including mudslides, wood debris, landslides, and significant damage to personal property. In the 1980s, flooding from the Lui River led several family groups to move to higher grounds. Today, these families form KOA Genting Peras, Tanjung Rambai, and Ongkel along the Jalan Semenyih–Kuala Klawang highway.

	TYPE	CAUSES
Major flood — year 2021	Strong, fast, rapid flood water with mud and wood debris. Recedes within a few hours. The flood water level reached chest level.	Continuous rain (heavy and light) for 3 days (due to Tropical Depression 29W crossing the peninsula from the South China Sea).
Minor floods — every 10 years or so	Only affects homes located in the lower areas of the village. Recedes within a few hours.	Heavy downpour.
Major flood — year 1971	Strong, fast, rapid flood water with mud and wood debris. However, the 1971 flood water level was not as high as compared to the 2021 flood.	Continuous rain (heavy and light) for 7 days.

Table 1: Types of floods at KOA Paya Lebar



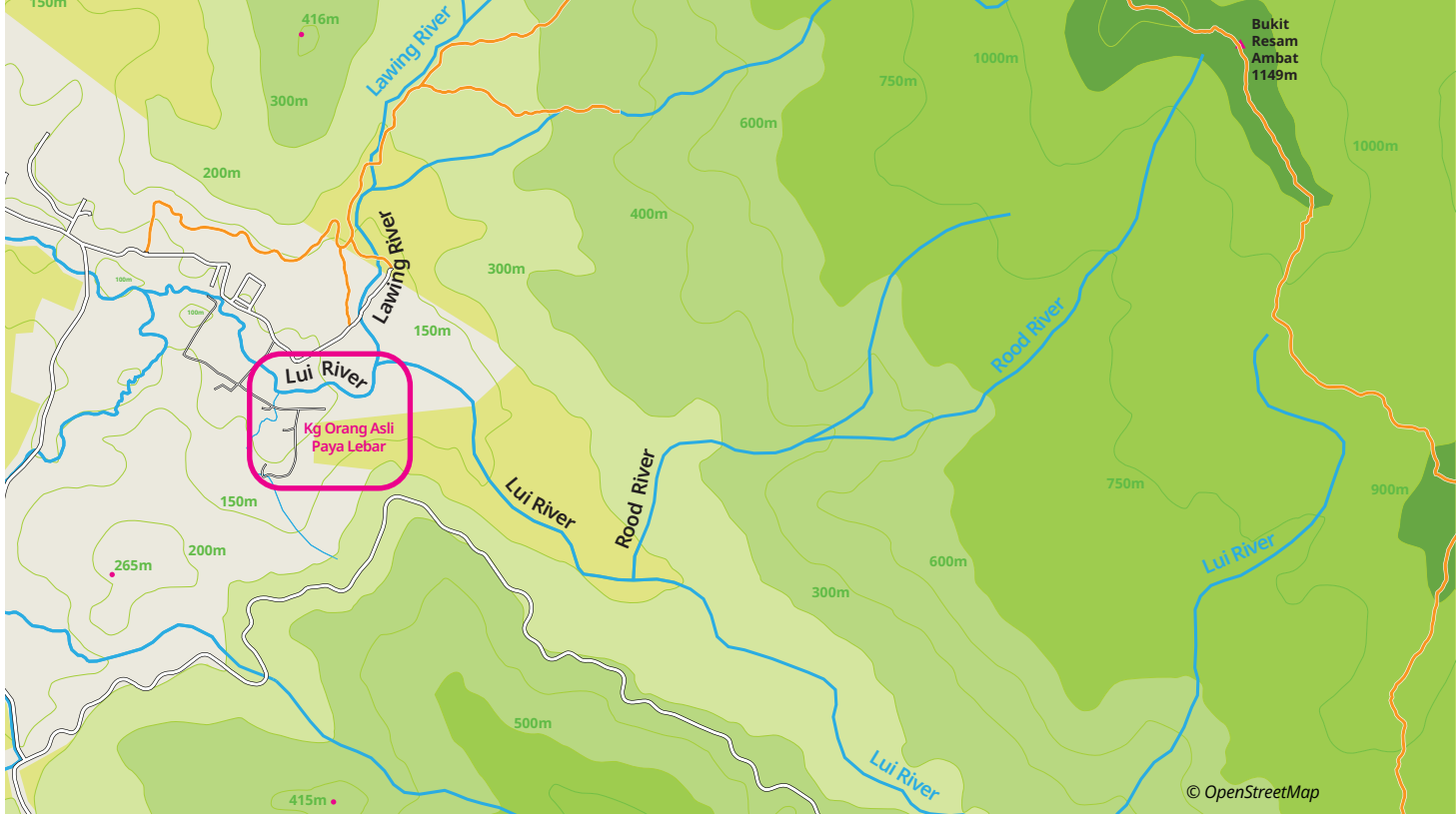


Figure 1: Map showing KOA Paya Lebar, situated in a valley surrounded by steep mountain ridges and an extensive river network

3.2.3 Perceptions of Floods

Causes of Floods

The majority of the community attribute the 2021 floods to continuous torrential rainfall. These were exacerbated by landslides upstream, turning the river into rapids that brought mud and wood debris downstream. The village is located in a valley at the foot of Gunung Hitam range, and is a floodplain due to its close proximity to the Lui River, which is connected to an extensive river network upstream. With torrential rainfall such as the 2021 incident, water flows rapidly downstream through these networks into the Lui River, causing flash floods.

The community associates the causes of landslides with past logging activities. Tok Batin noted that logging occurred more than 20 years ago, before he was elected headman. Loggers accessed the forest via Genting Peras and logged upstream of Siong, Ropok, and Sekeu Rivers. Although secondary forest growth has since regenerated, the thinned canopy and weakened root system are insufficient to stabilise the soil during continuous heavy downpour, further amplifying the likelihood of landslides and flooding.

Perceptions and Indigenous Knowledge of Floods

The upstream Temuan have a flood story that is closely tied to their *kepercayaan moyang* (ancestral beliefs). Some villagers maintain that the flood is

caused by their *moyang* (ancestors) in the form of *naga* (serpent- or dragon-like creatures), travelling from the mountain to the sea. The mountain *moyang* make their way down after they have gained enough wisdom in the mountains and seek to battle the sea *moyang*. Their route is by way of water, so rain would precede its journey, bringing with it tree debris and a flood, as the ancestor travels downstream.

Before the flood comes, some villagers would receive dream warnings from the *moyang*, in which the *moyang* would inform their *cucu* (descendants) of their wish to descend the mountain. Thereafter, a flood would pass through the village on the *moyang's* journey towards the sea. KOA Paya Lebar did not face any casualties during the floods as some villagers believe that their ancestors fulfilled their request for protection from flood disaster. The understanding of floods is also connected to the belief of the Temuan—if the people do not take good care of nature in accordance with their *adat* (customs), floods will happen. “*Kita jaga moyang/alam, moyang/alam jaga kita*”, which translates to, “We look after the environment, and it will look after us.”

Based on their deep understanding of their lived environment and the interconnectedness of the river system, the KOA Paya Lebar community asserts that flooding upstream (their village) inevitably leads to downstream flooding (near KOA Bukit

Tadom and the broader Kuala Langat area). This IK is also present in the other Orang Asli villages within the Langat River Basin, highlighting a shared understanding of their river systems. There is also a general consensus that the changing climate and volatile weather patterns have caused unpredictable rainfall and heavier precipitation.

3.2.4 What Happened During the 2021 Flood

On 18 December 2021, after several days of continuous rain, floodwaters surged between 7pm and 8pm, inundating the area from all directions, as depicted in Figure 1. In a single day, rainfall in Selangor reached up to 363mm compared to the average monthly rainfall of 300mm for December (Bernama, 2021; World Weather Online, 2024). The extensive river network upstream and the surrounding mountains directed rapid waters into the valley in which KOA Paya Lebar is located. Landslides further intensified the situation by channelling debris and mud into the floodwaters, resulting in a flash and mud flood.

The villagers were unable to evacuate to the designated PPS at Dewan Lui in Batu 21 as the Lui River had already swollen into a dangerous rapid. Instead, they evacuated to the BUDIMAS community library as it was the largest and only communal space built on stilts in the village. During that time, both electricity and mobile phone signals were disrupted, for about two weeks. The floodwaters began to recede between midnight to 3am, and the community immediately set to work cleaning, repairing, and rebuilding their homes and village. Access to clean water, as well as water supply in general, was one of the most critical post-flood challenges. Cut off from the outside world for the first few days, the community survived on their own knowledge and resources until flood relief arrived.

However, the community observed that flood relief efforts were often uncoordinated, unsystematic, and not tailored to their specific needs. Aid distribution often failed to account for the actual number of villagers or households, leading to wastage and unequal allocation. This was an added burden on the village leadership, who took the responsibility to manage incoming aid while also attending to their own recovery efforts. For example, flood relief sometimes arrived in the early hours of the morning, requiring JPKKOA members to remain on standby to

assist NGOs and receive the aid, even as they were rebuilding their own lives.

Flood Impacts

Short Term

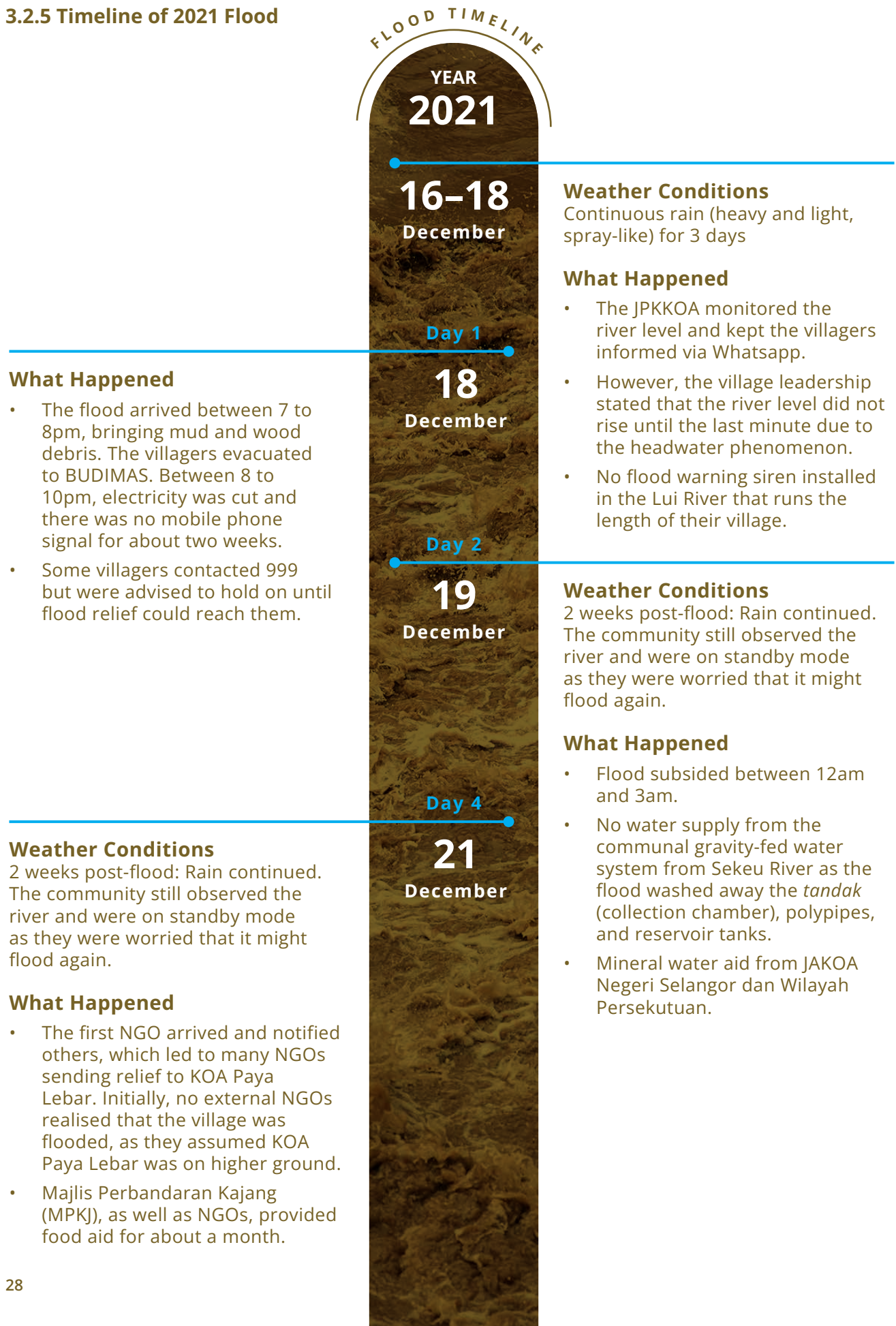
The flood inundated homes, leaving behind thick layers of mud inside and piles of wood outside of some homes. It damaged the floors, walls, windows, doors, household items, and personal belongings, and left their village surroundings resembling a desert as it swept away their home gardens and killed fruit trees in the vicinity. Some villagers also fell ill from exposure to the continuous rain and the lack of dry clothing. There was also the risk of exposure to solid waste, and liquid waste from sewage. Meanwhile, only one major road coming from Kuala Lumpur and Selangor, Jalan Sungai Tekali, was accessible to the village as the other roads were cut off by the flood and landslide debris. This affected their access to shops to purchase necessities, and access of aid workers to provide support to the community. During the post-flood period, agricultural activities were halted as the community focused on the recovery of their families and homes.

Long term

To date, the water quality and general access to clean water remain an issue due to the damaged riverbank from the landslide, as well as the high cost of rebuilding their gravity-fed water system. While government cash aid supported some of their repairing and rebuilding, it was not sufficient to cover the total damage. This included their vehicles (cars and motorcycles) and expensive home appliances such as refrigerators and washing machines. To this day, some villagers are still repairing their homes and replacing their household items.

In terms of livelihoods, not many crops were lost from the flood, however the flood water damaged tree roots that were submerged. This caused some of their fruit trees to not bear fruit for two years. For trees, crops, and seedlings that were destroyed by the flood, the community said that they have to wait another 5 to 10 years before they could enjoy the fruits of their labour. From an emotional health perspective, heavy and continuous downpours remain traumatic to the community.

3.2.5 Timeline of 2021 Flood



Day 5

22
December

Weather Conditions

2 weeks post-flood: Rain continued. The community still observed the river and were on standby mode as they were worried that it might flood again.

What Happened

The Gombak Orang Asli Hospital Mobile Team (PBOA) carried out a medical and health aid mission in the village.

Weather Conditions

2 weeks post-flood: Rain continued. The community still observed the river and were on standby mode as they were worried that it might flood again.

What Happened

Villagers went to reconnect their polypipes and clean the community-built rock dams to have water to clean their houses as well as for drinking and cooking.

19-22
December

Day 9

26
December

Weather Conditions

2 weeks post-flood: Rain continued. The community still observed the river and were on standby mode as they were worried that it might flood again.

What Happened

Chairman of the Selangor State Standing Committee on Indigenous Affairs visited the village. Other political parties that sent aid are: UMNO, BN, MIC.

Day 11

28
December

Weather Conditions

2 weeks post-flood: Rain continued. The community still observed the river and were on standby mode as they were worried that it might flood again.

What Happened

Donation of polypipes, water connection equipment, and labour for the installation by Kedah Menteri Besar and related agencies.

Day 30+

8
January 2022

What Happened

Minister of Environment and Water (KASA) visited the village to inspect the effects of the flood.

Day 30+

What Happened

- On a TV3 online news report, ex-chairman of JPKKOA Paya Lebar, Aba Chahim requested that JPS and JAKOA deepen the river and construct a bund at the riverbank.
- He also stated that the village still did not have access to water, therefore asked for a proper *tandak* to be built.

30

January 2022

**After
2022**Chinese
New Year**What Happened**

There was a total of RM4,000 cash aid provided by the government. However, villagers noted not every household received the full amount as well as additional aid. This was reportedly due to the lack of assistance and poor digital literacy in online cash aid applications, and unclear criteria and selection process in determining cash aid eligibility.

What Happened

JAKOA built the *tandak* at Sekeu River.

**After
Mid-
2022****2024****What Happened**

- Sekeu River is still murky due to the floods that damaged the riverbank. This is due to the lack of a tree root system to prevent soil erosion and silt from entering the river water whenever it rains.
- Some villagers are still rebuilding their homes.

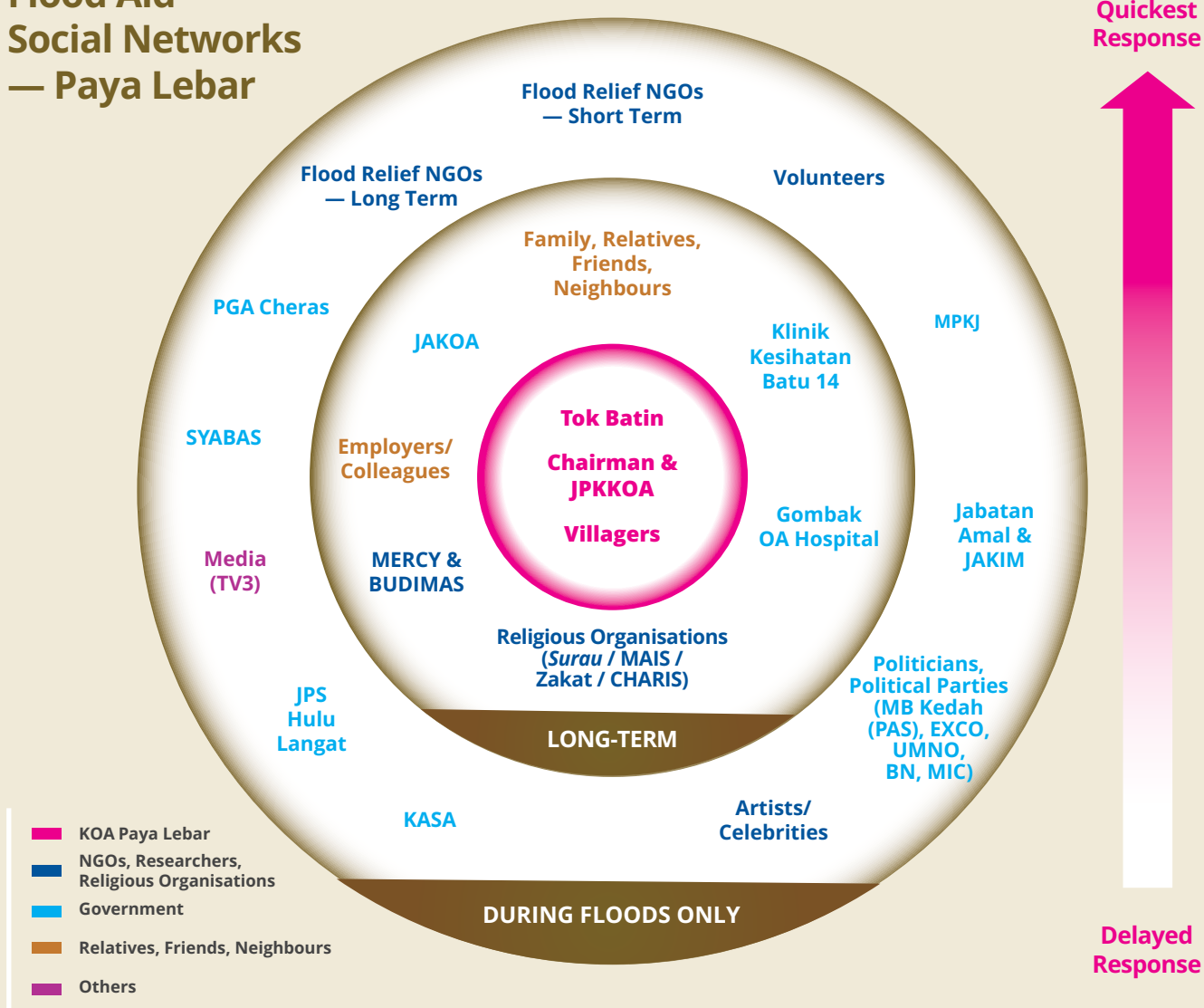
3.2.6 Flood Aid Social Networks

As KOA Paya Lebar does not experience annual flooding, the community do not have the same level of preparedness as their downstream relatives. Nevertheless, the community demonstrated their communal spirit, resilience, and resourcefulness in coping with the flood. They supported one another throughout the disaster, with immediate families and relatives playing a key role since their homes were built close together. As a small village, the close-knit community was able to look out for each other, especially during the

evacuation to the shelter and surviving on existing resources before aid arrived.

The key decision makers before, during, and after the flood are the Tok Batin and the JPKKOA Chairman and Committee Members. They kept the community updated and informed about the river situation pre-flood via Whatsapp. When the mobile phone signal was lost during the flood, they went from house to house to check on the community once the flood subsided. They are also the intermediary between the community and external groups such as the NGOs and government agencies.

Flood Aid Social Networks — Paya Lebar



Flood NGOs – During Floods Only: Activated during flood seasons only to address urgent and immediate needs

Flood NGOs – Long-term: Engaging communities across all phases of the Disaster Risk Management cycle

Figure 2: Long-term and during floods only aid social networks in KOA Paya Lebar

During Floods Only

The community stated that NGOs and volunteers from across Peninsular Malaysia were the first to respond in providing flood relief. This was later followed by other government agencies. They highlighted that PGA Cheras and MPKJ supplied clean water and ready-to-eat meals respectively for the longest duration. The media brought attention to the community's plight. Politicians and political parties followed after, with the notable aid being the donation and installation of polypipes by the Kedah Menteri Besar. Artists and celebrities were the last to arrive, providing a platform to amplify the community's flood experiences.

Long-term Support

Since flood disasters are less often faced by the community of KOA Paya Lebar, they were unsure of whom to reach out to in seeking flood relief. Despite this, friends, colleagues, and employers stepped in to support the villagers during their time of need. Long-term government support for the community primarily comes from JAKOA, the PKD Orang Asli (Klinik Kesihatan Batu 14), and the Gombak

Orang Asli Hospital (HOAG). Key NGOs, such as BUDIMAS and MERCY, have maintained a consistent presence in the community. BUDIMAS built the children's library in the village and organises outreach programs, including health and hygiene talks. This library happens to be one of the only structures built on stilts in KOA Paya Lebar, and has become their unofficial PPS. Meanwhile, MERCY has provided long-term support through home rebuilding efforts and post-flood monitoring.



2 MERCY homes were built for KOA Paya Lebar villagers who lost their houses during the 2021 flood



Villagers of KOA Paya Lebar worked together to repair the water pipes

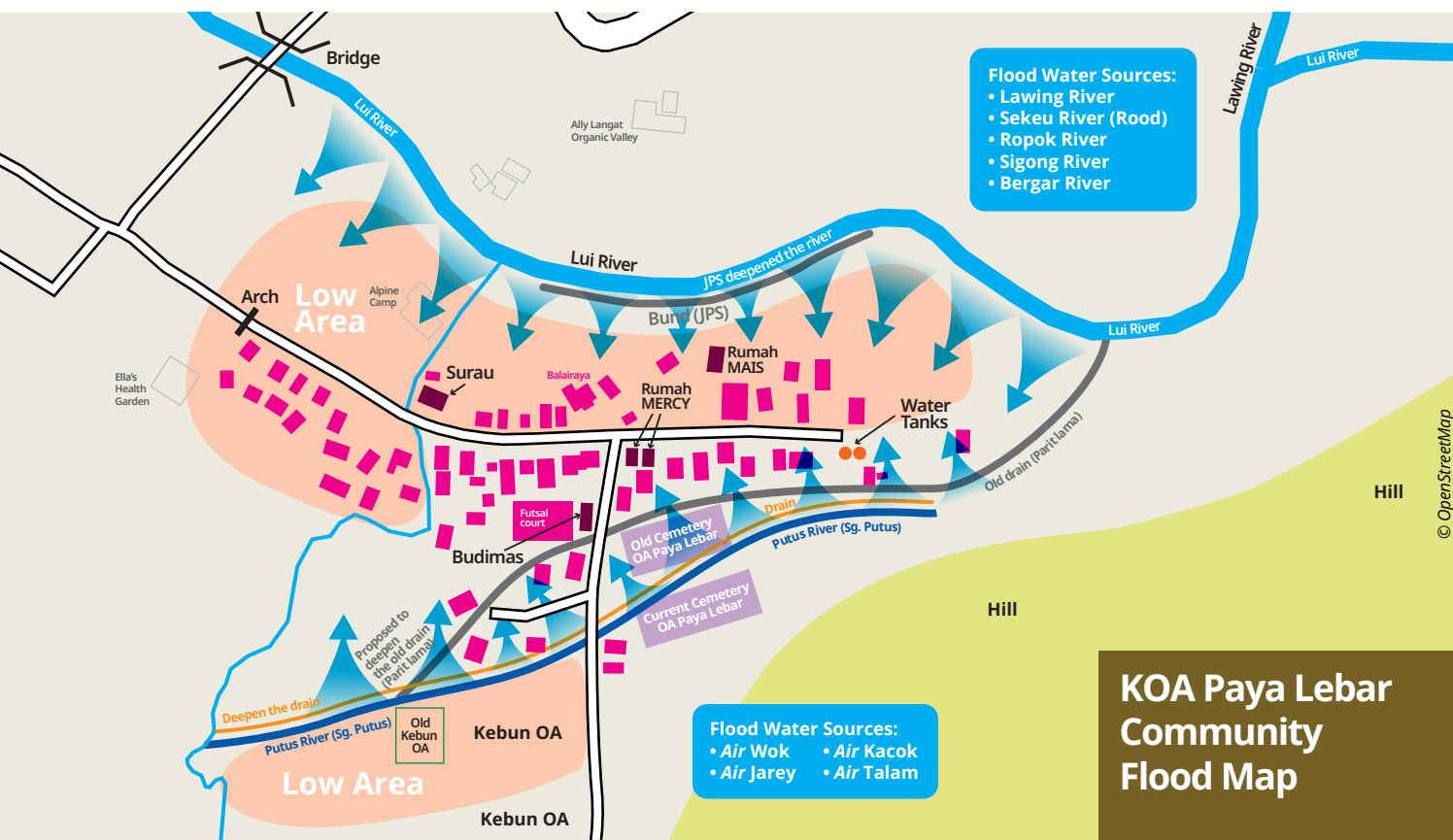


Figure 3: Community flood map highlighting source of flood, high and low-lying areas of the village, and current and suggested flood mitigation measures. The flood inundated both high and low-lying areas, with homes in the low areas being the worst affected due to the higher water levels

3.2.7 Community Resource Mobilisation

When the community realised that they would be isolated in the days following the 2021 flood, they leaned on their **Indigenous Knowledge, Systems, and Protocols (ISP)** to respond swiftly and effectively. This section explores how the community tapped into their ISP to navigate post-disaster challenges, complementing external humanitarian assistance efforts before, during, and after the flood. By relying on their Indigenous knowledge, resource management strategies, and well-established community protocols, the community was able to maintain resilience and ensure the wellbeing of each community member.

During Floods

HUMANITARIAN



a. WaSH (Water, Sanitation, Hygiene)

The communal water polypipes, water tanks, and dam were swept away and destroyed during the flood. Household-owned water pipes were also impacted but with less severe damage.

ISP

Drawing from their knowledge of the area's river system, the community is aware that Sekeu River was the most impacted by the landslides and flood, and which streams originate from the same hill where the landslides occurred. This knowledge enabled them to quickly determine which rivers and streams were safe to source water from.



b. Shelter

Evacuation to the official PPS located approximately 5km outside the village was extremely risky as villagers had to cross a bridge over the swollen river. The community was also aware that floodwaters tend to accelerate as they flow downstream. There were also vulnerable individuals in the community, including the elderly, pregnant women, the sick, those with special needs, and people with disabilities, who required extra care and assistance during the evacuation. Thus, they evacuated to an unofficial PPS in their village.

ISP

The community relied on their familiarity with the pathways in the village to reach safer ground. Their communal spirit played a crucial role in (1) Guiding one another in the darkness, and (2) Assisting to carry ill and disabled individuals to safety, ensuring safe evacuation. Based on their past experience of flood and knowledge of the landscape, the villagers first moved to houses on higher grounds which they expected not to be affected by the flood. However, the 2021 flood inundated all houses. They then headed to the BUDIMAS library due to two factors: (1) it is located on higher ground, and (2) the BUDIMAS structure has metal stilts and is therefore raised a few feet from the ground. They also reasoned that the building could withstand impact from any wood debris. However, the library was not large enough to accommodate all the villagers, forcing them to squeeze into the limited space available.

Before & After Floods

HUMANITARIAN



a. WaSH (Water, Sanitation, Hygiene)

All households lost access to water for cleaning, drinking, and cooking. The community received aid in the form of bottled mineral water from NGOs and government agencies, while PGA Cheras sent a *tangki lurus* (water truck) for drinking and cooking. Two weeks post-flood, the community received aid to rebuild their communal gravity-fed water system. There is also the issue of solid and liquid waste from the community and neighboring areas overflowing into the village during the floods.

ISP

Within 1 to 5 days after the flood, villagers with household-owned water pipes began repairing their polypipes to secure water for cleaning their homes. By the time aid arrived, most households had already restored their water access, although not all sources were suitable for drinking or cooking. This quick restoration applied only to household-owned polypipes that were merely disconnected and could be salvaged. Once water access was restored, the community shared with families whose households were unable to restore their own access to water.

The community was quick to respond as they already have an existing practice they refer to as *bela tandak*, which translates to caring and maintaining their water source and water system. The only external support they needed were new polypipes, connectors, and reservoir tanks. For the rebuilding of their communal gravity-fed water system, Tok Batin Aning led the crew and chose an alternative area along Sekeu River as the new water catchment as the flood destroyed the previous one. Sekeu River was chosen as the new location for water to be piped to the village as it is after the last Malay village and they knew that the water is uncontaminated.



b. Food Security & Basic Necessities

Essential aid such as ready-to-eat meals, drinking water, dry food, cooking gas and stoves, clothing, dignity kits, baby kits, and candles and matches were distributed to the villagers by NGOs and government agencies. They also received other household items such as utensils, tableware, mattresses, washing machines, refrigerators, among others. However, the community noted instances of food wastage due to oversupply of ready-to-eat meals. In some cases, households received excess of the same item, such as cooking stoves. Meanwhile, some households reported not receiving certain types of aid, highlighting an imbalance in distribution. For instance, NGOs only distributed aid to houses located along the main road in the village, leaving more interior or remote households underserved.

ISP

While waiting for assistance to arrive, the community survived on their existing food supply that was not washed away or destroyed by the flood. Those who still had access to dry foods as well as cooking gas and stoves shared their resources among family members and relatives.



c. Shelter

After the flood receded, some villagers returned to sleep in their own homes or in the homes of relatives, provided there were rooms that had not been inundated by mud. The remaining villagers continued to stay in BUDIMAS, while some moved to the 2nd floor of the *surau* (prayer hall) temporarily until their homes were cleared enough to sleep in.

ISP

The community has deep generational knowledge of their lived environment and the broader Hulu Langat landscape. Therefore, KOA Paya Lebar is advocating for a shelter within their village—large, sturdy, and high enough from the ground for safe evacuation and refuge during flood disasters.



KOA Paya Lebar community library by BUDIMAS



d. Health

Many villagers fell ill with fever, cough, and flu after being drenched during the evacuation. The continuous rain and chilly weather exacerbated their condition. Most were unable to pack spare clothes and medications, while the flood either washed away or damaged their clothing and medical supplies at home. The Gombak Orang Asli Hospital, Klinik Kesihatan Batu 14 Hulu Langat, NGOs, and other agencies provided medication supplies.

ISP

The villagers shared available medications among themselves until aid arrived four days after the flood.



Cleaning the mud from the affected home at KOA Paya Lebar



e. Post-disaster (cleaning, repairing, rebuilding)

NGOs and volunteers provided cleaning tools and offered their labour to help with cleaning. Severely damaged homes, especially the ones located by the river and at the lower areas in the village, were rebuilt—two by MERCY and one by MAIS. Under the Bantuan Banjir Keluarga Malaysia initiative (MKN, 2022), the government allocated RM4,000 in cash aid and up to RM5,000 for home repairs. However, not all affected households received the full amount of the cash aid as well as the home repair aid (which was the BPR aid). This was reportedly due to the lack of digital literacy and assistance in online cash aid applications, gaps in access to information, and transparency in the distribution process. This prompted some villagers to question why their homes did not qualify for BPR, despite their homes being as damaged as those who qualified. For instance, during the Dewan Rakyat session in January 2022, it was disclosed that 439 households were eligible for BPR assistance nationwide (Tengku Abdul Aziz, 2022, p. 26), though the eligibility criteria were not clearly outlined in the proceedings.

ISP

The flood subsided within the night and the community started cleaning immediately. They made makeshift shovels to remove the mud, shared water supply among themselves for cleaning, and used chainsaws to cut, burn, and remove the wood debris. Households with water access shared it with those without, taking turns to gradually clean the mud from their homes. Meanwhile, the community replanted their home gardens and the village surroundings, as well as their *kebun* using existing seeds and seedlings. Repairing, rebuilding, and replanting continue to this day.

DISASTER MANAGEMENT



a. Preparedness

The Lui River that flows beside KOA Paya Lebar does not have a flood warning siren installed. However, it is one of the most upstream tributaries of Langat River and should have a siren. As above-mentioned, flooding in KOA Paya Lebar foretells the flooding of the rest of Hulu Langat. Additionally, the villagers noted that they did not receive any flood warning or information from government agencies prior to the 2021 flood.

The community had the knowledge of what to pack (important documents, food, baby milk and kits, clothes, and blankets) and save (chainsaw, grass cutters, and refrigerators) based on priorities and needs. However, the strong flood knocked down some items placed on top of shelves or racks.

ISP

Based on their oral tradition, historical accounts, and past experiences of flood disasters in their area, the community have early warning systems that include rain types, observation of the river levels, colour of water, dream warnings from *moyang*, and animal behaviour.

Type	Description
Observation of rain intensity and type	Continuous rain that changed between heavy downpour and fine, spray-like rain for 3 days. The 1971 flood saw continuous rain for 7 days before the flood arrived. Therefore, the 2021 flood was unexpected.
Observation of the river levels	To monitor if the Lui River water level rises due to the continuous rain. However, the river did not rise until the very last minute when the flood struck.
Water quality	Usually when it rains, the rising river water is whitish in colour. However, the rising river water observed in the streams during the 2021 rain was murky, or what is colloquially known as <i>teh susu</i> (milk tea). This is a sign that the soil upstream/uphill has eroded and the heavy downpour will push the water and soil downstream/downhill.
Dreams	Two elders in the village received dream warnings from their <i>moyang</i> a week before the flood, as anecdoted above. One of them added that the rain preceding floods would change between heavy and light to soften the ground, corresponding to their early warning system of rain type.
Animal behaviour	The freshwater fish rise to the surface of the river, still alive. This is contrary to the usual floating fish, which are often dead.

Table 2: Types of community early warning systems at KOA Paya Lebar



b. Mitigation

JPS has deepened part of Lui River and raised part of its embankment. However, both mitigation efforts are only carried out within the KOA Paya Lebar boundary and not further upstream as beyond their boundary is private land. JAKOA had recently built drains along the village main road, however this drainage system does not extend to the deeper areas of the village.

ISP

The village leadership stated that the drainage system should follow the old drainage system, as shown in Figure 3. They also stressed that the deepening and raising of the embankment should extend beyond the boundaries of their village to upstream areas. This recommendation is based on multigenerational knowledge of the complex river network in their area, whereby powerful floodwater would flow from upstream, intensified by gravity as it travels downward from the surrounding mountainous terrain. If mitigation measures only address the part of the Lui River beside KOA Paya Lebar, and not further upstream, the community stated that the risk of flooding in their village will remain high.

3.2.8 Summary of Findings

During Floods		
Cluster	Challenges & Actions	Indigenous Knowledge, Systems, and Protocols (ISP)
HUMANITARIAN		
WaSH	The communal gravity-fed water system was destroyed, while household-owned gravity-fed water systems experienced less damage.	The community used their knowledge of the river system to identify the flood and landslide impacts on Sekeu River, and to locate safe and clean water sources.
Shelter	Evacuation to the PPS at Dewan Lui, Batu 21 was risky due to accelerating floodwaters. Vulnerable individuals (not limited to the elderly, pregnant women, and the physically challenged) required extra care.	Community guided one another, relying on past flood experiences and knowledge of the village landscape. They first moved to higher grounds and then to BUDIMAS (due to its higher elevation and sturdy construction). BUDIMAS, however, could not accommodate everyone.

Table 3: Summary of findings at KOA Paya Lebar

Before & After Floods		
Cluster	Challenges & Actions	Indigenous Knowledge, Systems, and Protocols (ISP)
HUMANITARIAN		
WaSH 	- Bottled water and clean water in tanks were provided by NGOs and government agencies. - The communal gravity-fed water system was rebuilt with external aid but with community consultation. - Solid and liquid waste management should be addressed as part of flood management.	- The community self-recovered and self-restored household-owned gravity-fed water systems within 1-5 days post-flood using <i>bela tandak</i> practice. - Community shared water among those whose water access couldn't be restored.
Food Security & Basic Necessities 	Essential aid and household necessities were provided. However, there was wastage of ready-to-eat meals and over- and under-supply of specific aid due to uncoordinated response from external groups.	Villagers shared food and other supplies with each other. Some caught and cooked fishes left by the floodwaters.
Shelter 	Some villagers returned home or stayed with relatives, while others continued to shelter in BUDIMAS or temporarily moved to the <i>surau</i> .	Villagers advocate for a tall, sturdy shelter within the village based on their knowledge of the environment and flood risks.
Health 	The Gombak Orang Asli Hospital, Klinik Kesihatan Batu 14 Hulu Langat, NGOs, and other agencies provided medication supplies.	Villagers shared medications with each other that were not washed away by the flood.
Post-Disaster Recovery 	- NGOs and volunteers provided cleaning tools and offered their labour to help with cleaning. - Three homes were rebuilt with government assistance and an NGO. - Financial aid was inconsistently distributed.	- Households with water access shared water supply with others. - Makeshift tools to clean homes - The community replanted gardens and farms using available seeds and seedlings. - Repairing, rebuilding, and replanting continue to this day.
DISASTER MANAGEMENT		
Preparedness 	- No flood warning sirens installed. - Villagers did not receive any warning from government agencies before the 2021 flood. - Keep/Pack important items, documents, food and basic necessities.	Early warning systems that include rain types, observation of the river, colour of water, dream warnings from <i>moyang</i> , and animal behaviour.
Mitigation 	- JPS deepened part of the Lui River and raised part of the embankment, but work only extended to the village boundary. - JAKOA built drains along the village road, but they do not reach the back of the village.	Village leadership suggests following and deepening the old drainage system.

Table 3: Summary of findings at KOA Paya Lebar

Hilir Findings — KOA Bukit Tadam



Figure 4: Map showing KOA Bukit Tadam, KOA Paya Rumput, and KOA Mutus Tua, situated along the Langat River and surrounded by encroaching development

3.3 Hilir Findings — KOA Bukit Tadam

3.3.1 About KOA Bukit Tadam

Kampung Orang Asli (KOA) Bukit Tadam is located in Banting, Kuala Langat, Selangor. KOA Bukit Tadam consists of three villages - Bukit Tadam, Paya Rumput, Mutus Tua - and Sungai Kelembau, their agricultural area. All three villages have been gazetted as Orang Asli Reserves under Section 7, Act 134, between 2016 to 2019.

KOA Bukit Tadam is part of a peat swamp ecosystem situated on the floodplains of the Langat River, and their ancestral lands extend all the way to the South Langat Forest Reserve. The highest point in KOA Bukit Tadam ancestral lands is Bukit Tadam (The hill, approx. 115 ft above sea level), which used to be the location of their original settlement. It was mined for *tanah merah* (laterite) in the 1980s, which left behind a pit lake surrounding the hill. This area is now the site of the Tadam Hill Resorts, an externally managed bamboo-inspired resort that runs recreational activities in the lake.

In the past, Bukit Tadam was surrounded by forests, and the villagers planted paddy in Paya Rumput and durian orchards on Bukit Tadam (Tadam hill) and Mutus Tua. Since the 1980s, the surrounding areas were developed by the government and private corporations, and the Langat River mined for sand. As a result, the Langat River and its tributaries began

to be polluted. Today, the village is surrounded by oil palm plantations, housing developments, factories, a landfill, a solar farm, KLIA and many connecting highways.

The village is led by Tok Batin Hadi Anak Jembik, *Lembaga Adat* (Council of Elders), the JPPKOA Chairman, Soeb bin Miah and members of the JPPKOA. Their population numbers around 600, with around 280 families. Bukit



Tok Batin Hadi

Tadam has a *sewang* group called Kumpulan Centak Chentong and a weaving group called Kumpulan Kembang Sejambak, where the elders actively train the younger generations in their traditional songs, dance, weaving practices as well as *adat* and beliefs.

Since the 1980s, the main economic activity of the community has been cultivating and harvesting oil palm from their *kebun* (privately-owned farms). Prior to that, they planted rubber, cacao, and paddy. They also cultivated durian in their *dusun* (ancestral orchards). Today, many also work as wage labourers, namely landscapers, cleaners, drivers, factory workers, and are also employed at Tadam Hill Resorts. Despite this shift to wage labour, many villagers continue to fish, plant and harvest fruits and vegetables for daily consumption. Many younger villagers now pursue higher education and are entrepreneurs.

3.3.2 Types of Floods

The community identifies two types of floods that affect the Bukit Tadam, along with their respective causes and responses:

	TYPE	CAUSES AND ACTIONS TAKEN
<i>Banjir termenung</i> — Yearly floods (end of the year)	Low stagnant floods that take up to 1-2 weeks to recede	• Continuous rain • Rainfall of >300mm in December • Tadam: Rainwater from large development projects flow to Bukit Changgang -> Bukit Tadam -> Labohan Dagang • Paya Rumpit: Rainwater from KLIA flows to the village and stagnates in the area • Affected households move to the PPS
<i>Banjir mengejut</i> — Unpredictable, intense floods (end of 2021)	Unpredictable intense floods that stagnate and take up to 2-4 weeks to recede	• Continuous rain for 3 days (as a result of Tropical Storm 29W) • Rainfall of >300mm in a day • High tide in Strait of Malacca • Rain in the upstream, and releasing of water from dams in the upstream • Neighbouring developments are built with higher formation levels than the area's historic flood levels for flood mitigation. As the village is now on a lower level, this routes excess water from the new neighbouring development areas to the village, causing floods. • Tadam: Rainwater from large development projects flow to Bukit Changgang -> Bukit Tadam -> Labohan Dagang • Paya Rumpit: Rainwater from KLIA flows to the village and stagnates • Mutus Tua: Excess water from the Langat River overflows into the back of the village • If we do not care for the environment and <i>moyang</i>, the environment and <i>moyang</i> will retaliate
<i>Banjir mengejut</i> — Unpredictable, intense floods (1971, 1926)	Unpredictable intense floods that take up to 2-4 weeks to recede	JPS realigned and straightened the river

Table 4: Types of floods at KOA Bukit Tadam

3.3.3 Perceptions of Floods

Causes of Floods

The KOA Bukit Tadam community recognises that the increasing intensity and frequency of floods are caused by rapid development around their ancestral lands. This disrupts existing hydrological and flood mitigation functions of the peat swamps, which have been cleared for plantations and developments. Moreover, new developments are often built with higher formation levels than the area's historic flood levels. This changes the area's ground profile and causing KOA Bukit Tadam and its surrounding areas to be on a lower

level. As a result, excess rainwater flows from these developments to the village, leading to frequent and severe flooding.

The Temuan of Bukit Tadam also associate the phenomena of floods with the ancestral belief that *"Kita jaga alam dan moyang, alam dan moyang jaga kita."* Meaning, if we care for the environment and ancestors, the environment and ancestors will care for us. The intensification of development and resource extraction around their ancestral lands is equated with no longer caring for the environment and *moyang* adequately. This results in disasters sent by the environment and *moyang*.

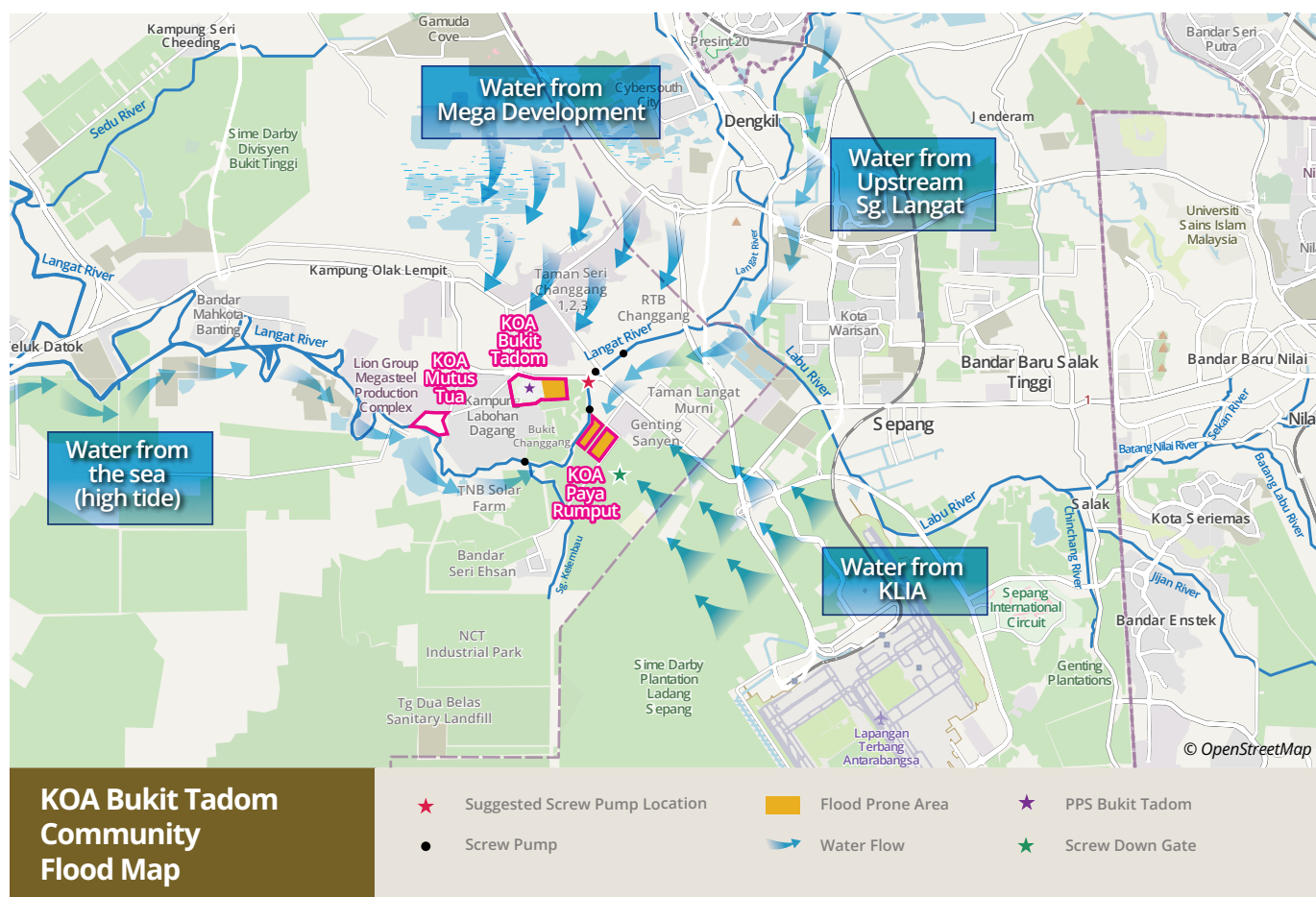


Figure 5: Map showing rain water flowing from upstream, high tide, and surrounding developments on higher ground merging and stagnating in KOA Bukit Tadam, KOA Paya Rumput, and KOA Mutus Tua



Villagers who fish regularly also serve as village flood patrollers. Here they are observing the rising water level in one of their oil palm planted areas by the Langat River

Perceptions and Indigenous Knowledge of Floods

The KOA Bukit Tadam community is used to the yearly stagnant floods at the end of the year, during the inter-monsoon phase and the Southwest Monsoon winds. This is because their village is located in a peat swamp area, and next to the Langat River. In the past, their homes were built on stilts, and they lived on the highest areas of the village, on Bukit Tadam (Tadam hill).

The community has their own early warning systems such as dreams from their ancestors, and are also familiar with the weather signals that indicate the coming of rain and floods. They hold Indigenous knowledge of the topography and terrain of their ancestral lands and its surrounding areas, and of the flow of water in the Langat River basin. These inform their knowledge on where to evacuate, areas in the village that are most affected by floods, and steps to take in facing floods. The community continues to consider floods as a *musim mewah* (an abundant season) for fishing as with the rising waters comes an abundance of fish and other sources of protein. Despite this, the community notes how the rainy season is increasingly unpredictable due to changes in the weather and climate.

In terms of the connectivity of Langat River as a whole, the Tadam community notes how heavy rain and flooding upstream will cause it to flood downstream as well. The villagers often say that Langat River is one river, so what happens

on one end will affect the other. Due to their close proximity to the mouth of the river, Bukit Tadam is also affected by the high and low tidal phenomenon. If it rains heavily resulting in floods in the upstream, and if it is high tide in the Strait of Malacca, Bukit Tadam will experience stagnant floods that will only begin to recede once it is low tide again, and once it has stopped raining.

3.3.4 What Happened During the 2021 Floods

On 18 December 2021, after a few days of continuous rain that resembled mist, flood waters began to rise in KOA Bukit Tadam overnight. In parts of Selangor where some of the worst flooding took place, rainfall as high as 363mm was recorded on this day (Bernama, 2021), while the average rainfall for the entire month of December in Selangor averages at 300mm (World Weather Online, 2024). Villagers in all 3 villages heard thunderous currents and loud winds as if they were on the coast. They had also received word from relatives via their village Whatsapp group of floods and continuous rains in Hulu Langat, and from the *peronda kampung* (community patrollers) about rising water levels in the Langat River. As they are used to living with floods, some knew to pack important items and evacuated to the Community Hall in the morning. Others, for the same reason, thought it was the usual end-of-year stagnant floods, and decided to wait it out. By the morning of 19 December, flood water had inundated the lower areas of the villages, including the Community Hall. Villagers then evacuated to the

school, which was also flooded by the next morning. By this time, electricity and mobile signals had been cut. The community was reluctant to move to the PPS because it was during the pandemic, it was far away, they were not provided transport, and the PPS were often overcrowded. While evacuated to external PPS previously, they also experienced prior discrimination from other ethnic groups and from PPS officials for being Orang Asli. On 20 December, most community members evacuated to Bukit Tadam (Tadam hill), the highest location in the village, and their original settlement site. Elders, those with children or special needs evacuated to the homes of relatives and friends who lived in areas not affected by floods.

Aid from NGOs arrived after 3-4 days, but it was uncoordinated, unsystematic, and not specific to the needs of the community. This was an added burden on the village leadership, who took the responsibility to manage incoming aid while also attending to their own families' needs. As Bukit Tadam (Tadam hill) was not an official PPS, the community noted that many aid organisations required permission from authorities before they could enter the PPS area to provide aid. Regardless, the community survived for the first few days on their own Indigenous knowledge, practices and resilience; and felt relatively safer on Bukit Tadam (Tadam hill), a site that is familiar and near. They built temporary huts for shelter, fireplaces to cook and keep warm, brought with them dry food, bottled water, and fished in the flood waters. They also tapped into existing social networks to source tents, clean water, food and basic necessities, health kits, and evacuation sites for those with special needs. Throughout this period, it continued to rain, and flood waters rose up to the level of rooftops before gradually receding and stagnating.

After about a week, the local JPS representative, who is also a member of the village, started the screw pumps and mobile pumps to begin draining the village of the stagnant flood waters. The community was aware of the high tide phenomenon in the Malacca Straits that was preventing flood waters from subsiding quicker. It took another week for the water to subside enough for the community to be able to begin cleaning their homes. They continued

to live in their tents and huts on Bukit Tadam (Tadam hill) for another week until their homes and gardens were clean enough for inhabiting.

Flood Impacts

Short Term

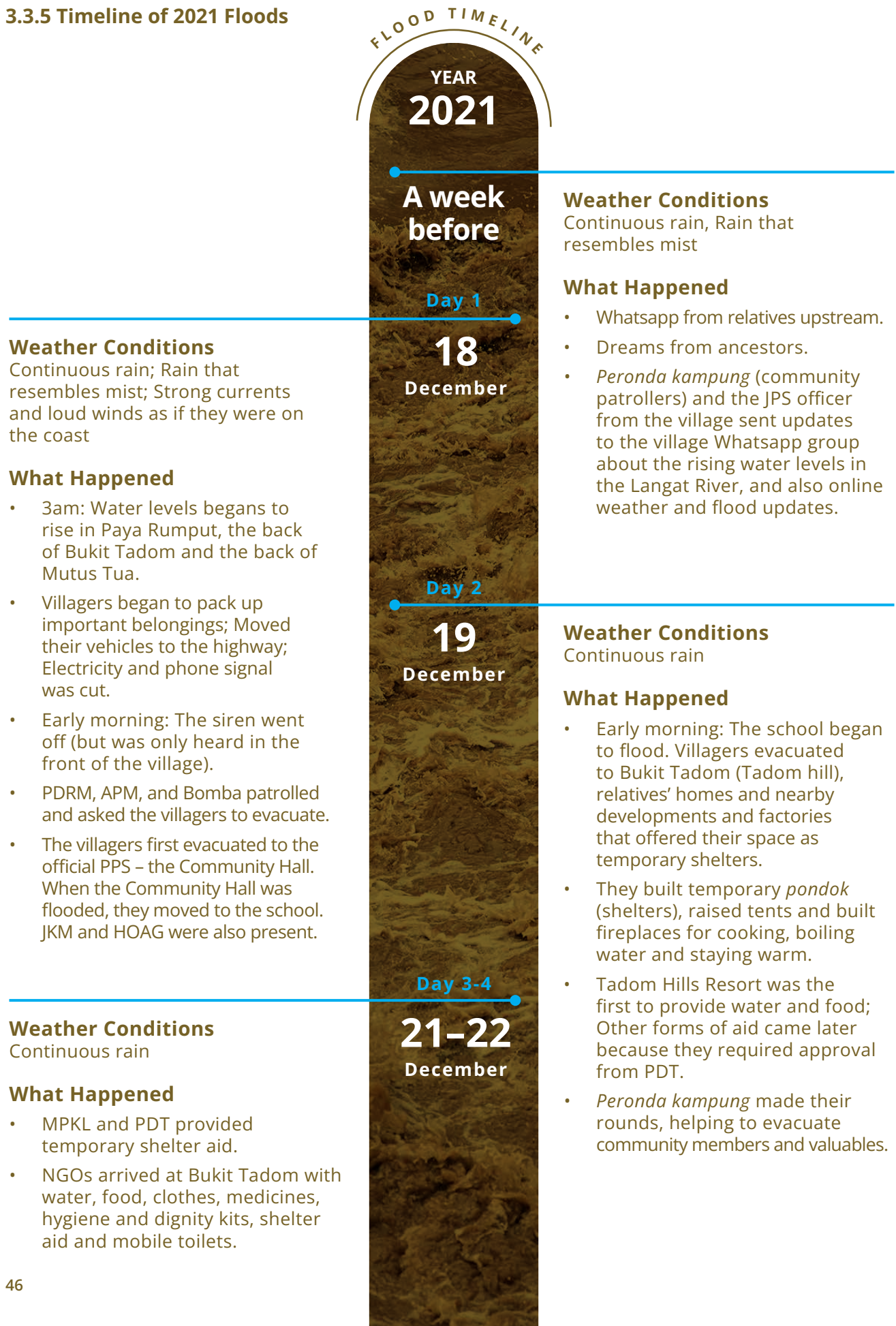
In the immediate floods and their aftermath, homes, belongings, and vehicles were the most affected. Access roads to the village were also often flooded, which caused delays in access to food aid and basic necessities, bottled water, and sanitation amenities. The floods carried rubbish from nearby settlements and industrial areas, with added concern that leachate from the landfill may overflow into villages, posing serious environmental and health risks.

The communities' orchards were also affected by the stagnant floods. When flood water levels were high, the orchards and their access roads were flooded out for weeks at a time. The fruits were left to rot until the water receded. When flood water levels were low enough, the community paddled boats out to their orchards to harvest the oil palm fruit. Older trees were more likely to begin to rot if left standing in stagnant floods for too long. However, the floods have also affirmed their choice of oil palm as the main cash crop, due to its resilience to flooding, as compared to other cash crops. After about a month, villagers were able to return to their orchards to begin harvesting again. Compared to other cash crops, the oil palm has proven itself to be the most resilient to floods. This has affirmed their choice of oil palm as the community's main cash crop.

Long term

Cleaning, repairing and rebuilding took the community more than the immediate period of recovery. Up to 3 years on, many homes have not yet replaced doors or windows that were destroyed or swept away by the floods. This is especially compounded by yearly monsoonal stagnant floods. However, aid often ends during the first few weeks of recovery. Additionally, heavy and continuous rains also bring trauma to the community, as they continue to live in fear of large, unpredictable floods.

3.3.5 Timeline of 2021 Floods



Day 5-7

23-25
December

Weather Conditions
Continuous rain

What Happened
Other agencies began arriving at Bukit Tadam, including HOAG.

Day 8-14

24-31
December

Weather Conditions
Stagnant waters; floodwaters began to recede slowly

What Happened

- The village JPS officer started the screw pumps.
- Villagers who evacuated elsewhere moved back to the Bukit Tadam (Tadam hill) PPS to receive aid.
- JAKOA visited Bukit Tadam.

Day 15-21

1-7
January 2022

Weather Conditions
Water began to recede in more areas of the village

What Happened

- Villagers began cleaning their homes and village; NGOs came to provide cleaning support, food, household items, clothes, and more.
- Villagers developed fever, Covid and other health challenges due to the contaminated mud and post-flood waste. HOAG was present for medical support.
- They continued to live in their shelters on the hill while cleaning.

Day 22-28

8-15
January 2022

Weather Conditions
Water receded completely

What Happened

Villagers continued cleaning and moved back to their homes; NGOs continued to provide cleaning support, and food and basic necessities.

Day 30+

Jan-Feb
2022

Weather Conditions
Water receded in their orchards

What Happened

- Villagers returned to their orchards but some of the oil palm fruits and trees were rotten. Others returned to wage work.
- Students returned to school and KEMAS provided aid to replace classroom needs, uniforms, etc.

Weather Conditions

Continuous rain at the end of the year (October - December)

What Happened

- Monsoonal floods at the end of 2022.
- After Chinese New Year: RM4,000 aid from NADMA for each affected household: RM1,000 first; then RM3,000 in July/August.

2022**2023****Weather Conditions**

Continuous rain at the end of the year (October - December)

What Happened

- Monsoonal floods at the end of 2023.
- The villagers received two new houses for 2021 flood survivors from MBI.

What Happened

The villagers received one new house for 2021 flood survivors, and funding for repairs for another home from MBI.

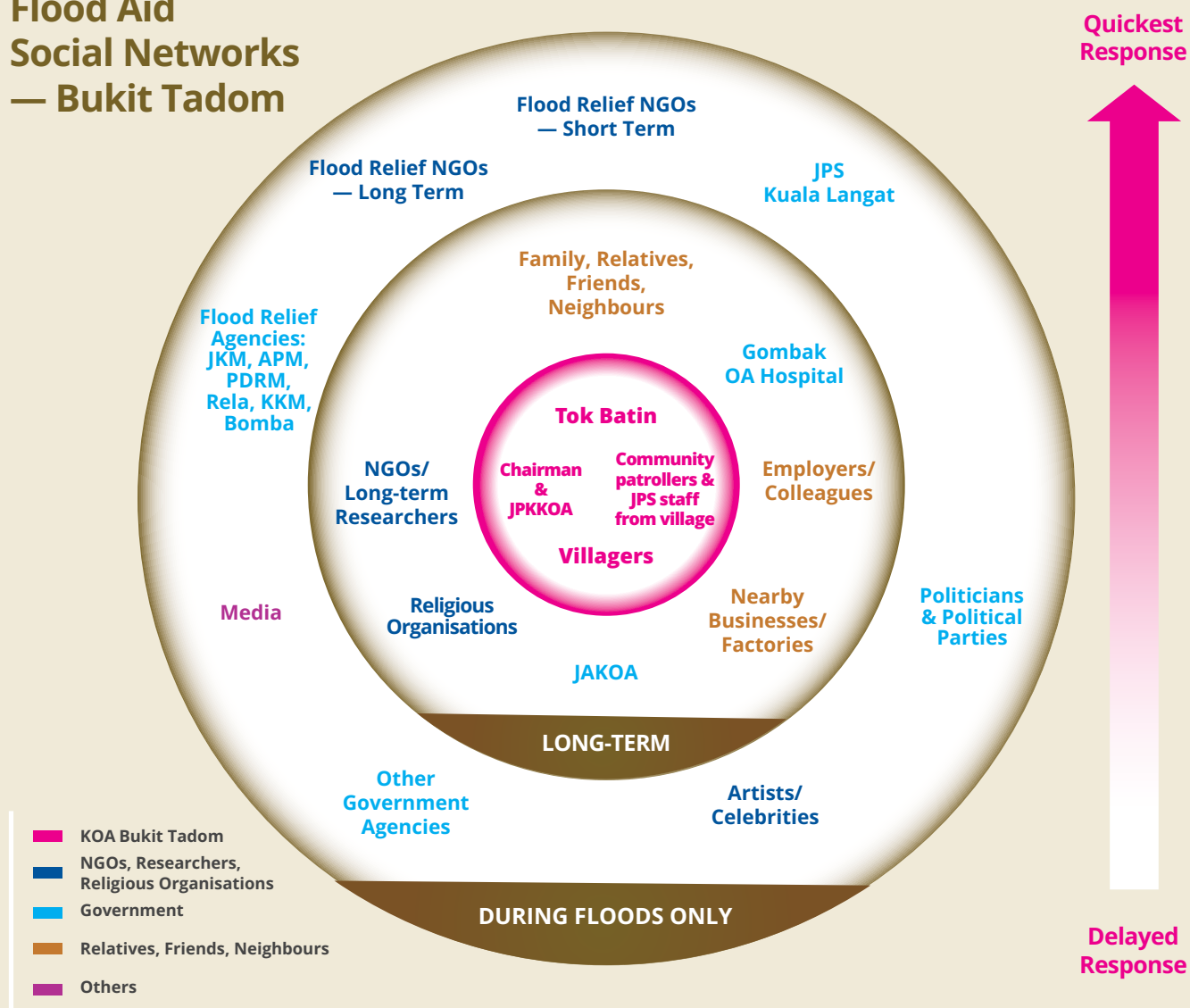
2024

3.3.6 Flood Aid Social Networks

During floods, the Bukit Tadam community is relatively self-reliant for the first few days. They are able to evacuate, build their own temporary shelters and fireplaces for cooking and warmth. However, they are often cut off from longer-term access to food, clean water, shelter, health amenities, orchards and other forms of wage work. They rely on their extended social support networks that have been cultivated over time.

Within the village, the Tok Batin, the village chief, the Orang Asli Village Development and Security Committee (JPKKOA) Chairman and Committee Members, are the key decision makers and coordinators of flood management in the village. They are supported by the JPKKOA Committee members in their respective roles, the youth who serve as community patrollers who monitor the river water levels, and the JPS officer who originates from Bukit Tadam. They are supported first by their immediate families, relatives, friends and friendly neighbours.

Flood Aid Social Networks — Bukit Tadam



Flood NGOs – During Floods Only: Activated during flood seasons only to address urgent and immediate needs

Flood NGOs – Long-term: Engaging communities across all phases of the Disaster Risk Management cycle

Figure 6: Long-term and during floods only aid social networks in KOA Bukit Tadam



The Bukit Tadam JPS officer (and villager) carrying out his daily rounds - monitoring Sungai Langat levels and existing village mitigation efforts including this pump. Photo from Bukit Tadam Facebook page

During Floods Only

The community noted that flood-related government agencies, namely PDRM, ATM, Bomba, Rela, JKM and PKD provided intermittent early warnings and evacuation support. However, the first organisations to provide flood aid in the form of food, basic necessities, clean water, shelter, dry clothes, health and sanitation amenities were the long- and short-term flood NGOs. PDT, MPKL and other agencies came after. This was followed by the media, artists, celebrities and politicians, who provided various platforms for the community's experiences and stories to be showcased.

Long-term Support

Throughout their years leading the community, the Tok Batin, the JPKKOA Chairman and their Committee members have built long-term relationships with the Tadam Hill Resort, NGOs, researchers, religious organisations, employers, colleagues, neighbouring businesses, and factories. Key long-term government supporters of the community are JAKOA and Gombak Orang Asli Hospital. During the floods, these were among the first and those guaranteed to support the community by providing immediate and long-term aid in the form of food, basic necessities, clean water, shelter, dry clothes, and health and

sanitation amenities. JPS Kuala Langat is another important actor in providing long-term support, whereby their JPS officer, who is also from the village, continuously monitors and updates the community and JPS on the status of the river water levels, and the conditions of other mitigation methods.



Representatives of long-term village partner, HOAG, giving out medical supplies to flood evacuees at the Bukit Tadam PPS in 2021

3.3.7 Community Resource Mobilisation

During the first few days of the 2021 floods, prior to mobilising resources from their external social networks, the Bukit Tadam community relied on **Indigenous knowledge, systems and protocols (ISP)**. This section discusses how the community turned to their ISP for immediate survival, and how it complemented humanitarian aid before, during and after the floods.

During Floods

HUMANITARIAN



a. WaSH (Water, Sanitation, Hygiene)

Access to clean water, as well as water supply in general, was one of the most critical challenges the community faced during flood disasters. The individual household water tanks, and pipes were submerged in floods, and there were no sanitation and hygiene amenities in the first few days.

However, the community mobilised their knowledge of water sources, and knowledge of how to ensure adequate levels of sanitation and hygiene, given the existing conditions. They sourced water and mobile toilets from their networks, namely the resort, and requested bottled water and water tanks from friends, relatives, neighbours, NGOs, government agencies and JAKOA.

ISP

Drawing on Indigenous knowledge of their ancestral lands, the community were also aware of the clean water sources such as the groundwater tanks at Bukit Tadam (Tadam hill). Intergenerational knowledge of hygiene and sanitation is also reflected in their clear division in locations for sleeping

and resting, and for waste. Prior to the arrival of external aid, the community built their own fires on Bukit Tadam (Tadam hill) to boil drinking and cooking water.



b. Food Security and Basic Necessities

The first few days, the community needed food and basic necessities to stay warm as many had evacuated with only their important documents. They reached out via Whatsapp and social media to their networks to source food and basic necessities from friends, relatives, NGOs, government agencies and JAKOA.

ISP

In the first few days, prior to the arrival of external aid, the community built their own fires on Bukit Tadam (Tadam hill) to cook food, boil water and to warm and dry themselves. To the community, floods are also *musim mewah*, a time of abundance, as there is an abundance of fish and other forms of protein to be harvested during this season. Those who were prepared also brought with them dry food and gas stoves for cooking, and dry clothes.



Food and basic necessities aid distribution at the Bukit Tadam PPS in 2021



© Tan Sri Datuk Seri Panglima Haji Annuar bin Musa Facebook

Temporary evacuation shelters that are a combination of tents and traditional OA huts on Bukit Tadam PPS



c. Shelter

When flood waters began to rise, the community evacuated to the government-gazetted official PPS—the Community Hall—and then to the school. They sourced tents, tarps and other forms of shelter from friends, relatives, NGOs, government agencies and JAKOA. However, these eventually flooded as they were on lower ground.

ISP

The community eventually evacuated to the highest point in the village, Bukit Tadam (Tadam hill). Their original village was located on the hill, in self-built wooden homes on stilts. In the 1970s, they were instructed by JAKOA to resettle in the lowland floodplains, in PPR brick homes. During the 2021 floods, the community returned to their original village location, and built their own *pondok*, temporary shelters while waiting for tents and tarps. Although it was not an officially gazetted PPS, the community were resolute in their decision to evacuate there.



d. Health

The community was particularly concerned about the risk of Covid-19 spreading throughout the PPS, as they were in close proximity to each other. KOA Bukit Tadam villagers received support from HOAG, their long-term health professional partners, who had a mobile clinic. They provided masks, sanitizer, among other medicines for fever, flu, and leptospirosis; as well as support for those with existing and chronic illnesses. The villagers also kept updated on whether the PKD and nearby clinics were accessible during floods. Families with existing medicine kits also shared medicine among each other during evacuation.

ISP

During the COVID-19 pandemic, many Orang Asli communities isolated themselves from the outside world by barricading their villages, screening visitors, and only allowing health professionals to enter (Idrus et al., 2021). In the past, if there was an illness in the village, OA communities would isolate that individual and their family from others.

As the 2021 floods coincided with the pandemic, KOA Bukit Tadam villagers chose to isolate themselves according to villages, and into smaller extended family groups. Some evacuated to Bukit Tadam (Tadam hill), while others set up temporary shelters at nearby and willing industrial and housing areas or other relatives or friends' homes. They also chose to stay on their own ancestral lands, as opposed to evacuating to the designated PPS, in order to limit exposure. This approach of isolation was to mitigate the spread of other waterborne diseases during floods as well.

Before & After Floods

HUMANITARIAN



a. WaSH (Water, Sanitation, Hygiene)

After the floods subsided, the KOA Bukit Tadam community's water concerns shifted. They now had bottled water from friends, relatives, NGOs, government agencies and JAKOA. The community possessed knowledge of who to reach out to for clean water. However, they needed pressurised water for cleaning. Meanwhile, the community and NGOs hired trucks to clear large and solid waste to the landfill. However, landfill leachate and liquid waste remains to be addressed as part of disaster management. This poses health risks to the KOA Bukit Tadam community where stagnant floodwaters can last a month.

ISP

The community was aware of post-flood contamination risks, which is reflected in their choosing to stay on Bukit Tadam (Tadam hill) while cleaning their homes. This knowledge stems from Indigenous ways of living that emphasise the separation between clean living areas and waste areas.



b. Food Security and Basic Necessities

Food security was a key issue during the floods, and in the long-term. In the immediate aftermath of the floods, friends, relatives, neighbours, NGOs, government agencies and JAKOA provided this support. The community also sourced food from nearby shops. They highlighted the importance of long term food security in the village, especially for the most vulnerable groups. Thus, community leadership continues to expand diverse networks of access to food and basic needs.

ISP

Some community members resumed fishing in the Langat River and its tributaries, and harvesting of fruits and vegetables on their *wilayah dan tanah adat*. They also intended to resume their long term recovery and food security plan to replant their vegetable and fruit home gardens. However, these were disrupted by river and soil pollution from the nearby factories and landfill that had contaminated the rivers. As a result, fish and other freshwater produce are no longer safe for consumption, and their home gardens did not flourish.

**c. Shelter**

Post-floods, the community advocated among their networks for the Bukit Tadam (Tadam hill) evacuation site to be recognised as an official PPS. They sought funding to flatten parts of the Hill to make it more comfortable for flood evacuees. They are also tapping into their networks or saving up to source tents, tarps, and other forms of temporary shelter as part of their preparedness plan.

ISP

The community has knowledge of the topography and terrain of their ancestral lands. Namely, which areas are more or less likely to flood, and have action plans to move to higher points in the village during floods. In the past, the village used to be located on higher ground, and the community would migrate to higher ground during the rainy season. While they no longer migrate, that knowledge remains evident in their building of attics or high shelves in their homes for storing important and expensive items all year round.

**d. Health**

The villagers were concerned about the spread of Covid-19, and continued to isolate. The community Komuniti Sihat Perkasa Negara (KOSPEN) is quite active and works together with the HOAG mobile clinic to ensure basic health needs are met, essential medication is continued. They are aware of access to nearby clinics. For families who had medicine kits, they stocked up and shared medicine among each other during recovery and in preparation for the upcoming floods. They were also concerned about the spread of dengue from the breeding of aedes mosquitoes in the stagnant flood water, and have advocated for post-flood fogging in the future.

ISP

After the floods, the community replanted their medicinal, food and decorative plants into pots for healing purposes, and also in order for these to withstand floods in the long term.

**e. Post-Disaster
(Cleaning, Repairing, Rebuilding, Cash Aid)**

The community sourced cleaning materials from friends, relatives, NGOs, government agencies and JAKOA. They also sourced waste management trucks to carry away post-flood waste. However, Post-Disaster recovery, especially repairing and rebuilding continues until today. The urgency of this depends on the community's socio-economic status and thus priorities.

The government provided a total of RM4,000 in cash aid, along with additional financial support for home repairs. However, not every household received the full amount or the extra assistance. This was reportedly due to the lack of assistance and poor digital literacy in online cash aid applications, and unclear criteria and selection process in determining cash aid eligibility.

ISP

The community depends on familial networks for support in cleaning, repairing, and rebuilding. Many of these activities are carried out communally.

DISASTER MANAGEMENT



a. Preparedness

The Langat River does not have a consistently working flood warning siren installed. However, villagers often hear early warnings from agencies who patrol the outer parts of the village, and neighbouring villages. Additionally, the villagers noted that they did not receive any flood warning or information from government agencies prior to the 2021 flood, except information that they gathered themselves from the various weather- and flood-related websites and social media.

The community relied on community early warning systems and prioritized what to pack (important documents, food, baby milk and kits, clothes, and blankets) and save (expensive household items) based on prior experience as well as their family's needs.

ISP

The community have early warning systems that include rain types, observation of the river, colour of water, dream warnings from *moyang*, and animal behaviour. These are drawn from oral histories and past experiences of floods in the village.

Type	Description
Observation of rain intensity and type	Continuous rain that alternated between heavy downpour and fine, spray-like rain for about a week before the floods.
Observation of the river levels	The community patrollers who fish daily are familiar with river water levels. When the river water began to rise rapidly, they knew that floods were about to take place.
Dreams	Elders in the village received dream warnings from their <i>moyang</i> a week before the flood. One of them added that the rain preceding floods would change between heavy and light to soften the ground. This corresponded with their observations of rain type.

Table 5: Types of community early warning systems at KOA Bukit Tadam



b. Mitigation

During the end of year rainy season, KOA Bukit Tadam will flood if rain falls continuously for a few days. As a mitigation measure, the community has built new culverts, with support from Tadam Hill Resort and YB, to channel water coming from developments in the north directly to the Langkat River. They also advocate to influential external parties for the installation of a new screw pump in Bukit Tadam, and for better drainage systems in surrounding and upcoming developments. One of their main resources is a JPS staff member and also a villager who monitors and maintains all irrigation and drainage related flood mitigation measures.

ISP

Mitigation measures cannot be focused on one part of the river only, but must take into consideration how measures taken at one part of the river might affect the rest of the river. This is based on the community's intergenerational knowledge that *sungai itu satu sahaja*, which translates to "there is only one river."

This has also informed their advocacy for a new screw pump location, and their call for new and existing developments to have adequate drainage systems that direct water to the Langkat River.

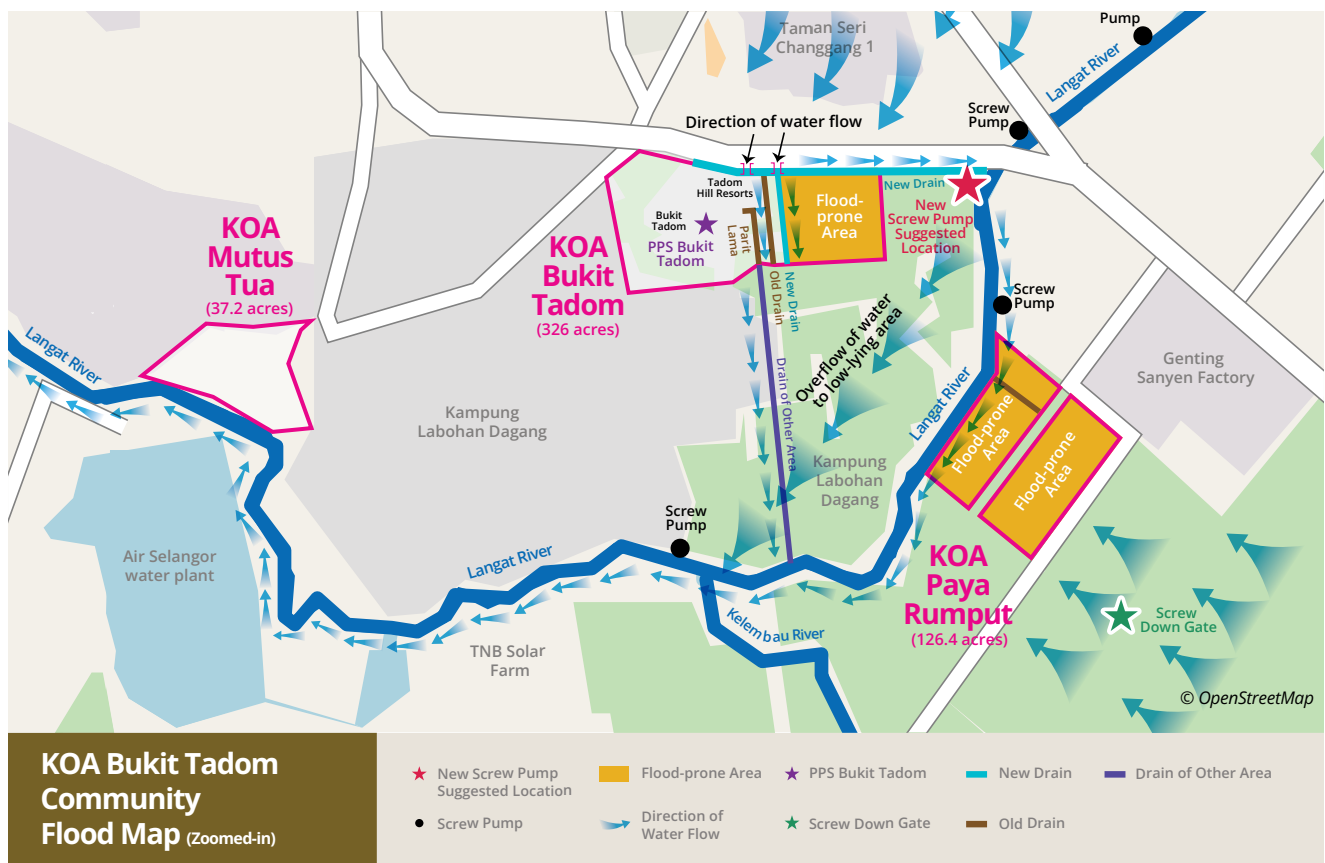


Figure 7: Map of KOA Bukit Tadam's existing and proposed mitigation efforts, including the suggested location for a new screw pump. This map also shows the proposed PPS on Bukit Tadam (Tadam hill)

3.3.8 Summary of Findings

During Floods		
Cluster	Challenges & Actions	Indigenous Knowledge, Systems, and Protocols (ISP)
HUMANITARIAN		
WaSH 	Water tanks and pipes submerged, no sanitation amenities. Sourced bottled and piped water from networks (friends, NGOs, government agencies).	Indigenous knowledge of local clean water sources at Bukit Tadam (Tadam hill) and fire usage to boil water for cooking.
Food Security & Basic Necessities 	Community needed food and basic necessities, so they reached out to networks (social media, friends, NGOs, government agencies).	Built fires to cook, boiled water, harvested fish. Flood season is seen as <i>musim mewah</i> with abundant protein sources.
Shelter 	Evacuated to the Community Hall and school (on lower grounds), but these flooded. Where possible, local leaders and youth supported elders, expectant mothers and others with special needs in evacuation.	Evacuated to Bukit Tadam (Tadam hill), their ancestral high ground and original settlement. Built <i>pondok</i> , and set up tents on the hill.
Health 	Concerned about COVID-19 spread in crowded shelters. Villagers received masks, sanitizers, and medicine. Concerned also about the potential for leptospirosis and dengue.	Isolated into smaller family groups/ villages to avoid disease spread; followed traditional isolation practices when there is an illness.

Table 6: Summary of findings at KOA Bukit Tadam

Before & After Floods		
Cluster	Challenges & Actions	Indigenous Knowledge, Systems, and Protocols (ISP)
HUMANITARIAN		
WaSH 	Post-flood concerns: cleaning homes, post-flood waste management, needed pressurised water for cleaning and hired trucks for waste disposal.	Chose to shelter on Bukit Tadam (Tadam hill) during cleaning to avoid contamination.
Food Security & Basic Necessities 	Long-term food security disrupted by river pollution (from factories/landfills). Resorted to purchasing produce from the shop.	Replanted home gardens, harvested fish and plants, but face river and soil health challenges.
Shelter 	Settlements are located in the floodplains after being asked to move down by authorities in the 1970s. Homes are also brick houses on the ground.	Knowledge of terrain guided relocation to higher grounds during evacuation. Sought recognition of Bukit Tadam (Tadam hill) as an official PPS. Building of high shelves/attics for preparedness.
Health 	Continued COVID-19 isolation, stocked medicine, concerned about dengue from stagnant flood water. Leaned on their community KOSPEN and HOAG.	Replanted medicinal plants, stocked up medicine, advocated for post-flood fogging to prepare for future health needs.
Post-Disaster Recovery 	Sourced cleaning materials, rebuilding and repairing support from networks.	Relied on communal and familial support for cleaning and rebuilding efforts.
DISASTER MANAGEMENT		
Preparedness 	Inconsistent flood warning systems, no phone signal, no electricity.	Indigenous early warning systems: observing rainfall patterns, river levels, and <i>moyang</i> dream warnings.
Mitigation 	Built new culverts and advocated for adequate drainage systems to prevent future floods. Advocated for installation of a new screw pump.	Advocacy based on the understanding of river interconnectivity, ensuring holistic river and drainage system planning.

3.4 Community Aspirations for External Stakeholder Support

Both the KOA Paya Lebar and KOA Bukit Tadam communities are self-reliant, and draw on their deep-rooted Indigenous knowledge, systems, protocols, and networks to manage and overcome the challenges posed by flooding. However, targeted humanitarian aid and disaster management-specific support from external stakeholders are still necessary to strengthen community resilience. Importantly, they request for aid to come sooner, and to be more coordinated according to community needs, based on longer-term community mapping, and respectful of and through the community leadership. These are some of their aspirations.

Humanitarian Clusters

WaSH (Water, Sanitation, Hygiene)



Pre-Floods	During Floods	Post-Floods
Temporary (A few weeks before anticipated flood period): Stockpiling of mineral water, soap, cleaning materials Long term: Purchasing of communal water jet for cleaning. Reinforcement of river embankment; Protection of existing clean water source	Clean drinking water Sanitation (incl. gender-specific mobile toilets)	Clean drinking water Restore existing water sources Sanitation (incl. gender-specific mobile toilets) Solid and liquid waste management

Food & Basic Necessities



Pre-Floods	During Floods	Post-Floods
Temporary (A few weeks before anticipated flood period): Stockpiling of dry food kits, dignity kits, and children's kits Long-term: Food security, Establishment of <i>tabung kilat</i> (flood preparedness fund) Communal solar-power source - for communal lighting especially in high foot traffic areas, and for charging of mobile phones	Dry food kits, dignity kits, children's kits, and clothes to keep warm	Long term food aid, dignity kits, and children's kits

Shelter



Pre-Floods	During Floods	Post-Floods
Temporary: Stockpiling of waterproof tents, other forms of temporary shelter Long term: Recognition of PPS in the village, flood resilient design and build of future houses, ownership and maintenance of drainage systems	Temporary: Waterproof tents, other forms of temporary shelter Long term: Recognition of PPS in the village	Long-term aid for the refurbishment of their damaged homes Long-term maintenance and ownership of drainage systems

Health



Pre-Floods	During Floods	Post-Floods
Access to information on nearest, most accessible clinics/hospitals (not flooded) Stockpiling of first aid kits and medications (can go under village KOSPEN) Assured identification of and medical support for those with special needs or chronic illness	Emergency medical kits	Fogging to combat Aedes mosquitoes and prevent dengue disease Medical support for longer-term effects of waterborne diseases

Post-Disaster (Cleaning, Repairing, Rebuilding)



Pre-Floods	Post-Floods
Preparation of clean water, cleaning jets/cleaning materials	Network support mobilisation Clean water & cleaning materials Solid and liquid waste management

Aspirations for External Stakeholder Support (Continued)

Disaster Cycle-Specific

Preparedness



Multiple early warning communications:

- Regularly maintained sirens
- Early warnings from the government via Whatsapp/SMS
- Early warnings from APM/Bomba/Police patrollers

Coordination:

Coordinated aid in terms of communities' needs and NGO responses to prevent duplication

Training and Guides:

- Preparedness training
- CBDRM training and disaster management planning based on community knowledge and practices
- Guide on understanding how disaster management works in their district, the stakeholders involved in floods, their respective roles, who to contact

Studies:

Studies on the soil and hydrology in flood prone areas

Mitigation



KOA Bukit Tadam: Monitoring of Langat River water levels:

- Installation of a new screw pump in Bukit Tadam
- Deepening of the river, sand dredging
- Raising and maintaining of bunds
- Installation of mobile pumps when needed

Irrigation and drainage:

- Monitoring, maintenance and access to the drainage systems, pumps and bunds around the village

Land use planning:

- Advocacy that new developments must have proper planning and implementation of drainage systems that channel excess water to Langat River

KOA Paya Lebar:

- The deepening of Lui River further upstream
- Constant monitoring and maintenance of drainage systems and bunds within the village
- Complete drainage system that follows the old drainage system, and deepening of existing drainage system
- Proper land use planning that includes flood mitigation
- Planting of crops for flood mitigation such as bamboo that can further reinforced embankments and hillsides with extensive and strengthened root systems

Recovery

— Livelihoods (Cash aid)



Aid:

Long-term food and recovery aid especially for the most vulnerable, and those who have lost their source of income due to floods

Guides:

- Guide on understanding disaster management structure and functions at the district, state and federal level; stakeholders involved in floods and their respective roles; especially local liaisons
- Guide on sources of aid during the entire disaster cycle, agencies and officers in charge, application steps, details

Funding:

- Clarity and transparency on sources of funding of aid for the 4 flood phases, the agencies in charge of the fundings, and which agencies are related to flood and water such as Air Selangor, LUAS, JPS, etc
- Digital literacy and access (for application of cash aid) are important and should be noted

These recommendations are based on findings from research with the communities of KOA Paya Lebar and KOA Bukit Tadam. These are supported by insights gathered from conversations with government, NGO, and private sector stakeholders, as well as subject matter experts.



KOA Bukit Tadam villagers drawing out community maps of their existing flood management efforts and flood management aspirations

The resilience of Orang Asli communities is deeply rooted in their ability to practise Indigenous Systems and Protocols, during disasters and beyond. Supporting Orang Asli resilience means first acknowledging and reinforcing the preparedness, mitigation, response, and recovery efforts that OA communities already carry out, that are grounded in their knowledge systems. Given that OA communities rely primarily on these Indigenous protocols in the initial stages of disaster response, it is crucial to integrate these practices.

The primary objective of these recommendations is to serve as a guide to contextualise disaster risk management planning and implementation, for all stakeholders working with communities. The recommendations must be adapted to the specific needs of each Orang Asli community. They are also a form

of advocacy for the recognition and integration of Indigenous knowledge alongside Western scientific practices. This approach is vital for building community-based disaster resilience, enhancing community capacity, and preserving intergenerational knowledge. Particularly, in the face of existing vulnerabilities that the communities already face, as well as growing threats from disasters and development and climate change.

The implementation of these recommendations require the strengthening of multi-stakeholder collaborations, in particular, existing collaborative efforts between the government, civil society organisations and community-based partners. Effective solutions require higher adoption of proposed co-interventions through a whole-of-society approach, which will in turn increase likelihood of long-term project success.

4.1 Government & NGOs

Recommendation 1:

Mainstream and Prioritise Orang Asli Knowledge, Practices, and Leadership in Disaster Management

Ensure that Orang Asli knowledge, practices, perspectives, and leadership are respected, recognised, and integrated into all phases of disaster management, at federal, state and district level, enhancing the resilience of Orang Asli communities.

1. Encourage Orang Asli-Led Disaster Management in All Phases

In all four phases of disaster management for Orang Asli communities—mitigation, preparedness, response, and recovery—Orang Asli knowledge and practices should be prioritised and Orang Asli-led. This includes:

- Ensuring that preparedness and response strategies are aligned with their cultural and logistical preferences, such as establishing evacuation centres on their ancestral lands for reasons of safety, logistical ease, and to acknowledge the communities' local ownership and governance of their ancestral lands.
- Learning from their deep understanding of local ecosystems, especially the connectivity of rivers from *hulu* (upstream) to *hilir* (downstream), to guide river management, environmental policies, and disaster mitigation.

2. Respect and Utilise Orang Asli Leadership Structures

Disaster management efforts must recognise the leadership roles of key figures within Orang Asli communities, such as the Tok Batin, *Lembaga Adat*, JPKKOA Chairman, and the JPKKOA. These leaders play central roles in decision-making and coordination of aid. Disaster management teams must work closely with existing community leadership channels to ensure efficient and culturally sensitive responses. Effective disaster management requires:

- Consulting these leaders to identify the community's needs during all phases of disaster management, and in designing disaster management strategies. Many JPKKOA already have existing Flood Action Plans.
- Coordinating aid delivery through these leadership structures, ensuring that relief is effectively distributed and aligned with local priorities. This links to Recommendation 2 that emphasises long term community-mapping with the community in order to understand local governance structures and awareness of the micro-politics involved as a key part of community-centered aid distribution approaches.

By respecting and incorporating the knowledge, practices, and leadership of Orang Asli communities into disaster management, solutions are not only effective but also sustainable and culturally appropriate.

Recommendation 2:

Enhance Aid Delivery for Orang Asli Communities through Early, Coordinated, and Community Mapping-based Approaches

Establish a tailored framework and mechanism to deliver aid more swiftly, effectively, and respectfully to Orang Asli communities, ensuring that it meets their specific needs and honours their Indigenous systems and protocols.

1. Early Aid Mobilisation for Orang Asli Communities

Create a dedicated aid delivery system that prioritises early mobilisation for Orang Asli communities during emergencies or crises. This system should leverage community early warning tools and work closely with Orang Asli leaders to anticipate needs, ensuring aid arrives promptly.

2. Community-Specific and Coordinated Aid

Aid interventions should be customised to address the distinct needs of Orang Asli communities, such as access to healthcare, education, and sustainable livelihoods.

Aid agencies should co-conduct thorough community-based mapping and other assessments as part of the preparedness stage to ensure that assistance is well-coordinated and does not overlap with existing services, addressing essential aspects of community well-being.

3. Respect for Orang Asli Leadership and Customs

Aid programs must be delivered through Orang Asli traditional leadership structures to ensure that they are respectful of the community's culture and decision-making processes. Training aid workers in cultural sensitivity and involving Orang Asli leaders in decision-making will encourage aid that is not only effective, but also respectful of Indigenous ways of life.

4. Inclusive Stakeholder Engagement Team

Establish a collaborative coordination team that integrates input from Orang Asli leaders, disaster and Orang Asli related government agencies, local NGOs, and community members. This mechanism will enable regularly gathered insights from these stakeholders to adapt aid programs to the evolving needs of the Orang Asli, ensuring that aid delivery reflects their priorities.

By aligning aid delivery with the specific needs and cultural frameworks of the Orang Asli, this will help ensure that aid is both timely and respectful, promoting long-term resilience and empowerment.

Recommendation 3:

Comprehensive Flood Management and Long-Term Resilience Building for Orang Asli Communities

Develop a holistic approach to aid that moves beyond immediate flood response to address the long-term vulnerabilities of Orang Asli communities, focusing on recovery, preparedness, and mitigation, while ensuring continuous community involvement and empowerment.

1. From Immediate Response to Long-Term Recovery and Mitigation

Aid programs should be designed to extend beyond immediate flood response to encompass long-term recovery efforts. The focus should be on enhancing the community's resilience to future disasters through addressing existing vulnerabilities. This includes addressing long term food and water security, loss of livelihoods, disrupted access to basic services, supporting Orang Asli-led rebuilding initiatives, and importantly, recognising the Orang Asli communities' rights to land and self-determination.

- Focus on Food and Water Security**
 Prioritise long-term food and water security for the affected Orang Asli communities. This could involve enhancing their agricultural practices or communal water systems, and improving access to clean water sources. Enhancing these will reduce the impact of future floods and ensure the community's well-being.
- Longer-Term Shelter and Infrastructure Recovery**
 Aid should support the community in designing and rebuilding their own homes and other infrastructure within the village by incorporating Indigenous knowledge and sustainable building practices. Aid provided should also recognise that long-term support extends beyond the immediate rebuilding period.
- Recognition of Rights to Land and Self-Determination**
 A key part of aid should be recognising, respecting and supporting the community's ways of life and continued wishes to live on their ancestral lands. In the event that the community's safety while residing on their ancestral lands is compromised as a result of disasters, communities must have a say in their relocation to land that is safe and appropriate to their needs.

2. Ongoing Community Consultations for Tailored Solutions

Implement a framework for repeated consultations with the Orang Asli communities to identify their evolving concerns. By engaging the community at multiple stages of the recovery process, aid programs can be continually adapted to meet their specific requirements, ensuring that both immediate and long-term needs are adequately addressed.

3. Disaster Preparedness and Community-Based Approaches

Introduce disaster preparedness programs contextualised to Orang Asli communities, including courses on flood preparedness, CBDRM, and the establishment of a *tabung kilat*. These programs should integrate local leadership, respect Indigenous knowledge and communal ways of working, emphasise the importance of passing down traditional knowledge to future generations, and focus on empowering communities to build its own disaster management plans, with external support as needed.

By focusing on long-term recovery, preparedness, and mitigation, Orang Asli communities could be more supported before, during and after floods, their existing vulnerabilities addressed, and the OA will be better equipped to thrive in the face of future challenges.

Recommendation 4:

Improve Communication and Socialisation of Disaster Management Policies and Mechanisms for Orang Asli Communities

Provide Orang Asli communities with clear and accessible information about government flood management policies, mechanisms, and cash aid, including the roles of agencies, application processes, and accountability measures.

1. Enhanced Communication of Flood Management Policies

Develop a comprehensive communication strategy to clearly explain the government's flood management policies to Orang Asli communities. This should include:

- Detailed information about agencies involved in flood management.
- Clear descriptions of the roles and responsibilities of these agencies.
- A directory of contact persons with easily accessible and frequently updated phone numbers and locations.
- Guidelines on how to reach out for assistance during floods, including emergency hotlines.
- Step-by-step instructions on how to ensure accountability, such as contact persons for following up or grievance mechanisms.

2. Clear Explanation of Government Disaster Cash Aid and Other Available Sources of Support

Improve and make accessible systems to explain the government disaster cash and other aid available to Orang Asli communities. This system should provide:

- Clear and concise descriptions of the available cash aid programs.
- Information on eligibility criteria and how to apply for cash aid.
- A list of agencies responsible for distributing aid, along with their roles.
- A clear point of contact, including contact persons and locations where the community can apply for assistance.
- Transparent information on the application process from start to finish, including deadlines, required documents, and how applications will be processed.
- Mechanisms to ensure accountability, allowing community members to track their applications and channel inquiries if necessary.



KOA Paya Lebar villagers working together to bela tandak at Sekeu River

3. Tailored Outreach for Orang Asli Communities

Implement localised outreach efforts towards culturally appropriate and accessible communication. This can include:

- Digital literacy programs especially targeted towards enhancing accessibility to aid programs for flood survivors.
- Workshops and community meetings facilitated by local leaders to explain flood management policies and cash aid.
- Simplified materials that use the local language.
- Regular community consultations to address questions, gather feedback, and adapt communication methods based on community needs.

This recommendation suggests how Orang Asli communities can be better informed to navigate disaster management mechanisms effectively, and are empowered to hold agencies accountable in times of need.

Recommendation 5:

Integrate Indigenous Knowledge in Mitigation and Land Use Planning for Orang Asli Communities and in Areas Around Orang Asli Ancestral Lands

Incorporate the Indigenous knowledge of Orang Asli communities alongside scientific assessments in mitigation and development planning, particularly land use and drainage systems.

1. Co-Design of Mitigation Systems with Local Communities

Establish a framework for community consultations that actively seeks the input of Orang Asli communities during the planning of mitigation measures. Ensure that the design and implementation are carried out in collaboration with Orang Asli communities. This includes incorporating community suggestions on water management, river behaviour, and other environmental factors that may not be immediately evident from conventional scientific studies alone. This will ensure that measures are not only technically sound but also sustainable and based on local, multigenerational expertise.

2. Hydrological and Topographical Studies to Guide Infrastructure

Require that comprehensive hydrological and topographical studies be conducted prior to the implementation of any drainage systems or land use developments. These studies should be aligned with community knowledge of local water flows, flood patterns, and land characteristics. The combination of scientific data with traditional insights will result in more effective and sustainable drainage systems that reduce the risk of flooding and other environmental hazards.

3. Land Use Planning with Indigenous Ecological Knowledge

Include Indigenous knowledge and practices in broader land use planning and development decisions. Recognising the Orang Asli's unique understanding of their ecosystems will help avoid disruptions to their environment and livelihood, while also ensuring that land development projects support the community's long-term sustainability and resilience to natural disasters.

4. Consultation of Orang Asli communities in Mitigation and Development planning in and around their Ancestral Lands

Orang Asli communities must be consulted in disaster mitigation and development planning in and around their ancestral lands. This includes land use and drainage systems that have the potential of impacting their settlements and agricultural areas. While existing regulations might require this, there is a need to ensure their enforcement.

By integrating the knowledge and perspectives of Orang Asli communities into mitigation and land use planning, this will lead to more contextually relevant and environmentally sustainable outcomes. Stronger partnerships between government planners and Orang Asli communities, could lead to more inclusive development. While this applies primarily to planning for Orang Asli communities, these must be taken into consideration in new developments or mitigation plans that take place around Orang Asli areas.



Flooding at KOA Bukit Tadam in 2021

Recommendation 6:

Inclusion of JAKOA as a Key Stakeholder in District, State, and National Disaster Command Centres (PKOB)

Include JAKOA as a key stakeholder in disaster management and decision-making at the District, State, and PKOB, given its mandate to support the welfare and development of Orang Asli communities.

1. Inclusion of JAKOA in NADMA's Directive No. 1

Include JAKOA as a permanent and key stakeholder in disaster management planning and coordination at all levels (District, State, and Federal). JAKOA's consistent presence at PKOB meetings will allow for effective advocacy for and address the specific needs of Orang Asli communities during disasters.

2. Clarify JAKOA's Role Alongside JKM

Clearly define JAKOA's role in disaster management, particularly in relation to JKM. While both agencies serve vulnerable populations, JAKOA should be recognised as the primary coordinator for disaster mitigation, recovery and preparedness phases involving Orang Asli communities. Existing disaster response strategies as coordinated by the PKOBs should continue to be strengthened, with JAKOA's inclusion. This must be approached on a case by case basis depending on the current state's capacities and coordination arrangements.

3. Capacity Building for JAKOA in Disaster Management

Allocate resources to build JAKOA's capacity to coordinate disaster relief effectively, particularly in high-risk states like Selangor.

This could involve additional staff training, budgetary support, the establishment of dedicated disaster response teams within JAKOA to enable the agency to be well-prepared to handle their responsibilities during emergencies and formalised collaborations with non-governmental stakeholders.

By integrating JAKOA into PKOB and strengthening its role in disaster management, this will enable proper representation and support for Orang Asli communities during disasters.

List of Recommendations:

1. Mainstream and Prioritise Orang Asli Knowledge, Practices, and Leadership in Disaster Management
2. Enhance Aid Delivery for Orang Asli Communities through Early, Coordinated, and Community Mapping-Based Approaches
3. Comprehensive Flood Management and Long-Term Resilience Building for Orang Asli Communities
4. Improve Communication and Socialisation of Disaster Management Policies and Mechanisms for Orang Asli Communities
5. Integrate Indigenous Knowledge in Mitigation and Land Use Planning for Orang Asli Communities and in Areas Around Orang Asli Ancestral Lands
6. Inclusion of JAKOA as a Key Stakeholder in District, State, and National Disaster Command Centres (PKOB)

4.2 Indigenous Knowledge, Systems, and Protocols (ISP): Before, During, and After

Related to the above recommendations, this section elaborates on specific ISP that OA communities practise before, during and after floods. These must be taken into consideration when working with Orang Asli, as they are crucial aspects of Orang Asli resilience. This includes respect, recognition of Orang Asli rights to their ancestral lands and self-determination, OA leadership and governance, *semangat gotong-royong* (communal spirit), and Indigenous early warning systems.

4.2.1 Orang Asli Rights to Land and Self-Determination

Orang Asli identity is defined by two fundamental aspects: “attachment to a particular territory and a religio-cultural spirituality linked very much to that geographical space” (Nicholas, 2022, 33). While the land around Bukit Tadam is increasingly being developed, and the community have adopted formal education and religion, the Bukit Tadam villagers continue to hold on to their connections to their ancestral lands and practice associated beliefs and customs. To gain a firmer hold on their ancestral lands, KOA Bukit Tadam, Paya Rumput and Mutus Tua have all been gazetted as Orang Asli Reserves as of 2019.

In the context of floods, the community is advocating for their village PPS to be permanently located on Tadam Hill, after which the village is named, as it is the nearest, highest, safest point of evacuation. The community possesses the Indigenous knowledge that this hill was the location of their initial village, their old durian orchards, their *balai adat*, and is where their ancestors continue to reside. This is also a way of further asserting the community's connections and rights to their lands, and to practise their generational ways of life that centre around these very lands.

The 14-acre gazettement of KOA Paya Lebar is surrounded by private lands and neighbouring

Malay villages. For the Orang Asli in the Hulu Langat area, land remains a critical resource for survival (Indriatmoko, 2006), and the Temuan community holds fast to their remaining access. The *kebun* and *dusun* cultivated by each household and their predecessors respectively will eventually be passed down to future generations, serving as a continuation of their ancestral heritage (Diansyah et al., 2022). To this day, the community sustains their deep-rooted connection with the forest, rivers, mountains, and the broader landscape, as they believe these natural spaces are home to their *moyang*, from whom they seek guidance, protection, and spiritual matters.

The KOA Paya Lebar community is also advocating for a designated PPS within their village. They envision this shelter being fully equipped with essential emergency supplies. Their intimate knowledge of the land informs them that the safest place for evacuation and refuge is within their own village. By establishing and managing their own shelter, the community can continue to foster their communal spirit, kinship, and sense of self-reliance, and draw upon other Indigenous knowledge and community protocols for immediate relief and support in times of crisis.

4.2.2 Indigenous Leadership and Governance

The Temuan community of KOA Bukit Tadam and KOA Paya Lebar traditionally look to their headman, the Tok Batin, and the *Lembaga Adat* (Council of Elders) for spiritual and Indigenous leadership. Both of which are often installed on the basis of lineage. Elders continue to be given the highest priority in terms of decision-making, in this case the Tok Batin, the Council of Elders and the *moyang*, especially because Indigenous governance is based upon Indigenous *adat*. The Tok Batin and Elders are often the ones who receive early warnings through messages from the *moyang*, and who communicate these to the rest of the villagers. The community is also governed by the JAKOA- and state-sanctioned JPKKOA and its Chairman. This formalised

leadership structure serves as the intermediary between JAKOA and the villagers, especially on socio-economic development related issues.

In terms of flood management for both KOA Paya Lebar and KOA Bukit Tadam, the Batin, JPKKOA Chairman and committee members all serve as the intermediary and coordinators of aid between village and external stakeholders. They oversee the village safety and development, the 4 phases of disaster management, and actively maintain and grow support networks for aid.

At KOA Bukit Tadam, the JPKKOA carry out specific roles according to their positions. For example, the *AJK Wanita* (Women's Representative) and the women's group would prepare and plan for upcoming floods as they are most able to identify the crucial needs for the family, elders, children, women, and men. They sometimes also serve as the health representatives. The *AJK Belia* (Youth Representative) on the other hand would lead the youth and able men in becoming *peronda kampung* (community patrollers), serve as the village early warning system team, evacuation team, and cleaning team. The JPKKOA also serves as the Tadam Flood Management Committee, and they are in charge of formulating a Flood Action Plan (PTB).

At KOA Paya Lebar, during the 2021 flood, the JPKKOA played a crucial role in monitoring the rising river levels where infrastructure lacked as there was no flood warning siren along the Lui River. They kept villagers informed via WhatsApp before the flood and checked on the safety of each household and community member afterward. As flood relief began pouring in, the JPKKOA worked late into the night, setting up a post by the *surau* to ensure that the aid was well-received and distributed properly to every household and/or community member.

The balance of power between the *Lembaga Adat* and the JPKKOA differs in every village. It is crucial to understand existing village

leadership structures in order to enable coordinated aid that serves the community most efficiently and effectively. This also empowers Indigenous leaders to be responsible and accountable to their communities.

4.2.3 Communal Spirit

Both the upstream and downstream communities note how "*Kita jaga kita dulu*" or we take care of our own first, is a representation of "*semangat gotong-royong*" or communal spirit, serving as the main driver of their mitigation, preparedness, relief and recovery efforts.

During the floods, the KOA Bukit Tadam community *gotong-royong* or worked together to evacuate to Bukit Tadam (Tadam hill), a higher, safer location on their own ancestral lands. They also shared water, food and fire with each other while waiting for the arrival of external support. The youth patrolled the village to ensure that everyone was safely evacuated, and also to monitor the safety of the village, household and property.

Similarly, the KOA Paya Lebar community came together to ensure that everyone, including the ill and disabled, was safely evacuated to BUDIMAS, the only refuge in their village high and sturdy enough to withstand the flood. During the initial days before flood relief aid arrived, community members shared water, food, medicines, and other essential resources to support one another through post-flood.

Both villages practise the concept of "*Kalau satu dapat, semua dapat*," or if one receives, all will receive. The Tok Batin, Pengerusi and JPKKOA ensure that aid is allocated equally to every member of the community. During recovery, the community came together to *gotong-royong* to clean, share clean water and food again. Those who were able, came together to fortify the community's mitigation and preparedness efforts.

At KOA Paya Lebar, the community continues to uphold their communal *bela tandak*, a practice deeply tied to the village's way of life. Every

two to three months, the entire village would come together for the maintenance of their communal gravity-fed water system. The men head to the water catchment area to repair and reinforce the rock dam, clearing the *tandak* of mud and leaves, while the women prepare a shared meal for the community. During the rainy season, this practice becomes more frequent as the need for upkeep increases. In the past, the villagers piped the water into their village through bamboo conduits, and presently through polypipes.



Water filter at Lata Lekah made by Paya Lebar villagers to trap fallen leaves from blocking the water pipes

Following the 2021 flood, community members with household-owned gravity-fed water systems began repairing their polypipes to secure water for cleaning their homes within the first 5 days. Once restored, they shared water access with those who could not recover or restore their pipes. For example, post-2021 floods, 10 households went to *bela tandak* at Lata Lekah, at a river which was not affected by the flood, pulling newly donated polypipes to the location and making their own rock dam and filter, in order to restore their access to clean water.

The community's communal practices in disaster management are an important part of Indigenous culture and identity. These are gradually being eroded by present day economics that place less emphasis on collective responsibilities to each other and to our environments, and prioritise individual gains.

4.2.4 Indigenous Early Warning Systems

The youth at KOA Bukit Tadam who frequently fish in the river, serve as the *peronda kampung* who observe the changing water levels in the river. They frequently inform the villagers through word of mouth and their village WhatsApp group about these updates. Additionally, elders at KOA Bukit Tadam note how they often receive early warnings that floods are coming from their *moyang* or ancestors and their ancestral lands in the form of dreams.

This is also true for the KOA Paya Lebar community. The elders received dream warnings from their *moyang* a week before the flood, which involved the naga *moyang* travelling from the mountain to the sea, bringing a flood along its journey. This flood story is also present in the Jakun, Jah Hut, and Temiar groups. This is often correlated with oral histories and belief systems passed down intergenerationally, that emphasise Orang Asli systems of reciprocity demonstrate strong emphases on care between humans and their environments.

Both villages also state that another of their early warning systems is by "reading" the rain type. They recognise that alternating patterns of heavy and light (spray-like) rain typically precedes a flood. This is complemented by updates from MET Malaysia, Public Info Banjir by JPS, social media updates, and WhatsApp updates from relatives and friends living upstream. These are then shared to other members of the village via word of mouth or through the village WhatsApp group.

Centering Indigenous early warning systems is important, as community members are often the frontline responders, and experts of their ecological niches and built environments. Recognition of such Indigenous knowledge also encourages the continued passing down of Indigenous culture and knowledge, and affirms the importance of community-based knowledge as complementary to western scientific knowledge.



KOA Paya Lebar villagers continue recovery from the 2021 floods through community-led water management rooted in their ISPs

4.3 Conclusion

The findings of this research carried out with KOA Paya Lebar and KOA Bukit Tadam have provided deeper insight into Orang Asli communities' perspectives and experiences on floods and flood management. Importantly, during the initial stages of floods, when external flood aid has yet to arrive, the Orang Asli communities are self-reliant on their own Indigenous knowledge, systems and protocols (ISPs). These ISPs are dependent on their multi-generational relationships with their ecological niches. Findings also highlighted that respect and recognition of ISPs enable for better coordination of aid and other disaster management efforts during response, recovery, preparedness and mitigation phases. Communities' Indigenous knowledge of their environment that shapes these systems and protocols also informs their flood and land management. This emphasises the complementary nature of Indigenous knowledge and western scientific knowledge, especially in the intersections of long-term land use and flood mitigation plans. Based on these, this report provides six recommendations for including Orang Asli voices, perspectives and experiences towards building community flood resilience.

Importantly, these suggest prioritisation of preparedness and mitigation phases, alongside immediate response and recovery.

Further research is needed to contextualise these findings and community recommendations within Malaysia's broader disaster governance. There is a need for policy analysis of existing government and civil society disaster management, land use and related directives, policies, plans and strategies, in order to systematically address where Indigenous knowledge on disaster governance and land use can be complementary to existing efforts in national and state disaster governance frameworks. Additionally, Orang Asli communities should be supported in creating Indigenous Flood Management Protocols, that address how external parties can support existing community efforts, and that take into consideration intersectional approaches. For example, the inclusion of a gender-responsive management plan that specifically addresses challenges faced by women, elders and children during floods; and protocols that take into consideration the experiences and challenges of community members with special needs as well.

Chapter 1

- Bernama. (2023, March 15).** Nik Nazmi: Orang Asli community to be actively involved in environmental sustainability. *New Straits Times*. <https://www.nst.com.my/news/nation/2023/03/889444/nik-nazmi-orang-asli-community-be-actively-involved-environmental>
- Chambers, R. (1996).** Participatory rural appraisal and the reversal of power. *The Cambridge Journal of Anthropology*, 19(1), 5–23. <http://www.jstor.org/stable/23818769>
- Gimino, G. (2023, September 22).** New Act mulled to improve disaster management. *The Star*. <https://www.thestar.com.my/news/nation/2023/09/22/new-act-mulled-to-improve-disaster-management>
- Intergovernmental Panel on Climate Change (IPCC). (2023).** In *Climate change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, Lee, H., & Romero, J. (Eds.)]. (pp. 1–34). <https://doi.org/10.59327/IPCC/AR6-9789291691647.001>
- Lim, I. (2021, December 22).** Experts: Selangor floods show failure to prevent a repeat of Kelantan in 2014; Malaysia needs better warning systems. *Malay Mail*. <https://www.malaymail.com/news/malaysia/2021/12/22/experts-selangor-floods-show-failure-to-prevent-a-repeat-of-kelantan-in-201/2030182>
- Majlis Keselamatan Negara. (2012).** *Arahan MKN No. 20 (Semakan Semula), Dasar dan Mekanisme Pengurusan Bencana Negara*. Retrieved from https://www.umpsa.edu.my/doc/arahan-mkn-no.20-semakan-semula-09_02_2013.pdf
- National Disaster Management Agency. (2023).** *Disaster management needs wider and more active NGO participation*. https://www.nadma.gov.my/images/2023/KeratanAkhbar/Disaster_Management_Needs_More_Active_Ngo_Participation.pdf
- National Disaster Management Agency. (2024).** *Arahan NADMA No. 1: Dasar dan Mekanisme Pengurusan Bencana Negara*. Retrieved from https://www.nadma.gov.my/images/2024/RujukanDalaman/Arahan_NADMA_No_1.pdf
- Omran, A., Schwarz-Herion, O., & Bakar, A. A. (2018).** Factors contributing to the catastrophic flood in Malaysia. In A. Omran & O. Schwarz-Herion (Eds.), *The impact of climate change on our life* (pp. 33–55). Springer. <https://doi.org/10.1007/978-981-10-7748-7>
- Rahman, S. (2022).** Malaysia's floods of December 2021: Can future disasters be avoided? *ISEAS Yusof Ishak Institute Perspective*, 2022(26), 1–15. <https://www.iseas.edu.sg/articles-commentaries/iseas-perspective/2022-26-malaysias-floods-of-december-2021-can-future-disasters-be-avoided-by-serina-rahman/>
- United Nations Office for Disaster Risk Reduction (UNDRR). (2015).** *Sendai framework for disaster risk reduction 2015–2030* (p.15).
- United Nations Environment Programme (UNEP). (2024).** *Disasters and climate change*. <https://www.unep.org/topics/fresh-water/disasters-and-climate-change>
- Zahiid, S. J. (2024, May 7).** Cabinet approves review of current disaster management policy, DPM Zahid says. *Malay Mail*. <https://www.malaymail.com/news/malaysia/2024/05/07/cabinet-approves-review-of-current-disaster-management-policy-dpm-zahid-says/133011>

REFERENCES (Continued)

Chapter 2

- Abdullah, S. Z. S., Mohamed Saleh, R., Abdul Rashid, N. H., & Ali, S. H. (2023). Surviving the flood: The case of Indigenous Batek of Malaysia. *Geografia-Malaysian Journal of Society and Space*, 19(1), 201–212. <https://ejournal.ukm.my/gmjss/article/view/49314>
- Along, N. Z. B., Ahmed, I., & MacKee, J. (2022). Flood knowledge management by multiple stakeholders: An example from Malaysia. *International Journal of Disaster Resilience in the Built Environment*, 13(2), 141–157. <https://doi.org/10.1108/ijdrbe-08-2021-0102>
- Ayob, M. A., Nutman, A., Lee, L. H., Alias, A., Khamis, S., Redzuan Hafiz Boon, N. E. F., Tew, S. T., & Soon, J. M. (2016). Indigenous plants and tuber as alternative food sources for Temiar communities during flood situations. *Advances in Environmental Biology*, 10(1), 93–100. ISSN 1995-0756.
- Battiste, M. (2005). Indigenous knowledge: Foundations for First Nations. *WINHEC: International Journal of Indigenous Education Scholarship*, 1(1), 1–17. <https://journals.uvic.ca/index.php/winhec/article/view/19251>
- Blaikie, P., Brown, K., Stocking, M., Tang, L., Dixon, P., & Sillitoe, P. (1997). Knowledge in action: Local knowledge as a development resource and barriers to its incorporation in natural resource research and development. *Agricultural Systems*, 55(2), 217–237.
- Chikaire, J., Osuagwu, C.O., Ihenacho, R.A., Oguegbuchulam, M. N., Ejiogu-Okereke, N., & Obi, K.U. (2012). Indigenous knowledge system: The need for reform and the way forward. *Global Advanced Research Journal of Agricultural Science*, 1(8), 201–209.
- Cuatón, G. P., & Su, Y. (2020). Local-Indigenous knowledge on disaster risk reduction: Insights from the Mamanwa Indigenous peoples in Basey, Samar after Typhoon Haiyan in the Philippines. *International Journal of Disaster Risk Reduction*, 48, 101596. <https://doi.org/10.1016/j.ijdr.2020.101596>
- Danladi, A., Ho, C. S., & Ling, G. H. T. (2018). Importance of Indigenous knowledge in flood risk reduction: A review. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, 11(1), 7–16.
- Danraka, M. M., Mohamad, S., & Ismail, S. N. H. (2024). Community-based adaptation to flood: A systematic literature review. *Malaysian Journal of Sustainable Environment*, 11(1), 251–278. <https://doi.org/10.24191/myse.v11i1.998>
- Endicott, K. (Ed.) (2016). *Malaysia's original people: Past, present and future of the Orang Asli*. NUS Press.
- Hadlos, A., Opdyke, A., & Hadigheh, S. A. (2022). Where does local and Indigenous knowledge in disaster risk reduction go from here? A systematic literature review. *International Journal of Disaster Risk Reduction*. 79. 103160. [10.1016/j.ijdr.2022.103160](https://doi.org/10.1016/j.ijdr.2022.103160).
- Haque, M. A., Rahman, D., & Rahman, M. H. (2016). The importance of community-based approach to reduce sea level rise vulnerability and enhance resilience capacity in the coastal areas of Bangladesh: A review. *Journal of Sustainability Science and Management*, 11(2), 81–100.
- Hiwasaki, L., Luna, E., Syamsidik, & Shaw, R. (2014). *Local & Indigenous knowledge for community resilience: Hydro-meteorological disaster risk reduction and climate change adaptation in coastal and small island communities*. UNESCO.
- Intergovernmental Panel on Climate Change (IPCC). (2019). Annex I: Glossary. In *Climate change and land: An IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*.
- Ismail-Zadeh, A. T., Cutter, S. L., Takeuchi, K., & Paton, D. (2017). Forging a paradigm shift in disaster science. *Natural Hazards*, 86(2), 969–988.
- Jabatan Kemajuan Orang Asli (JAKOA). (2023). *Jadual taburan etnik Orang Asli mengikut negeri*. <https://www.jakoa.gov.my/orang-asli/jadual-taburan-etnik-orang-asli-mengikut-negeri/>

Chapter 2 (continued)

- Knopf, K. (2015). The turn toward the Indigenous: Knowledge systems and practices in the academy. *Amerikastudien / American Studies*, 60(2/3), 179–200. <http://www.jstor.org/stable/44071904>
- Leonie, A., Lasimbang, J., Jonas, H., & Mansul, B. (2015). *Red and raw: Indigenous rights in Malaysia and the law*. Indigenous Peoples Network of Malaysia.
- Matti, S. & Ögmundardóttir, H. (2021). Local knowledge of emerging hazards: instability above an Icelandic glacier. *International Journal of Disaster Risk Reduction*, 58, 102187. <https://doi.org/10.1016/j.ijdr.2021.102187>
- Mercer, J., Kelman, I., Taranis, L., & Suchet-Pearson, S. (2010). Framework for integrating Indigenous and scientific knowledge for disaster risk reduction. *Disasters*, 34(1), 214–239. <https://doi.org/10.1111/j.1467-7717.2009.01126.x>
- Mercer, J., & Kelman, I. (2008). Living with floods in Singas, Papua New Guinea. In R. Shaw, N. Uy, & J. Baumwoll (Eds.), *Indigenous knowledge for disaster risk reduction: Good practices and lessons learned from experiences in the Asia-Pacific region* (pp. 46–51). United Nations International Strategy for Disaster Reduction (UNISDR).
- Muhamad, N. and Shaidin, H.A. (2022). The Assessment of Flood Events in Selangor, Malaysia. *Journal of Advanced Geospatial and Science Technology*. 2(2), 42-55.
- Mwaura, P. (2008). *Indigenous knowledge in disaster management in Africa*. United Nations Environment Programme.
- Nicholas, C. (2012). *Protection of Indigenous knowledge in Malaysia*. <https://staging.coac.org.my/protection-of-indigenous-knowledge-in-malaysia/>
- Nicholas, C. (2022). *Looking Back, Looking Forward: Orang Asli Self-Governance and Democracy*. Asia Indigenous Peoples Pact.
- Nyong, A., Adesina, F., & Elasha, B. O. (2007). The value of Indigenous knowledge in climate change mitigation and adaptation strategies in the African Sahel. *Mitigation and Adaptation Strategies for Global Change*, 12, 787–797. <https://doi.org/10.1007/s11027-007-9099-0>
- Rahsidi, S. M., Tukiman, I., Mohd Hussain, M. R., & Ismawi, Z. (2017). Perception analysis on public awareness and preparedness towards early warning system (EWS) for dam safety: A case study in Bertam Valley Cameron Highlands. *International Journal of Hydropower and Dam, Shaping the Future of Hydropower*.
- Rai, P. & Khawas, V. (2019) Traditional knowledge system in disaster risk reduction: Exploration, acknowledgement and proposition. *Jambá: Journal of Disaster Risk Studies* 11(1), a484. <https://doi.org/10.4102/jamba.v11i1.484>
- Scott, J. C., Cabello-Llamas, D., & Bittner, P. (2013). *Engaging Indigenous peoples in disaster risk reduction*. Center for Public Service Communications.
- Shaw, R., Uy, N., & Baumwoll, J. (Eds.) (2008). *Indigenous knowledge for disaster risk reduction: Good practices and lessons learned from experiences in the Asia-Pacific region*. UNISDR Asia Pacific.
- Sidle, R. C., Gallina, J., & Gomi, T. (2017). The continuum of chronic to episodic natural hazards: Implications and strategies for community and landscape planning. *Landscape and Urban Planning*, 167, 189–197.
- Sithole, W. W., Naser, M., & Guadagno, L. (2015). *Indigenous Knowledge for Disaster Risk Reduction: Documenting Community Practices in Papua New Guinea*. International Organization for Migration and National Disaster Centre.
- United Nations Office for Disaster Risk Reduction (UNDRR). (2023). *Midterm review of the Sendai Framework for Disaster Risk Reduction 2015–2030: Thematic report on local, Indigenous and traditional knowledge for disaster risk reduction in the Pacific*.

REFERENCES (Continued)

Chapter 3

- Ahmed, M. F., Alam, L., Ta, G. C., Mohamed, C. A. R., & Mokhtar, M. (2016). A review on the chemical pollution of Langat River, Malaysia. *Asian Journal of Water, Environment and Pollution*, 13, 9–15.
- Ahmed, M. F., Mokhtar, M. B., Lim, C. K., Suza, I. A. B. C., Ayob, K. A. K., Khiretdin, R. P. K., & Majid, N. A. (2023). Integrated river basin management for sustainable development: Time for stronger action. *Water*, 15(13), 2497. <https://doi.org/10.3390/w15132497>
- Bernama. (2021, December 18). Selangor records highest rainfall ever as floods continue. *Malaysia Now*. <https://www.malaysianow.com/news/2021/12/18/selangor-records-highest-rainfall-ever-as-floods-continue>
- Carey, I. (1976). *Orang Asli: The aboriginal tribes of Peninsular Malaysia*. Oxford University Press.
- Dunn, F. L. (1975). *Rain-forest collectors and traders: A study of resource utilization in modern and ancient Malaya*. Monographs of the Malaysian Branch, Royal Asiatic Society No. 5.
- Gomes, A. G. (1979). *Ecological adaptation and population change: A comparative study of Semang foragers and Temuan horticulturists*. [Master's thesis, University of Malaya]
- Idrus, R., Man, Z., Williams-Hunt, A., & Chopil, T. Y. (2021). Indigenous resilience and the COVID-19 response: a situation report on the Orang Asli in Peninsular Malaysia. *AlterNative: An International Journal of Indigenous Peoples*, 17(3), 439–443. <https://doi.org/10.1177/11771801211038723>
- Lim, F.-H., W.-K., Lee, W.-K., Khor, W.-S., Chan, L., Sulaiman, M. S., Shaari, H., & Jalil, M. K. (2023). River basin change index for integrated river basin management of Langat River, Malaysia. *Water Policy*, 25(11), 1035–1061. <https://doi.org/10.2166/wp.2023.035>
- Majlis Keselamatan Negara (MKN). (2022). *Bantuan Bencana Banjir Keluarga Malaysia*. <https://www.mkn.gov.my/web/ms/2022/03/14/bantuan-bencana-banjir-keluarga-malaysia/>
- Tengku Abdul Aziz, T. Z. (2022, January 20). Penerangan Daripada Menteri Kewangan. *Penyata Rasmi Parlimen Dewan Rakyat*, 26. Parliament of Malaysia
- World Weather Online. (2024). Selangor weather averages. *World Weather Online*. <https://www.worldweatheronline.com/selangor-weather-averages/selangor/my.aspx>

Chapter 4

- Diansyah, M. W., Abas, A., & Sakawi, Z. (2022). Exploring the relevance of engaging the Orang Asli in Malaysia's forest management. *Frontiers in Forests and Global Change*, 5, Article 1019994. <https://doi.org/10.3389/ffgc.2022.1019994>
- Indriatmoko, Y. (2006). Orang Asli, land security and response to the dominant society: A case study of the Tanjung Rambai Temuan Malaysia. *Power, purpose, process, and practice in Asia: The work of the 2003/2004 API fellows* (pp. 52–67). The Nippon Foundation.
- Nicholas, C. (2022). *Looking Back, Looking Forward: Orang Asli Self-Governance and Democracy*. Asia Indigenous Peoples Pact.



A project by



GERIMIS

Supported by



Federal Ministry
for the Environment, Nature Conservation,
Nuclear Safety and Consumer Protection



SGP The GEF
Small Grants
Programme



YAYASAN
HASANAH
 A foundation of Khazanah Nasional

based on a decision of
the German Bundestag