

GENDER, FOOD SECURITY, AND CLIMATE ADAPTATION: INDIGENOUS RESILIENCE IN INDONESIAN LOCAL COMMUNITIES

A Thesis

**Submitted to the Master's Study Program of Public Policy Specializing
in Climate Change at the Faculty of Social Sciences in partial
fulfillment of the requirements for the degree of**

Master of Public Policy (M.P.P.)



by:

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UNIVERSITAS ISLAM INTERNASIONAL INDONESIA

DEPOK

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ABSTRACT

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This research investigates how climate change impacts Indigenous peoples and local communities (IPLCs) in Indonesia, by focusing on local food systems and Indigenous women's access to and control over natural resources. Using an intersectional lens, it explores how traditional ecological knowledge underpins community-based adaptation. Fieldwork was conducted in 2025 over four months in four locations: Mentawai, West Sumatera (Mentawai), Tebo, Jambi (Talang Mamak), Maros, South Sulawesi (Bara and Cindakko), and Lebak, Banten (Baduy and Kasepuhan), with support from the Estungkara Program run by Kemitraan, which is part of the Australia-Indonesia INKLUSI partnership. The research employs ethnographic and participatory action research methods. It focuses on one central question: How does climate change affect the vulnerability and resilience of Indigenous women in securing food and preserving cultural practices, and what locally rooted adaptation strategies can be supported to ensure equitable and sustainable responses? Across the four cases, this study finds that Indigenous women are disproportionately affected by the effects of climate change. It also reveals that Indigenous women are key agents of local adaptation. They draw on diverse traditional practices—seed conservation, poly-cropping, forest stewardship, communal food sharing—to buffer their families against climate shocks. As primary providers of food, water, and family health, they are particularly vulnerable to catastrophic weather, crop failures, and environmental stresses, yet they are often excluded from decision-making. Despite these vulnerabilities, traditional agroforestry and food systems remain central to resilience, though they are overlooked in formal adaptation policies. Indigenous knowledge systems rooted in spiritual values, communal ties, and ecological stewardship enable adaptive responses to environmental change, but face erosion due to pressures from modern, chemically intensive agriculture, cultural disconnection, and migration. The research underscores that effective adaptation must be locally grounded, gender-responsive, and participatory, recognizing both the legitimacy of Indigenous knowledge and the gendered dimensions of vulnerability. Ignoring these factors risks perpetuating systemic marginalization. The study contributes empirical insights to policy debates on climate resilience, gender equity, and Indigenous knowledge by providing field evidence and community perspectives for shaping inclusive, gender-sensitive, rights-based adaptation frameworks in Indonesia and comparable contexts.

Keywords: Climate change, IPLCs, food security, food sovereignty, resilience, adaptation, gender equity, social inclusion, traditional ecological knowledge

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ABBREVIATION

ADB	: Asian Development Bank
CRI	: Climate Risk Index
CSO	: Civil Society Organization
FGD	: Focus Group Discussion
FPCI	: Free, Prior, and Informed Consent
GIS	: Geographic Information System
IPCC	: Inter-Governmental Panel on Climate Change
IPLCs	: Indigenous Peoples and Local Communities
KA	: Indigenous Community (<i>Komunitas Adat</i>)
KWT	: Women's Farming Group (<i>Kelompok Wanita Tani</i>)
LAD	: Customary Law Village Council (<i>Lembaga Adat Desa</i>)
NGO	: Non-Governmental Organization
PAR	: Participatory Action Research
ProKlim	: Climate Village Program
SIKAT	: Siaga Krisis Akulturasi Toolkit
TEK	: Traditional Ecological Knowledge

CHAPTER I INTRODUCTION

Indonesia frequently ranks in the top tier of the Climate Risk Index (CRI) due to its high sensitivity to severe weather events such as heat waves, extended droughts, landslides, and coastal flooding, making it one of the world's most climate-vulnerable nations (the World Bank and Asian Development Bank, 2021). The severe consequences of these climatic stressors on natural ecosystems and agricultural systems endanger the lives of millions of people, particularly those living in distant and rural locations.

Indigenous Peoples and Local Communities (IPLCs) rely on forests, rivers, and ancestral grounds for food, water, medicine, culture, and spirituality, and they have deep connections to their homeland. However, they are currently facing several obstacles, including fast climate change, ecological decline, and historical marginalization. The 2023-2024 El Niño caused droughts and forest fires in eastern Indonesia, whereas preceding La Niña events resulted in heavy rains and flooding. These recurring episodes highlight Indonesia's climate's increasing unpredictability, as well as the immediate consequences for agricultural systems and Indigenous ways of life.

Within these encounters, Indigenous women experience the consequences in overtly gendered ways. Women have unique problems when traditional staples run out or seasons change abruptly, since they are the primary caretakers of food, water, and family wellbeing. For example, during severe droughts, women may spend up to 60% more time obtaining water, taking time away from education, paid work, leisure, or care responsibilities. Meanwhile, land concessions (for oil palm, production forest, mining, etc.) have undermined women's traditional farming, which once supplied the majority of household food. Customary land titles and village institutions usually favor male heads of families, excluding women from decision-making processes. Despite these pressures, Indigenous women are hardly passive victims. They provide critical but underestimated roles in ensuring food security and resilience by maintaining seed banks, managing forest gardens, and adapting crop and food systems to environmental change. However, adaptation policies and programs rarely reflect these contributions, focusing instead on male-dominated institutions and technocratic solutions.

This research argues that Indigenous women are key agents of climate adaptation, yet their contributions remain marginalized in both policy and public discourse. Using a comparative case study approach focused on four communities—Mentawai, Talang

Mamak, Bara-Cindakko, and Baduy-Kasepuhan—this study explores how climate change affects local food systems, customary institutions, and gender dynamics. It asks:

How does climate change affect the vulnerability and resilience of Indigenous women in securing food and preserving cultural practices, and what locally rooted adaptation strategies can be supported to ensure equitable and sustainable responses?

To answer the research question above, this study combines ethnographic fieldwork, participatory observation, and community-based interviews, focusing particularly on women’s roles and experiences. The findings reveal three central insights. First, climate change is reshaping not only landscapes and seascapes but also social relations and food systems in Indigenous communities. Second, while *adat* (customary) institutions remain vital for environmental governance, they are also undergoing internal transformations—often reflecting, and sometimes reinforcing, gender inequalities. Third, adaptation practices already exist on the ground, often led by women, but are poorly integrated into formal climate strategies.

This study contributes to the fields of climate justice, ecofeminism, and Indigenous studies by centering gendered experiences of environmental change. It addresses a gap in the literature by showing how intersectional factors—gender, indigeneity, geography, and socio-economic status—shape differentiated vulnerabilities and adaptive capacities. Practically, the research informs climate policy in Indonesia by providing evidence for more inclusive, rights-based, and culturally grounded adaptation frameworks. In particular, it underscores the importance of recognizing and supporting Indigenous women’s agency in sustaining food systems and managing ecosystems amid climate uncertainty.

Given the immense ecological and cultural diversity of Indonesia, this study is necessarily limited in geographic scope. It focuses on communities with recognized customary systems and documented climate impacts. Nonetheless, the findings offer valuable lessons for broader efforts to integrate Indigenous knowledge, gender equity, and climate resilience in sustainable and equitable development planning.

CHAPTER II LITERATURE REVIEW

Recent scholarship confirms that Indigenous communities across Indonesia are on the frontlines of climate change. Research by Alfian (2023) and Mariadi et al. (2020) highlights how climate-induced disruptions—from droughts to changing rainfall patterns—are threatening Indigenous food systems in regions such as Sumatera and Sulawesi. These systems are not merely agricultural practices but also expressions of ecological ethics and cultural identity. Gade (2023) calls for a relational ecological ethics in which environmental care is deeply intertwined with justice, spirituality, and Indigenous worldviews, where she foregrounds multispecies perspectives, rights of nature, and environmental justice as central ethical concerns. She offers a distinctive ethics that resists neoliberal and colonial legacies, to go beyond the Anthropocene.

Despite their importance, IPLCs are increasingly under threat, and climate change has intensified risks for them. Research shows that Indigenous communities globally safeguard the bulk of remaining biodiversity, yet they receive minimal support for adaptation (Satria et al., 2024). Since 2000, state-sanctioned agricultural expansion has displaced approximately eight million Indigenous people in Indonesia (Andrianus, 2024), eroding Indigenous food systems. Erratic monsoon cycles and rising temperatures have already cut rain-fed crop yields by up to 50% and threaten up to 40% of West Papua's fruit and medicinal species (Silva et al., 2019). Technocratic solutions like carbon-offset reforestation often criminalize Indigenous caretaking, resulting in land grabs and eroded sovereignty (Sultana, 2022). These trends reflect broader political–ecological pressures. In this context, scholars stress that Indonesia's environmental crises are rooted not only in climatic variability but also in decades of poor governance.

Gendered climate injustice is a central concern. Studies of Indonesian communities highlight that Indigenous women bear disproportionate burdens and yet are critical adaptive agents. Even when customary law acknowledges women's stewardship (for example, communal seed banks managed by Dayak women), statutory land policies favor male household heads, weakening women's resource rights. For instance, Niko et al. (2024) note that droughts force women to expend 67% more time on water collection, cutting into their opportunities for education and economic activities. Oil palm expansion directly displaced women's gardens that once supplied 70% of household food. At the same time, climate adaptation programs have often been gender-insensitive: Indonesia's flagship Climate

Village Program (ProKlim) has been critiqued for reinforcing patriarchal structures by channelling resources through male-dominated councils and overlooking women's agroecological knowledge. In short, mainstream adaptation planning risks replicating pre-existing inequalities by ignoring the gendered dimensions of vulnerability.

Nonetheless, emerging literature underscores Indigenous women's resilience and innovation. Internationally, case studies from Bangladesh (Garai, 2025) and Colombia (Guáqueta-Solórzano & Postigo, 2022) reinforce the role of Indigenous women as innovators who reinterpret tradition to meet contemporary ecological crises. Across Asia, women have combined traditional practices (crop-rotation calendars, seed networks, forest mapping) with new strategies to adapt to climate variability. In Indonesia, studies by Arif (2021, 2024) echo this trend, showing how women adapt sacred rituals, forest knowledge, and communal networks to build climate resilience. Women-led initiatives include intergenerational seed exchanges in Mentawai, participatory Geographic Information System (GIS) mapping by Dayak women in Kalimantan, and rotating-credit (arisan) networks on Java to fund agroecological farms with climate-resilient crops (Mayastuti 2025, Atmadja et al., 2023). These examples reflect communal cooperation (gotong royong) as a model of relational resilience (Zahra 2025; Kurnia et al., 2023).

While Indigenous knowledge is recognized as crucial for adaptation, the specific agency of Indigenous women in sustaining food systems is under-studied in Indonesia. This research addresses that gap by centering women's experiences as knowledge-holders in climate adaptation. It uses an intersectional, ecofeminist approach by recognizing the interplay of gender, ethnicity, class, patriarchy, and colonial history. It also utilizes political ecology by examining power over land and resources (Sultana 2020; Nyantakyi-Frimpong 2019; Uche, & Ekine 2025) to frame the analysis.

This literature review has highlighted how climate change, development, and social inequalities intersect to threaten both ecosystems and gender equity. The next section describes the qualitative, multi-site methodology used to explore these dynamics in the four case communities.

CHAPTER III RESEARCH METHODOLOGY

This study adopts a qualitative, multi-site case study design, to explore how Indigenous women navigate the impacts of climate change while sustaining food security and community resilience. Four selected locations span diverse ecological and geographic terrains, yet all rely on climate-vulnerable agrarian livelihoods.

The site selection is guided by several interrelated criteria. The chosen sites represent a range of ecosystems—coastal islands, inland forests, and upland regions—each with distinct environmental and socio-cultural challenges. The Mentawai Islands, for instance, are an island-based society contending with rising sea levels, erratic rainfall, and diminishing culture. In Jambi’s Tebo District, the Talang Mamak community faces pressures from deforestation, biodiversity extinction, cash crop plantation expansion (such as oil palm and rubber), and increasing human-wildlife encounters (such as Sumatran tigers, elephants, orangutans, hornbills, and pangolins) within the constraints of a restoration ecosystem concession near Bukit Tigapuluh National Park. In South Sulawesi’s Maros region, the Bara-Cindakko highland community practices agroecology amidst soil degradation and seclusion.

These communities are then contrasted with the Baduy-Kasepuhan people, who serve as a comparative control group due to their cultural resilience and strong adherence to customary environmental stewardship. This is a mere programmatic decision, as no specific intervention or treatment will be introduced in their case. All four chosen sites are supported by Estungkara Program, which promotes inclusive governance by advancing equality, empowerment, and access for Indigenous peoples, especially women, children, persons with disabilities, and other marginalized groups. The study aimed to capture how ecological settings, traditional ecological knowledge, and systemic marginalization shape adaptive capacities and food resilience under the pressures of climate change.

The research combines ethnographic fieldwork with Participatory Action Research (PAR) methods. Ethnography enables an immersive understanding of daily life—observing domestic tasks, food preparation, farming routines, and tribal rituals. The methodological foundations for this draw on the work of Radcliffe-Brown & Malinowski (1922), who advocate for immersive, relational research in culturally distinct settings. PAR, meanwhile, ensures community members co-create knowledge and guide outcomes. PAR draws on the frameworks of Dudley (2014), Van De Sande & Schwartz (2017), and Stoecker & Falcon (2022), who identify three pillars of participation, action, and research. These pillars guide

both the ethical stance and the procedural flow of this study, from community consent to collaborative data interpretation.

The empirical data for this thesis were generated as part of a collaborative research project conducted under the Australia–Indonesia INKLUSI partnership through its Estungkara Program, which is administered by the Partnership for Governance Reform, or “Kemitraan”. The fieldwork was conducted over four months (March–June 2025) in all sites, in collaboration with local CSO-NGO partners (Yayasan Cipta Mandiri Mentawai /YCMM in West Sumatera, Komunitas Konservasi Indonesia/KKI WARSI in Jambi, Sulawesi Community Foundation/SCF in South Sulawesi, and Rimbawan Muda Indonesia/RMI in Banten).

Together with one co-researcher, the author was directly involved in designing and implementing the fieldwork across the four selected sites. Over the intensive four-month fieldwork, which started with Mentawai in March, Talang Mamak in April, Bara-Cindakko in May, and Baduy-Kasepuhan in June, two researchers gathered qualitative data from 245 informants through a combination of individual interviews, small-group discussions, and larger focus group sessions. Additional data collection was conducted in June to allow discussion with the local communities and government offices of Mentawai who reside on Sipora island – different from the Siberut island that was visited in March. The author’s responsibilities included coordinating with local NGO partners and government officials, conducting interviews and participant observations, facilitating group discussions, maintaining detailed field notes to ensure the richness and accuracy of the ethnographic record, conducting analysis, and writing report in tandem with the co-researcher.

Prior to data collection, permissions were obtained and ethical protocols for research with Indigenous communities were strictly adhered. All engagements were conducted in a culturally sensitive manner, often with the support of local community organizers and interpreters, and with specific attention to creating safe spaces for women’s participation. As part of the Estungkara Program’s commitment to reciprocity, preliminary findings were shared and validated with the participating communities in follow-up sessions, allowing for corrections, clarifications, and community ownership of the research outputs. This collaborative and ethically grounded approach not only enhanced the credibility of the data but also reinforced trust between the research team and the communities, ensuring that the study reflects the lived experiences and aspirations of the people whose knowledge and stories form its foundation.

Data collection methods included participant observation, in-depth interviews, Focus Group Discussions (FGDs), participatory mapping, and transect walks. Two

researchers spent 1–2 weeks in each village, accompanying households in daily activities (for example, collecting water, going to school, farming, forest foraging, fetching protein sources, harvesting crops, cooking, etc.) to document gendered labour patterns. Seventy-five semi-structured interviews (each 30–120 minutes) were held with Indigenous women, elders, youth, communal leaders, and local officials. Interview questions probed perceptions of climate change, impacts on food sources, shifts in gender roles, and access to land and resources.

Furthermore, twelve FGDs were conducted, using a research toolkit developed by anthropologists from Gadjah Mada University called SIKAT (“Siaga Krisis Akulturasi Toolkit”), with 134 participants from 245 informants in total. These group sessions explored community visions of environmental change, dietary shifts, gendered division of labour, and collective responses. Participatory mapping and transect walks further visualized climate risks (for example, flooded areas, drying springs, deforested and degraded forests) and loci of ecological knowledge. Informants were selected purposively to include diverse ages, genders, and social positions.

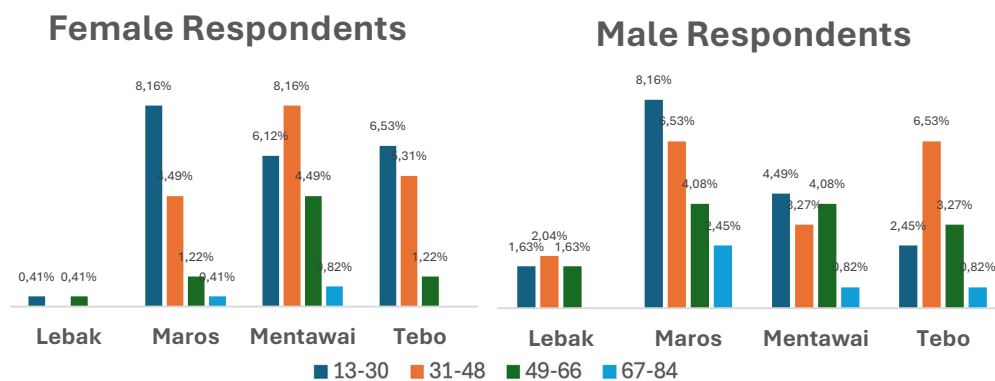


Figure 3.1
Percentage of Respondents Based on Gender and Age in Four Locations
Source: Primary data processed by the author (2025)

To understand how Indigenous communities experience and respond to climate impacts, this study adopts the climate risk framework from the Sixth Assessment Report, *Climate Change 2022: Impacts, Adaptation and Vulnerability* (IPCC Working Group II, 2022). The framework defines climate risk as the outcome of interactions between hazard, exposure, and vulnerability.

Hazards include rising average temperatures, shifting seasonal patterns, and increasingly frequent extreme events—such as storms, floods, wildfires, and landslides—driven by human-induced climate change and environmental degradation. Exposure refers to the presence of Indigenous communities in ecologically fragile areas—such as coastal zones, mountainous regions, and forests—that are particularly vulnerable to these climate-related hazards. In some cases, such as Mentawai and Talang Mamak, centralized resettlement policies have displaced the communities from their traditional lands and livelihoods, creating new forms of social and ecological exposure. Vulnerability encompasses the conditions that reduce communities’ capacity to cope with various hazards, including high dependence on local ecosystems, limited access to education and healthcare, insecure land tenure, low technological capacity, and restricted access to financial resources and political representation. Indigenous women face compounded vulnerabilities due to their marginalized status in both customary systems and state governance structures.

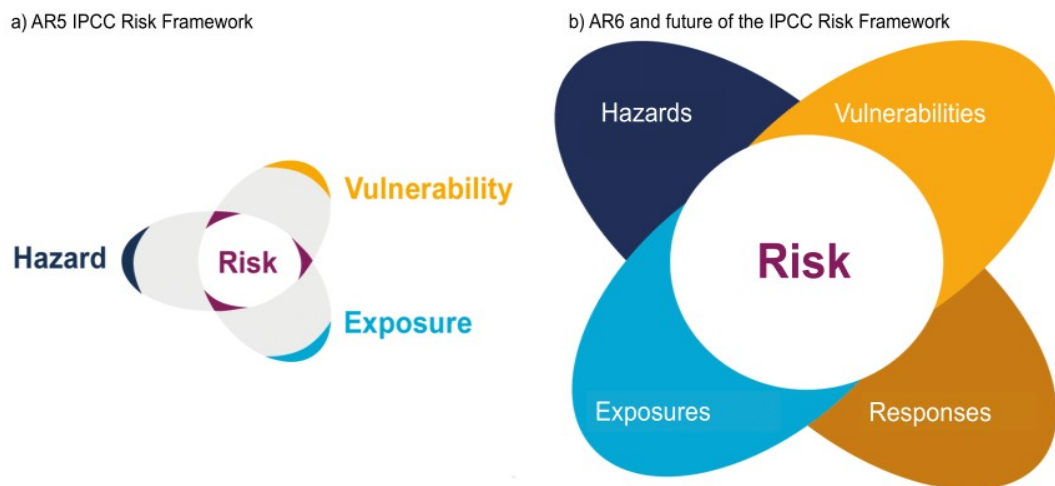


Figure 3.2 IPCC Risk Framework
Source: Simpson, N. P., et al (2022)

Together, these three components generate a clear and present danger, real and growing climate risks: the loss of traditional livelihoods, degradation of ecosystems essential to survival, increased domestic and productive labour burdens, and heightened

threats of hunger, malnutrition, and gender-based violence. These risks are further exacerbated by the limited adaptive capacity of Indigenous communities and the lack of alignment between mitigation and adaptation policies across different levels of governance.

All research adhered to ethical protocols for Indigenous communities. Free, Prior, and Informed Consent (FPIC) was obtained from village leaders and participants, and facilitation was gender-sensitive. Results were shared back with communities through validation meetings to ensure accuracy and reciprocal benefit. Data were triangulated by cross-checking interviews, focus group discussions, field notes, and archival materials (for example, customary law texts, regional plans). Thematic coding was applied, focusing on climate resilience, food security, and gender, to compare findings across sites. This methodology allows a nuanced analysis of how climate change intersects with cultural practices and social structures, with an explicit focus on women's roles and perspectives.

To ensure research validity and transparency, member-checking was conducted with Indigenous facilitators and community leaders during reflection sessions, allowing findings to be affirmed, revised, or expanded through collective input. Discussions with district-level government offices (Social Affairs, Education, Agriculture, Food Security, Civil Registration, Public Works, and Forest Management Units in Mentawai, Tebo, and Maros Districts) further contextualized community narratives within broader policy frameworks. Iterative learning was promoted, and anomalies were detected via peer debriefings with partner NGOs. The study's design was guided by three working hypotheses: Indigenous women are disproportionately vulnerable to the effects of climate change; their cultural roles and traditional knowledge provide them with underappreciated resilience; and adaptation initiatives based on gender-sensitive, participatory, and Indigenous-led governance are more likely to result in equitable and long-term outcomes.

CHAPTER IV FINDINGS

Indonesia features a vibrant tapestry of IPLCs, each shaped by unique ecological surroundings, livelihoods, and cultural traditions. Although they are sometimes seen as a single disadvantaged group inside the nation-state framework, their languages, religious systems, connections to the land, and approaches to environmental stewardship vary greatly. This study investigates four such communities—the Mentawai, Talang Mamak, Bara-Cindakko, and Baduy-Kasepuhan—focusing on their lived experiences with climate change and the adaptive knowledge embedded in their customary systems. These systems are more than just symbolic or ceremonial; they integrate logical and philosophical concepts that guide everyday acts that protect ecosystems and foster social interactions.

At the same time, their Indigenous knowledge systems provide critical insights and valuable lessons in adaptive governance, sustainable living, and climate resilience strategies based on deep, ancestral connections to the land.

The Talang Mamak of Sumatera's Bukit Tigapuluh live a forest-based livelihood via farming, rubber tapping, and gathering non-timber forest products such as *jernang* (a resin also known as dragon's blood or *Daemonorops spp.*). Their traditional knowledge assists biodiversity protection, but their territory remains legally unrecognized, leaving them susceptible to land seizures and food shortages. Despite biological limits and the collapse of slash-and-burn viability, the Talang Mamak have adopted horticulture initiatives and are highly devoted to environmental preservation.

The Bara and Cindakko tribes of South Sulawesi live in steep terrain and practice rain-fed terraced farming that is regulated by intricate rituals and cycles. Customary elders manage rites that educate water conservation and ecological balance, while local blacksmithing and links to the old Tanralili kingdom preserve cultural continuity. However, the lack of legal recognition for their customary forests hinders their capacity to legally manage or maintain their lands, putting their ecological governance at jeopardy.

Finally, the Baduy and Kasepuhan communities in Banten illustrate Indigenous survival by a rigorous commitment to *pikukuh karuhun* (ancestral law) and Sunda Wiwitan cosmology. Their agroforestry systems, sacred woods, and community rice barns provide long-term food security without utilizing pesticides. The Baduy Dalam restricts forest destruction and water manipulation, while the Kasepuhan encourages seed sovereignty and land zoning via customary rites such as *Seren Taun* (traditional Sundanese rice harvest

celebration). Social forestry schemes and community land acquisitions have both addressed land limits while protecting natural integrity.

These four groups reflect unique socio-ecological systems: coastal islands, lowland woods, highland farms, and peri-urban holy landscapes. Despite their variation, they all share a basic vulnerability to climate change and political apathy. At the same time, their Indigenous knowledge systems give essential insights and significant lessons in adaptive governance, sustainable ways of living, and climate resilience measures founded on deep, ancestral relationships to the land.

4.1 Climate Impacts and Food Sovereignty

All four communities report that climate-related stressors are eroding traditional food systems. In Mentawai, villagers noted that once-resilient sago palm groves are failing under prolonged drought, and many families have shifted entirely to purchased rice. Unlike sago—locally harvested and processed through communal techniques—rice must be bought and stored, tying families to market prices and reducing food sovereignty. Similar transitions occur in other sites: endemic tubers, wild fruits, and forest greens have become rare in Talang Mamak and Bara-Cindakko due to irregular rainfall and deforestation. These foods, rich in micronutrients and managed through agroforestry knowledge, were once staples. Women report that daily meals now consist largely of plain rice with basic boiled vegetables, with protein (fish or meat) reserved only for ceremonies. This dietary homogenization disproportionately affects women and children: pregnant women and young children face higher risks of anaemia and malnutrition when protein and vitamin-rich foods disappear.

Women describe the erosion of food traditions as a loss of autonomy. “Before, my mother and grandmother would go into the forest and bring back all sorts of greens,” one elder said, but “now we buy what we eat.” The slow disappearance of local staples, such as *‘toek’*, forces women to work outside subsistence farming or draw on meager incomes to feed families. In consequence, household expenditures on food have risen, while knowledge of seasonal cycles and wild harvests is fading. These shifts reflect a breakdown in food sovereignty: as one report notes, “[the] right of communities to define their own food systems in culturally appropriate ways” is undermined by climate stress and market dependency. In sum, climate change is reshaping not only what communities eat, but who controls that food: women’s traditional role as cultivators and cooks is challenged by scarcity and economic pressure.

4.2 Indigenous Women's Ecological Knowledge and Adaptive Practices

Indigenous women in all four sites demonstrate considerable adaptive agency rooted in ecological knowledge. Women are often the custodians of agroforestry gardens, seed banks, and food preparation techniques that buffer families against shortages. For example, Mentawai women maintain dozens of sago and tuber varieties through intergenerational seed exchange. They interplant crops to hedge bets against unpredictable rains. In Bara-Cindakko, elderly women still conduct traditional planting rituals (led by local Pinati elders) and tend upland rice and vegetable plots following ancestral rotational cycles. Women in these communities explain that they experiment with different crop species and planting times to cope with changing seasons.

Women also extend household resources through preservation and community networking. In Talang Mamak, some mothers conserve dried fish and jungle preserves for lean months, while sharing curing methods learned from elders. Communal networks (often women's *arisan* or savings groups) fund the procurement of native seedling saplings and support youth to start agroforestry gardens. A mother in Mentawai described how village women and men collectively teach girls to identify wild medicinal plants and edible mushrooms during evening gatherings. These informal knowledge-sharing practices strengthen cultural continuity and resilience.

Importantly, women's ecological roles come with strategic adaptation. One Talang Mamak woman noted how they changed cooking techniques: "When rice or taro yields fell, we learned to make fried or steamed cassava instead." Another in Mentawai reported mixing upland-grown tubers into soups to combat hunger when market rice was scarce. Such examples show that women actively reinterpret tradition to meet new challenges.

However, while women clearly exercise agency, their contributions remain undervalued in formal decision-making. In every community, women's organizations and leaders recounted being ignored in village planning meetings. One informant observed, "They [women] save the seeds, but when the village talks about climate plans, we (the men) go first... women are outside the meeting."

This finding aligns with the analysis: despite women's deep knowledge of forest ecology and cropping, they are rarely invited into adaptation planning. Women are key actors in food systems—preserving seeds, maintaining gardens, and transmitting food knowledge—but they are rarely acknowledged as such in community planning or policy-making. In other words, women mobilize ecological intelligence and social cooperation to sustain food systems, yet their insights are structurally marginalized.

4.3 Customary Governance and Gendered Exclusion

Customary institutions frame how communities organize adaptation, and these too are gendered. In Mentawai, for example, the traditional *uma* system (communal longhouses led by elders) has been largely supplanted by a state-sanctioned *Adat* Village Council (Lembaga Adat Desa, or LAD) focused on mediating conflicts. While the LAD institution nominally includes representatives from each clan, its mandate is primarily legalistic (land disputes) rather than ecological. Local women lament that issues like forest management and food security are not addressed by the LAD. In Talang Mamak, indigenous ritual roles linked to agriculture (for example, the *dukun padi* who interprets the rice spirit) have fallen into disuse as younger generations lose traditional language. Women who once led certain planting and harvest ceremonies now find fewer community-sanctioned platforms for those activities.

In Bara-Cindakko, some women still hold ceremonial *adat* titles (Pinati, Totua *Adat*) that recognize their roles in planting and healing rituals. However, these positions have become largely symbolic and have little formal power beyond specific events. Village decision-making on land use, conservation, or disaster response is conducted through district offices or mixed *adat* committees in which women sit peripherally. Overall, customary governance across all sites has been “hollowed out” under external pressures. The erosion of *adat* law (both in structure and in practice) reflects an underlying epistemic erasure: Indigenous ways of knowing and community-based authority are being sidelined in favor of national development agendas.

Table 4.1
Climate Change, Environmental Degradation, and Responses to the Impacts

Climatic Events and Its Impacts	Environmental Degradation and Its Impacts	Indigenous Communities Responses
Climate change affects timely crop plantation and agricultural activities. Loss of traditional crops.	Reforestation by Pine tree planting, which creates alternative income but also depletes bushy jungles and wooden trees	Mentawai (KAM): Keep the traditional crop seeds at all cost. Increase the spiritual work of the <i>Sikkerei</i> to avoid any occurrence of problem. Migrate to other island.

	Demand for wood, fuel, and construction lead to illegal logging and mining	<p>Talang Mamak (KATM): Keep the traditional crop seeds at all cost, but also plant cash crops and other crops based on the seasonal calendar (fruit or vegetable that is part of the main diet of the community).</p> <p>Bara & Cindakko (KABC): Request for assistance to local farming agency (certified seeds, fertilizers, pesticides). Migrate to city or other island.</p>
Increased intensity of torrential rainfall episodes and excessive rain causes soil loss, landslides, and floods	Planned and unplanned development, causing environmental degradation	<p>KAM: Move the house to higher ground. Increase the spiritual work of the <i>Sikkerei</i> to avoid any occurrence of problem.</p> <p>KATM: Use the areas that have less possibility of flooding for the planting of crops based on the seasonal calendar (fruit/vegetable that is part of the main diet of the community).</p> <p>KABC: Change the architecture/house material. Migrate to city or other island.</p>

<p>Excessive rain creates irrigation problems and damage crops surrounding the villages</p> <p>Landslide fills canals, altering water flow</p> <p>Floods destroy crops, vegetables, and cause massive loss of wealth and health</p>	<p>Intensive and extensive rice cultivation and industrial agriculture, monoculture expansion</p> <p>Landslides significantly damage agricultural land, causing infertile soil, less yield</p>	<p>KAM: Organize rituals. Planting flood-resistant crops and preserving seeds for replanting after flood.</p> <p>KATM: Shift profession, find alternative livelihood, work for the company (PT ABT). Migrate to other island.</p> <p>KABC: Change seed, add more agriculture inputs to increase yield.</p> <p>All of the communities apply TEK that guides land-use planning, such as avoiding landslide-prone areas or restoring forests to stabilize slopes.</p>
<p>Climate-induced extremities limit natural resources in the forest</p>	<p>Demand for wood, fuel, and construction lead to illegal logging and mining; Privatization of lands restricts access to forest resources and uses it for commercial purposes</p>	<p>KAM: Find alternative livelihood, work for the company/new land owner. Migrate to other island.</p> <p>KATM: Shift profession, find alternative livelihood, work for the company (PT ABT). Migrate to other island.</p> <p>KABC: Change seed. Add more agriculture inputs to increase yield.</p>

<p>Temperature increase, extreme heat</p>	<p>Slash and burn farming. Forest and land fires.</p>	<p>KAM: Pray/request for increasing spiritual work of <i>Sikkerei</i>. Migrate to other island.</p> <p>KATM: Keep the traditional crop seeds at all cost. Change the work hour when it is too hot. Request for help to combat the fire to authorities (PT ABT & local government agency)</p> <p>KABC: Change seed, add more chemical inputs to increase yield. Pray together.</p>
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Source: Fieldwork, interview, FGD, literature review. Table format is modified from Garay, J. (2025) and Guáqueta-Solórzano, V-E & Postigo, JC. (2022)

These institutional shifts have direct gender implications. Even when *adat* norms nominally allow women roles, the infusion of external norms (patriarchal structure, bureaucracy, religious conversion, formal education) has reshaped those roles into tokenism. For example, women noted that the village head and formal committees (dominated by men) control most village budgets. Customary meetings about planting seasons or forest rituals have been replaced by village councils that meet at the sub-district office, where women rarely speak. As a result, there are fewer venues for women to translate their ecological knowledge into collective action. The traditional concept of *gotong royong* (communal cooperation) persists in everyday life, but without institutional backing, its potential for organized adaptation is weakened.

The findings of the current study reveal a paradox: Indigenous women hold critical ecological knowledge and engage daily in sustaining food systems, yet both customary and formal institutions tend to exclude them from decision-making. Their adaptive contributions remain largely informal and invisible in official discourse. As one participant put it, “The forests and gardens will provide if we care for them, but only if those who make rules respect our way of living.”

The table above shows how significant stressors like shifting seasons, declining biodiversity, and land use changes disproportionately affect Indigenous women, as well as their coping strategies in ecological, cultural, and institutional domains to explain these dynamics. The next section examines these concepts via the theoretical frameworks of political ecology, Indigenous feminism, and intersectionality.

CHAPTER V

DISCUSSION

This research demonstrates how climate change affects Indigenous food systems, gender interactions, and traditional institutions. According to the data from the communities studied, climate stresses increase cultural decline and impair traditional government while also jeopardizing ecological stability and food security. "We used to grow different types of tubers and grains, but now we often rely on instant noodles," remarked a woman in an upland farming hamlet in Bara, reflecting a change in basic food consumption and the disappearance of traditional agricultural skills. One-woman farmer in Mentawai's coastal island community described how unpredictable seasons and increased vulnerability to pests and diseases affecting their banana, coconut, and betel nut crops have made it difficult to obtain more alternative sources of income, resulting in monotonous diets and a growing reliance on market foods.

Meanwhile, as government policies and climate change modify land use and seasonal activities, traditional institutions' influence has dwindled. "The *adat* calendar no longer corresponds with the seasons—it perplexes our youth, and many no longer follow our planting rituals," remarked a Baduy village elder. These modifications have especially pronounced gender impacts. Women, who are central to food preparation, seed saving, and ecological knowledge transmission, face increasing burdens and diminishing decision-making power. As one woman in a lowland forest community of Talang Mamak put it, "Before, I could gather herbs, but now the forest is forbidden or the garden is flooded. We are losing what we know." For easier discussion, the following section is structured around four key insights, namely shifts in staple food consumption, the rise of monotonous diets, the weakening of customary institutions, and the gendered dimensions of cultural and ecological vulnerability.

5.1 Shifts in Staple Food Consumption

The transition away from traditional, climate-resilient staples to market-dependent foods is one of the most visible symptoms of climate stress across Indigenous communities. In Mentawai, sago—once a central staple—has largely been replaced by rice. Unlike sago, which can withstand erratic weather and is processed locally using traditional methods, rice is less adaptable to changing climatic conditions and must be purchased. This transition increases household food expenditures, making families vulnerable to market shocks and

external price volatility. It also disrupts the ecological knowledge embedded in the processing and harvesting of sago, reducing community autonomy.

The decline of *toek*, a unique worm-resembling mollusk-based protein cultivated through the long-term submersion of hardwood logs, further illustrates how traditional food systems are intertwined with ecological cycles. The Latin name of *toek* is *Bactronophorus sp.* *Toek* is not a food that can be harvested directly like sea cucumber or mangrove snails. This animal must be cultivated in pieces of *bak-bak* tree trunk (*Camptosperma auriculate*) or tumung tree trunk (*Arthrophyllum diversifolium*), which are soaked in brackish rivers.

For generations, Mentawai women on Sipora Island, especially in three coastal villages of Matobe, Saureinu, and Goisooinan, have cultivated *toek* as their source of protein. The sensitivity of *toek* production to rainfall variability, salinity, and water temperature has led to its near decreased quality and quantity, marking not only the loss of a key protein source but also the degradation of ecological timekeeping systems that once informed community food calendars.

Similar transitions are observable in Talang Mamak and Bara-Cindakko. Tubers, wild greens, forest fruits, and freshwater fish—previously abundant and central to the diet—are disappearing due to biodiversity loss and land conversion. These traditional food sources are being replaced by store-bought, ultra-processed foods, which are calorie-dense but nutritionally poor. This dietary shift poses particular risks to women and children. Women, who are primarily responsible for food preparation, are often forced to work within shrinking nutritional options, while pregnant women and children face heightened risks of malnutrition, anaemia, and stunting. This mirrors broader regional trends where environmental degradation correlates with nutritional insecurity (Martini, 2021; Blanco et al., 2024).

Ultimately, this shift reflects a breakdown in food sovereignty—the right of communities to define their own food systems in ecologically and culturally appropriate ways, which differs from food security that focuses primarily on ensuring sufficient food availability regardless of its source or method of production. It also exposes the vulnerability of Indigenous food systems to overlapping stressors such as climate change, market dependency, and land tenure insecurity.

5.2 Monotonous Food Consumption

While ecological diversity persists in principle, it is rarely reflected in daily diets. In Mentawai, although forests and rivers still harbor diverse food sources, diets have become homogenized. The routine meal—rice, leafy vegetables, and sometimes dried

fish—lacks variety and fails to meet the dietary needs of all household members. Women in Sirilangai Mentawai continue to hunt eel (ikan sidat, *Anguilla bicolor*) at night, demonstrating high ecological intelligence and a commitment to nutrient-rich traditional foods. Yet this protein is infrequently consumed, either due to its declining availability or because economic needs take precedence over household consumption.

Talang Mamak has less protein sources, such as wild boar and freshwater fish, due to the relocation of hunting areas and the harm to aquatic habitats caused by rubber tapping and the expansion of oil palm and eucalyptus plantations. The growing trend of young people abandoning hunting in favor of paid employment or education has an even greater impact on the preservation of food-related customs. Rice is commonly consumed every day with little to no vegetables, such as squash or ferns, resulting in nutritional deficiencies, particularly in protein and minerals.

Families in Bara-Cindakko grow a variety of crops, but cooking techniques are limited due to socioeconomic constraints and gendered labor divisions. Typically, there includes rice and one kind of cooked vegetable. As a consequence of changing eating habits and cultural views about food, protein sources like fish and poultry are saved for ceremonial use. Even when supplies are technically accessible, women's twin tasks of caring for the home and working in small-scale employment leave little time or energy for extensive cooking, limiting nutritional variety.

The ramifications of this dietary simplicity are many. The ecological feedback loops that exist between individuals and their surroundings are mostly weakened. When the market is the sole source of sustenance, traditional knowledge of plant cycles, animal behavior, and seasonal rhythms is rendered obsolete. Second, it weakens the community's resilience. Diverse diets can help protect against environmental stressors and nutritional deficiencies. When dietary variety diminishes, so does the community's capacity to weather environmental and economic crises. Finally, since many culinary traditions are associated with rituals, family relationships, and community memory, they contribute to the dissolution of cultural identity.

5.3 Weakening of Customary Institutions

Traditional institutions, which have long been the basis for resource management, spirituality, and communal government, are collapsing rapidly. The LAD (*Lembaga Adat Desa*), which mainly functions as a conflict mediator, notably in land conflicts involving corporate parties, has supplanted Mentawai's traditional *uma*-based leadership. When customary authority is reduced to a bureaucratic function, it loses its entire role in

environmental management, dispute resolution, and moral direction. Because of this, traditional leaders are often excluded from key conversations like disaster response, environmental preservation, and land use.

Traditional roles that were formerly critical to ceremonial life and ecological balance, such as *dukun hantu* and *dukun padi*, have lost significance in Talang Mamak. Their rituals, which were linked to agricultural and spiritual cycles and performed in ancient languages, are no longer widely practiced. Younger generations are unable to maintain this information because they have been detached from these responsibilities and often lack the language or cultural skills required to continue them. This is an example of "symbolic survival," as described by Persoon and Minter (2020), in which conventional institutions continue to exist in name but no longer function.

With female leaders like as *Pinati* and *Totua Adat*, Bara-Cindakko has a more thorough traditional structure. Nonetheless, the value of these activities remains mostly ceremonial, confined to certain occasions like as marriages and planting rituals. Although having women in leadership positions is beneficial, customary law's low standing within wider governance frameworks hinders this. Traditional chiefs have little authority to respond since state governments control environmental protection, land management, and disaster response.

The overall impact is that old institutions are becoming less useful and identifiable. Their omission reflects a larger epistemic erasure, in which Indigenous knowledge and governance structures are seen as antiquated or obsolete. Communities are more vulnerable to ecological and political threats because they lack the ability to coordinate collective solutions to climate challenges, defend ecosystems, or exercise their property rights.

5.4 Gendered Climate and Cultural Erosion

When examining the consequences of climate change on Indigenous communities, gender remains an important perspective. Women undertake the bulk of unpaid labor, including food preparation, child care, and bringing water and firewood. The burden for women is increasing as climate change makes these duties more time-consuming and labor-intensive. For example, increasing temperatures in Talang Mamak have pushed rubber tapping into the early morning, when family obligations are at their peak. This limits women's capacity to participate in leadership, education, and climate adaptation planning by locking them in a vicious cycle of physical weariness and time poverty.

Resources and land access are also highly gendered. In general, women are underrepresented in decision-making processes and do not possess formal land. Although

they play a vital role in food systems by maintaining gardens, storing seeds, and sharing food knowledge, they are seldom recognized as such in community planning or policymaking. Boys and girls are given distinct tools and expectations that last throughout adulthood, symbolically perpetuating gender-based exclusion from infancy.

Climate change exacerbates cultural decline. When younger generations relocate to urban areas or participate in monoculture farming, they lose the ecological understanding and cultural traditions that seniors, particularly women, have handed down. Traditional knowledge systems about ceremonial cookery, holy feasts, and medicinal plants are vanishing with the languages and rituals that preserve them. External factors that aggravate this loss include government policies that favor commercial over traditional land usage, as well as religious conversions that undermine spiritual links to land.

Women also face disproportionate risks from climate-related health and safety threats. Rising temperatures and degraded water sources are linked to increased reproductive health issues and neonatal complications (Özer, 2024). Gender-based violence often spikes in the aftermath of natural disasters or food insecurity, yet these risks are rarely incorporated into adaptation planning (Komnas Perempuan, 2024 and Pasaribu, et al., 2024). As men often migrate for work, women remain in the village, bearing increased responsibility but lacking institutional support, income security, or formal recognition.

This gendered dynamic creates a paradox. Women are simultaneously at the center of ecological and cultural preservation yet pushed to the periphery in decision-making and resource allocation. Without addressing these gendered inequities, climate resilience strategies will remain partial and ineffective.

CHAPTER VI CONCLUSION AND RECOMMENDATION

6.1 Conclusion

This study focused on one central question: How does climate change affect the vulnerability and resilience of Indigenous women in securing food and preserving cultural practices, and what locally rooted adaptation strategies can be supported to ensure equitable and sustainable responses? Across four case studies, this study found that Indigenous women are indeed key agents of local adaptation. They draw on diverse traditional practices—seed conservation, poly-cropping, forest stewardship, communal food sharing—to buffer their families against climate shocks. Yet their roles are often invisible to policymakers and even in scholarly narratives. The current comparative analysis showed that while ecological and cultural contexts vary, a common thread is the gendered division of labor and power. Study reveals that the women’s voices are systematically underrepresented in *adat* councils and government programs, despite women’s deep understanding of local ecosystems.

The findings for the study make clear any climate resilience strategy will be incomplete without addressing gender gap. Indigenous women’s contributions to food security and cultural stewardship are not peripheral; they are central to how these communities have survived for generations. Yet evidence suggests that adaptation policies currently reinforce existing inequities, treating men as primary agents and ignoring women’s contributions.

To build effective, equitable climate adaptation, decision-makers should ground strategies in local realities and gender equality. This includes legally recognizing Indigenous land rights (with explicit attention to women’s access), integrating customary institutions in planning, and designing programs that reduce women’s labor burdens (for example, by improving access to water and sanitation, or providing energy-efficient stoves and/or micro credits). Crucially, adaptation interventions must involve Indigenous women as co-planners. For example, supporting women-led agroecology can revitalize food systems: seed banks, community gardens, and protection of foraging territories would harness women’s expertise. Similarly, capacity-building for *adat* leaders should include young women, ensuring intergenerational transmission of knowledge.

This study demonstrates that Indigenous women's agency is an important yet underestimated resource in climate adaptation. This study demonstrates that gender equality, as well as ecological innovation, are required for sustainable adaptation by

focusing on individual experiences via an Indigenous feminist lens. As one participant put it, "We have always cared for the land; now we need others to care for our rights too." A more equitable climate policy in Indonesia must include and empower women, recognizing that their ecological skills and leadership are critical to protecting agricultural systems and cultural continuity in the face of climate change.

6.2 Recommendation

According to this research, climate change has a disproportionate impact on Indigenous women since it makes it more difficult for them to procure food and maintain traditional practices. Women, as main food producers, caretakers, seed savers, and guardians of generational knowledge, confront growing problems as irregular seasons, dwindling biodiversity, and land use changes imperil traditional livelihoods and food security. Despite their crucial role in ensuring ecological and cultural continuity, their resilience is hampered by a lack of access to property rights, customary decision-making, and institutional adaptation activities.

This research offers both theoretical and practical recommendations. Theoretically, it challenges dominant narratives that portray Indigenous communities as passive or vulnerable by highlighting their dynamic adaptive capacities and deep ecological knowledge—capacities that can only be fully realized when their cultural systems are recognized and respected. Indigenous communities are knowledge producers (Whyte, 2017); their traditional ecological knowledge emerges as a critical epistemic contribution within the broader discourse on climate change. Practically, the study calls for inclusive, gender-responsive climate adaptation policies that integrate Indigenous knowledge and strengthen the legitimacy of customary institutions. This requires moving beyond top-down interventions toward co-developed strategies that ensure the participation of Indigenous peoples—especially women—in decision-making processes, land governance, and climate resilience planning.

The findings show that Indigenous women are not passive victims but active agents of adaptation. In many communities, women are innovating cultivation methods, restoring degraded lands, and transmitting customary practices to younger generations.

To support such agency and ensure equitable, sustainable climate responses, six interlinked and gender-sensitive operational recommendations are proposed:

1. Strengthening Local Food Systems for Climate Resilience and Nutritional Security

One of the most visible and alarming outcomes of climate change in the studied communities is the erosion of traditional food systems. The replacement of sago with rice, the disappearance of protein-rich mollusks like *toek*, and the reduced availability of forest-sourced tubers and greens all point to a loss of both nutritional diversity and ecological self-reliance.

In order to strengthen food security and community resilience, it is crucial to revitalize these local food systems through agroecological practices that value climate-adaptive crops and traditional harvesting methods. This requires a multi-stakeholder effort to promote seed-saving programs, support community gardens, and protect customary foraging and hunting territories from land conversion. Efforts should also be made to reduce dependency on market food supplies, which are not only nutritionally inferior but also subject to volatile pricing and supply disruptions. Women who hold deep ecological knowledge related to food processing, preservation, and biodiversity stewardship should be at the forefront of these initiatives, ensuring that local food systems remain diverse, resilient, and culturally meaningful in the face of increasing climate uncertainty.

2. Reinvigorating Customary Institutions as Pillars of Climate Governance

Traditional institutions, which were formerly critical to environmental management and local administration, are steadily losing prominence in all three groups under examination. Their dwindling role, which is mostly limited to ceremonial responsibilities or dispute resolution, reflects deeper structural shifts in which Indigenous institutions are subjected to market pressures and political procedures. To address this issue, customary governance systems must be acknowledged and re-empowered as valid and important stakeholders in climate adaptation planning. This includes offering capacity-building programs to younger generations, promoting intergenerational knowledge transfer, and publicly honoring traditional leadership in environmental decision-making. Ritual experts, traditional land stewards, and local customary law adjudicators should not be seen as historical objects, but rather as dynamic entities capable of responding to modern environmental concerns. In addition to restoring self-determination, revitalizing indigenous authority would include climate action within Indigenous spiritual frameworks that promote reciprocity, balance, and long-term sustainability.

3. Advancing Gender-Responsive Climate Adaptation

The impacts of climate change differ by gender. Women do a disproportionate amount of labor in all three categories, including collecting firewood and water, cooking

food, giving care, and earning an income, all of which become more difficult when climatic stressors grow. However, their contributions to local food systems are often disregarded, and they continue to have little influence over decision-making. Indigenous women's perspectives, expertise, and needs must be explicitly recognized in climate adaptation efforts. Some strategies for achieving this include time-saving technology, fair land rights, and including women into climate governance frameworks. Furthermore, during environmental shocks, when the risks of maternal health issues and gender-based violence rise, investments in community-based health services and safe places for women become critical. Climate interventions may go beyond surface engagement to actively eradicate structural inequities by using a gender-responsive strategy that allows women to act as change agents and agents of resilience.

4. Rebuilding Youth Engagement to Preserve Cultural-Ecological Knowledge

When traditional ecological knowledge is lost, both cultural heritage and climate resilience are lost. In contrast to ancestral lands, culinary cultures, and ceremonial activities that have historically preserved ecological balance, newer generations are increasingly opting for monoculture farming or urbanization. Restoring youth engagement is critical for long-term climate adaptation. Communities and supporting organizations can achieve this by establishing mentorship programs for elders and youth, incorporating Indigenous knowledge into formal and informal education, and using cutting-edge digital technologies to record rituals, ecological calendars, and land use practices. Providing financial incentives for youth to remain in their communities, such as eco-entrepreneurship in sustainable agriculture, community seed banking, or climate-related tourism, may ensure that traditional traditions adapt rather than vanish. Children must be rethought as future environmental and cultural stewards if communities are to be resilient in the face of climate change.

5. Protecting Biodiversity as the Foundation of Indigenous Climate Adaptation

The degradation of forest ecosystems, changes in water quality, and declining biodiversity observed in the field directly impact the food security, health, and cultural life of Indigenous communities. Biodiversity is not merely a backdrop but a living foundation of Indigenous adaptive capacity—providing medicine, food, spiritual meaning, and ecological knowledge systems. Climate strategies must therefore prioritize community-led biodiversity protection through participatory conservation approaches. This involves recognizing Indigenous territories as vital ecological buffer zones, restoring degraded landscapes with native species, and integrating biocultural diversity into formal conservation policy. Traditional land-use like rotational farming or sacred zones should be

protected not just for their economic and ecological benefits but for their embedded cultural values. By placing Indigenous custodianship at the center of conservation, biodiversity protection becomes a climate solution rooted in justice, reciprocity, and cultural continuity.

6. Creating Context-Specific Climate Adaptation Planning

Climate change does not manifest uniformly (Persoon & Minter, 2020). Some regions experience prolonged droughts and reduced rainfall, while others are confronted with increased precipitation and flooding. Temperature variations also differ significantly between lowland and highland ecosystems. Moreover, many Indigenous communities—such as in Mentawai—face compound environmental risks from geological phenomena like earthquakes, tsunamis, and land subsidence. Adaptation strategies must therefore be regionally calibrated, integrating both climatic and geophysical risk assessments. National and regional climate policies should move away from generic “one size fits all” programs and instead prioritize decentralized planning that reflects local climate realities and Indigenous knowledge systems.

These six recommendations respond to the interlinked social, ecological, and institutional vulnerabilities surfaced in the field, grounded in theory and aligned with policy opportunities. They call for strengthening local food systems and nutritional security, revitalizing customary institutions as climate governance anchors, and advancing gender-responsive adaptation that accounts for the differentiated impacts on women. Reengaging youth ensures the continuity of cultural-ecological knowledge, while biodiversity protection supports Indigenous adaptive capacity. Context-specific planning ensures locally relevant, culturally grounded responses.

The overall findings illustrate that climate change is not only an environmental issue but a multidimensional crisis. Policymakers must engage Indigenous communities as partners, recognize and restore the role of customary institutions, and ensure that Indigenous women—who are both frontline responders and knowledge holders—have equal access to land, resources, and meaningful participation. By centering Indigenous women’s agency, rights, and knowledge in both policy and practice, we can co-create adaptation strategies that are not only just and culturally grounded but also capable of addressing the intersecting challenges of climate change, food security, and cultural survival

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APPENDIX

List of Respondents

No.	Name	Profession Social Status	Sex	Age	Data collection methods
Mentawai Indigenous Community					
1	Rena Oiere	Customary Chief, Malancan	Male	50s	Interview
2	Sarma Tambunan	KWT (Women's Farming Group) official, Malancan	Female	37	Interview & FGD
3	Lasma Tambunan	KWT (Women's Farming Group) official, Malancan	Female	40	Interview & FGD
4	Nurmi	Housewife, Malancan	Female	40	FGD Sikat
5	Darmawati	Housewife, Malancan	Female	40	FGD Sikat
6	Sunarti	Housewife, Malancan	Female	32	FGD Sikat
7	Jalbe	Housewife, Malancan	Female	47	FGD Sikat
8	Uma Safani Umata Salaleuba	Housewife, Malancan	Female	35	FGD Sikat
9	Julius Pakpakbaga	Traditional Shaman, Malancan	Male	76	Interview
10	Saulina Rippun	Traditional Shaman, Malancan	Female	71	Interview
11	Mimi Susanti	Healthcare worker at Malancan public health center	Female	30s	Interview
12	Makarius	Field farmer, Fisherman, Malancan	Male	43	Interview
13	Satria	Housewife, Malancan	Female	41	Interview
14	Margajaya	Former logging concession employee; appointed as Hamlet Head	Male	79	Interview
15	Sarti Roma	Village Secretary, Malancan	Female	32	Interview & FGD Sikat
16	Kuadrat Eker	Elementary School Teacher, host family in Malancan	Male	38	Interview & FGD Sikat
17	Sujiman Siripeibu	Hamlet Head of Terekan Hulu, host family in Terekan Hulu	Male	30s	Interview
18	Resti	Housewife, host family in Terekan Hulu	Female	27	Interview
19	Herman	Church assistant teacher, farmer	Male	56	Interview

20	Rosa	Housewife	Female	49	Interview
21	Michael Sirisurak	Former Hamlet Head of Terekan Hulu, Village Secretary, Malancan, cooperative advisor, Custodian of Customary Traditions	Male	62	Interview
22	Barnabas Saerejen	Former Hamlet Head of Sirilanggai, host family in Sirilanggai	Male	53	Interview
23	Kesia	Housewife, host family in Sirilanggai	Female	49	Interview & FGD Sikat
24	Asionis Ligi Loer Saumanuk	Secretary of Malancan Village Customary Council, farmer in Sirilanggai	Male	53	Interview
25	Rosma Sapunduruk	Housewife, Malancan	Female	50	Interview
26	Saurlea Rohaini	Housewife, Sibeu Otcun	Female	31	FGD Sikat
27	Rini Miana Sastika	Born in Sigapokna, lives in Ukra, small business owner and make-up artist	Female	25	Interview & FGD Sikat
28	Susanna S	Sirilanggai, unemployed	Female	25	FGD Sikat
29	Mariani	Housewife, Sibeu Otcun	Female	50	FGD Sikat
30	Teresia	Housewife, Sibeu Otcun	Female	60	FGD Sikat
31	Berja	Housewife, Sibeu Otcun	Female	54	FGD Sikat
32	Marsalina	Sirilanggai community member	Female	45	FGD Sikat
33	Nursia	Sirilanggai community member	Female	50	FGD Sikat
34	Amina	Ukra	Female	70	FGD Sikat
35	Ratna	Sibeu Otcun community member	Female	18	FGD Sikat
36	Tina	Sirilanggai	Female	25	FGD Sikat
37	Paulina Pretty Stella (Ela)	Housewife, Ukra	Female	19	FGD Sikat
38	Refke Agustina	Sikabaluan community member	Female	56	FGD Sikat
39	Dwi Darma Yuliana	Housewife, Sirilanggai	Female	24	FGD Sikat
40	Arlan	Church youth	Male	17	FGD Sikat
41	Inal	Church youth	Male	25	FGD Sikat
42	Rino	Church youth	Male	25	FGD Sikat
43	Rida	Church youth + Housewife	Female	22	FGD Sikat
44	Rain	Church youth + informal labor	Male	31	FGD Sikat
45	Neza	Church youth	Male	18	FGD Sikat
46	Mikael	Church youth	Male	17	FGD Sikat

47	Kevin	Church youth	Male	18	FGD Sikat
48	Yen	Church youth	Female	17	FGD Sikat
49	Ria	Church youth	Female	17	FGD Sikat
50	Naila	Church youth + Housewife	Female	17	FGD Sikat
51	Silvanus	Church youth	Male	22	FGD Sikat
52	Aris	Church youth	Male	23	FGD Sikat
53	Safira Husianti Laisa	High School Student	Female	16	Interview
54	Job Sirurui	Subdistrict Head of Siberut Barat, hotel owner in Sikabalan	Male	60	Interview
55	Karolina (Mak Ayrin)	High School Teacher (Muara Sikabalan)	Female	40	Interview
56	Bambang Sagurung	YCMM Facilitator in Sikabalan (North Siberut), journalist	Male	40	Interview
57	Gugun	YCMM Facilitator in Muntei (South Siberut)	Male	40	Interview
58	Kortanius Sabeleake	Deputy Regent (2017– 2022), former Deputy Speaker of DPRD, former Speaker of DPRD; Director of YCMM (1997–2003)	Male	59	Interview
59	Tirjelius	Village Head of Saureinu (three terms)	Male	48	Interview
60	Jusmawati	Housewife, natural resource user (toek)	Female	40s	Interview
61	Ernawati	Housewife, natural resource user (toek)	Female	40s	Interview
62	Elina	Housewife, natural resource user (toek)	Female	60s	Interview
63	Permanti Saogo	Teacher & housewife	Female	38	Interview
64	Milus Salamanan	Civil Service Police Unit officer	Male	40	Interview
65	Taufika	Regional Disaster Management Agency officer	Male	50s	FGD with OPD
66	Pionir	Department of Community & Village Empowerment official	Male	55	FGD with OPD
67	Saiful	Regional Development Planning Agency official	Male	38	FGD with OPD
68	Hetti	Regional Development Planning Agency official	Female	35	FGD with OPD
69	Desmawenti	Women and Children Protection Unit (UPTD PPA) official	Female	56	FGD with OPD

70	Jennita	Women and Children Protection Unit (UPTD PPA) official	Female	28	FGD with OPD
71	Marliana	Food Security & Agriculture Department (DKPP) official	Female	40s	FGD with OPD
72	Epi	DKPP official	Female	37	FGD with OPD
73	Yosefa	Head of Women & Children Affairs, Social Services Department (Dinsos)	Female	40s	FGD with OPD
74	Norma	Dinsos official	Female	35	FGD with OPD
75	Marko Sagulu	Chairman, Mentawai Student Forum	Male	22	Interview
76	Maya	Housewife, PKK (Family Welfare Movement) cadre, Mentawai Regency (Sipora)	Female	30s	Interview
77	Reinal Suryadinata	YCMM Facilitator in Tua Pejat (Sipora)	Male	30s	Interview
78	Tarida Hernawati	Anthropologist, YCMM	Female	49	Interview
79	Rifai Lubis	Director, YCMM	Male	52	Interview
Talang Mamak Indigenous Community					
80	Kindok	Former Hamlet Head of Simarintihan, Warsi cadre	Male	31	Interview & FGD Sikat
81	Sikar	Incumbent Hamlet Head of Simarintihan	Male	30	Interview
82	Iskandar	Former Hamlet Head of Simarintihan	Male	35	Interview
83	Mita	Housewife (wife of Rotorang Silitonga)	Female	24	Interview
84	Tiada	Housewife (Mita's mother)	Female	50s	Interview
85	Sarben	Farmer (Mita's father)	Male	50s	Interview
86	Indra Gunawan	Talang Mamak youth, person with disabilities (trained in mechanic & barbering by Social Service)	Male	23	Interview & FGD Sikat
87	Wendy	Talang Mamak youth, PT ABT employee	Male	22	FGD Sikat
88	Rendy	Talang Mamak youth, PT ABT employee	Male	21	FGD Sikat
89	Sandi	Talang Mamak youth	Male	15	FGD Sikat
90	Rosi	Talang Mamak youth	Male	17	FGD Sikat

91	Fatma Ermi	Elementary School Teacher (graduated from PGSD UT, honorary/contract worker for 20 years)	Female	50s	Interview
92	Fahmi	Traditional Leader & community figure	Male	46	Interview & FGD Sikat
93	Herlina	Housewife	Female	36	Interview & FGD Sikat
94	Hermanto	Farmer, former FZS staff, host family in Talang Mamak	Male	40s	Interview & FGD Sikat
95	Karsinah	Housewife, host family in Talang Mamak	Female	39	Interview & FGD
96	Sonia	Women's Farming Group (KWT) member	Female	30s	Interview & FGD Sikat
97	Mardan	Shaman (rice fertility and ghost whisperer)	Male	70s	Interview & FGD Sikat
98	Bakhori	Shaman (rice fertility) & healer	Male	70s	Interview & FGD Sikat
99	Husrinawati	Elementary School Teacher (PT ABT recruit)	Female	40s	Interview
100	Taesah	Traditional Birth Attendant, mid-wife	Female	60s	Interview
101	Pia	Housewife	Female	19	FGD Sikat
102	Wetna	Housewife	Female	30	FGD Sikat
103	Suryati	Housewife	Female	37	FGD Sikat
104	Nila	Housewife	Female	20	FGD Sikat
105	Fira	Primary School Student	Female	13	FGD Sikat
106	Leli	Primary School Student	Female	13	FGD Sikat
107	Jojon	Housewife	Female	29	FGD Sikat
108	Hatta	Farmer	Male	50	FGD Sikat
109	Minar	Housewife, Women's Farming Group (KWT) member	Female	40	FGD Sikat
110	Tinis	Housewife, Women's Farming Group (KWT) member	Female	38	FGD Sikat
111	Siel	Housewife	Female	25	FGD Sikat
112	Mila	Housewife	Female	25	FGD Sikat
113	Yela	Housewife	Female	25	FGD Sikat
114	Doris	Student	Female	17	FGD Sikat
115	Amin	Farmer, store owner	Male	35	FGD Sikat
116	Deli	Farmer	Male	35	FGD Sikat
117	Sudirman	Farmer	Male	49	FGD Sikat
118	Pita	Student	Female	17	FGD Sikat
119	Neli	Student	Female	15	FGD Sikat

120	Ipat	Student	Female	15	FGD Sikat
121	Meri	Student	Female	15	FGD Sikat
122	Rido	Farmer	Male	35	FGD Sikat
123	Andi	farmer	Male	35	FGD Sikat
124	Joko Sarjito	Executive Director, PT ABT	Male	50	Group discussion
125	Taufiq Hidayat	Operational Manager, PT ABT	Male	54	Group discussion
126	Ayu (Cook)	Cook, PT ABT	Female	45	Interview
127	Ayu (Midwife)	Midwife, PT ABT	Female	35	Interview
128	Nety Riana Sari	Communications & Partnership Manager, PT ABT	Female	35	Virtual discussion
129	Mentari Medinawati	Community Development, PT ABT	Female	32	Group discussion
130	Lutfie	Community Development, PT ABT	Male	33	Group discussion
131	M Nazri	Community Development, PT ABT	Male	32	Group discussion
132	Habibi Mainas	Community Development, PT ABT	Male	31	Group discussion
133	Alfidayeen Akbar	Community Development, PT ABT	Male	32	Group discussion
134	M Havist	Community Development, PT ABT	Male	32	Group discussion
135	Dwi Setyaningsih	Food Security & Fisheries Department, Tebo	Female	45	FGD with OPD
136	Azrai	Head of Social Services Department, Tebo	Male	55	FGD with OPD
137	Rachmat H	Social Services Department	Male	32	FGD with OPD
138	Megi Susanti	Social Services Department	Female	33	FGD with OPD
139	Nanang Suyanto	Head of Agriculture & Horticulture Department, Tebo	Male	53	FGD with OPD
140	Haryanto	Project Manager, KKI Warsi	Male	35	Interview
141	Helen Silalahi	Facilitator, KKI Warsi	Female	35	Interview
142	Rusli	Facilitator, KKI Warsi	Male	32	Interview
143	Robert Aritonang	Anthropologist, KKI Warsi	Male	54	Virtual discussion
Bara and Cindakko Indigenous Community					
144	Indar	Farmer, community leader, host family in Cindakko	Male	37	Interview & FGD Sikat
145	Fitriani	Housewife	Female	35	Interview & FGD Sikat

146	Daeng Sunggu	Housewife	Female	45	Interview & FGD Sikat
147	Rudi	Farmer	Male	34	FGD Sikat
148	Nawir	Chairman, RT 3, Cindakko Hamlet	Male	55	Interview & FGD Sikat
149	Ika	Housewife	Female	25	FGD Sikat
150	Mustari	Farmer	Male	35	FGD Sikat
151	Malang	Farmer	Male	35	FGD Sikat
152	Husniah	Housewife	Female	25	FGD Sikat
153	Hasnia	Housewife	Female	25	FGD Sikat
154	Nur Annifa	Housewife	Female	36	FGD Sikat
155	Daeng Bara	Farmer	Male	50	FGD Sikat
156	Daeng Bollo	Farmer	Male	50	FGD Sikat
157	Sugianti	Housewife	Female	44	FGD Sikat
158	Daeng Mina	Housewife	Female	45	FGD Sikat
159	Nari	Student	Female	15	FGD Sikat
160	Nurul	Student	Female	15	FGD Sikat
161	Aesya	Student	Female	15	FGD Sikat
162	Anniesa	Student	Female	15	FGD Sikat
163	Nuranifa	Student	Female	15	FGD Sikat
164	Isma	Cindakko youth	Female	17	FGD Sikat
165	Rahma	Cindakko youth	Female	18	FGD Sikat
166	Citra	Cindakko youth	Female	19	FGD Sikat
167	Isna	Cindakko youth	Female	20	FGD Sikat
168	Haira	Cindakko youth	Female	17	FGD Sikat
169	Ahmad	Cindakko youth	Male	23	FGD Sikat
170	Rahmat	Cindakko youth	Male	24	FGD Sikat
171	Jailani	Cindakko youth	Male	22	FGD Sikat
172	Nasrul	Cindakko youth	Male	21	FGD Sikat
173	Enal	Cindakko youth	Male	23	FGD Sikat
174	Nurdin	Cindakko youth	Male	25	FGD Sikat
175	Sapri	Cindakko youth	Male	24	FGD Sikat
176	Asis	Cindakko youth	Male	23	FGD Sikat
177	A, Massuanna	University student	Male	22	FGD Sikat
J178	Daeng Ramallang	Custodian of Customary Traditions (<i>Gallarang</i>), Bara Hamlet	Male	70s	Interview
179	Suryadi	Teacher, Sekolah Kolong (Bara Hamlet)	Male	30	Interview & FGD Sikat
180	Abdullah	Teacher, Sekolah Kolong (Bara Hamlet)	Male	28	Interview & FGD Sikat
181	Mirna	Housewife & teacher, Sekolah Kolong (Bara Hamlet)	Female	28	Interview & FGD Sikat
182	Ansar	Farmer, community leader, host family in Bara Hamlet	Male	35	Interview & FGD Sikat
183	Sabaria	Housewife, host family in Bara Hamlet	Female	30	Interview & FGD Sikat
184	Nadia	student	Female	13	FGD Sikat

185	M Ikbal Suryadi	farmer	Male	30	FGD Sikat
186	Ika	housewife	Female	33	FGD Sikat
187	Suryani	Housewife	Female	29	FGD Sikat
188	Sahriani	housewife	Female	31	FGD Sikat
189	Daeng Gangga	Farmer	Male	70	Interview & FGD Sikat
190	Rizal	Farmer	Male	27	FGD Sikat
191	Karim	Farmer	Male	26	FGD Sikat
192	Rudi	Farmer	Male	25	FGD Sikat
193	Daeng Lihang	farmer	Male	65	FGD Sikat
194	Denna	farmer	Male	35	FGD Sikat
195	Ammar	farmer	Male	35	FGD Sikat
196	Ribi	farmer	Male	35	FGD Sikat
197	Bajira	Posyandu (health post) volunteer	Female	47	Interview
198	Bakri (Daeng Bakka)	Custodian of Customary Traditions	Male	53	Interview
199	Imam (Daeng Nombong)	Religious Leader	Male	70	Interview
200	Daeng Juma	Farmer (parent of Niah, Ika, Rudi & Karim; father-in-law of Suryadi)	Male	67	Interview
201	Rohani	Housewife	Female	63	Interview
202	Daeng Juha	Local leader, initiator of <i>Sekolah Kolong</i> in Bara	Male	70	Interview
203	Daeng Sunggu	Custodian of Customary Traditions (<i>Totua Adat</i>) Bara Hamlet	Female	70	Interview
204	Daeng Ngewa	Custodian of Customary Traditions (<i>Gallarang</i>), Bara Hamlet	Male	70	Interview
205	Sadi	Bara Hamlet youth	Male	35	FGD Sikat
206	Daeng Becce	Housewife	Female	45	FGD Sikat
207	Rafief Qobil M	University Student	Male	22	FGD Sikat
208	Saiful Setiawan	University Student	Male	22	FGD Sikat
209	Dimas Syafar	University Student	Male	21	FGD Sikat
210	Nur Rahmat Rahadi	University Student	Male	21	FGD Sikat
211	Firda	University Student	Female	22	FGD Sikat
212	Elys Dhian Mayasari	University Student	Female	21	FGD Sikat
213	Siti Nur Hasfa	University Student	Female	21	FGD Sikat
214	Daeng Ali	Custodian of Customary Traditions, host family in Baru Hamlet	Male	55	Interview
215	Daeng Ngasih	Custodian of Customary Traditions (Baru Hamlet)	Female	50	Interview
216	Ma'ruf	SCF staff	Male	30	Interview

217	Sultan Siama	SCF staff	Male	35	Interview
218	Dewi Utari	SCF staff	Female	35	Interview
219	Muh Andri (Aldi)	SCF staff	Male	46	Interview
220	Arham	Director, SCF	Male	46	Interview
221	Suwardi Sawedi	Head of Social Services Department, Maros	Male	55	FGD with OPD
222	Andi Patiroi	Head of Education Department	Male	55	FGD with OPD
223	Haudec Herrawan	Forest Management Unit (KPH) officer	Male	52	FGD with OPD
224	Antonius Birana	Forest Management Unit (KPH) officer	Male	52	FGD with OPD
225	Muhlis	Agriculture Department officer	Male	45	FGD with OPD
226	Sainuddin	Field Education Officer	Male	45	FGD with OPD
227	Herlina	Public Works Department officer	Female	45	FGD with OPD
228	Muthmainnah	Public Works Department officer	Female	50	FGD with OPD
229	Marwin Bustar	Department of Population & Civil Registration officer	Male	45	FGD with OPD
230	Kamal Malik	Department of Population & Civil Registration officer	Male	45	FGD with OPD
Baduy and Kasepuhan Indigenous Community					
231	Ayah Mursyid	Baduy tribe leader	Male	55	Interview
232	Ambu Mursyid	Baduy Indigenous woman	Female	50	Interview
233	Abah Maman	Guru SMA Sobang	Male	45	Interview
234	Jazuli	Sekretaris Desa Sindanglaya Kec. Sobang (Kasepuhan Pasir Eurih)	Male	45	Interview
235	Jaro Maman	Kepala Desa Wangunjaya, Kec. Cigemblong (Kasepuhan Jamrut)	Male	60	Interview
236	Olot Santari	Kasepuhan Jamrut	Male	60	Interview
237	Marja	Kasepuhan Jamrut	Male	35	Interview
238	Andri	Kasepuhan Jamrut - Forum Kawal	Male	25	Interview
239	Tati	Kasepuhan Jamrut - Forum Kawal	Female	25	Interview
240	Arsid (Acid)	Kasepuhan Jamrut	Male	30	Interview
241	Amil Sadeli	Kasepuhan Jamrut	Male	55	Interview
242	Cecep Sanusi	Kasepuhan Pasir Eurih - Forum Kawal	Male	27	Interview

243	Irsyad	Kasepuhan Bongkok - Forum Kawal	Male	29	Interview
244	Fauzan	Rimbawan Muda Indonesia	Male	35	Interview
245	Wahyu Binatara	Rimbawan Muda Indonesia	Male	45	Interview

Note:

Interview = In-Depth Interview, offline, in person

FGD Sikat = Focused Group Discussion using Acculturation Crisis Alert Toolkit

FGD with OPD = Focused Group Discussion with Local Government Officials

Some respondents' age is a rough estimate due to the unavailability of supporting proof