

ECHOES *of* PARTNERSHIP

Stories From
the Australia-Indonesia
Research Collaborations
Facing Shared
Climate Challenges



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KONEKSI – Australia - Indonesia Knowledge Partnership Platform

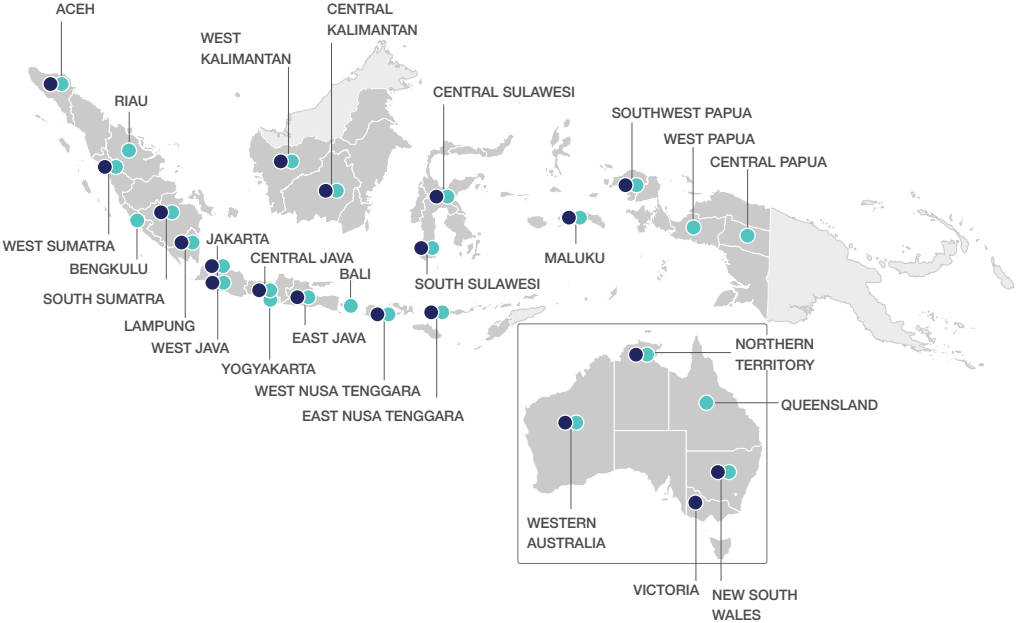
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KONEKSI is a collaborative initiative in the knowledge and innovation sector that supports partnerships between Australian and Indonesian organisations for inclusive and sustainable policy and technology. Supported by the Governments of Australia and Indonesia, the Program promotes equitable knowledge partnerships and leveraging local knowledge to address socio-economic challenges. KONEKSI acts as a vehicle for multidisciplinary solutions by engaging diverse stakeholders from academia, government, civil society, and the private sector.

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Locations of ECC Research Projects



● LOCATIONS OF ECC RESEARCH PROJECTS IN THIS BOOK ● LOCATIONS OF ALL ECC RESEARCH PROJECTS

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CHAPTER

1

ACKNOWLEDGEMENT

On behalf of **KONEKSI**, we extend our deepest gratitude and appreciation to everyone who has supported the research journey encapsulated in this book. As an initiative dedicated to fostering knowledge and innovation, KONEKSI takes great pride in serving as a bridge that strengthens knowledge partnerships between organisations in Australia and Indonesia. We firmly believe that international research collaboration advances inclusive, sustainable, and community-focused policies and technologies.

This book is the culmination of extraordinary dedication from numerous individuals who have contributed to 20 collaborative research projects focusing on pressing issues such as climate change, disaster

mitigation, inclusivity, sustainability, and health and well-being. These themes are not only of critical importance to the people of Indonesia and Australia, but are also globally relevant in tackling the evolving challenges of our world.

We wish to express our highest respect and heartfelt gratitude to the exceptional researchers who have shared their research journey: Dr. Zulfa Sakhiyya, Dr. Yulida Pangastuti, Sri Sumaryani, Dr. Rini Astuti, Zuhurul Anam, Sanaul Laily, Girindra Putri Dewi Saraswati, Agung Ginanjar, Widi Laras Sari, Dr. Moh. Taqiuddin, Dr. Rumayya, Dr. Rina Suryani Oktari, PhD, Prof. Juliet Willetts, Cindy Priadi, Prof. Patrick Keyzer, Dr. Dina Afrianty, Dr. Aryo Danusiri, S. Paramita B. Utami, Sofyan Ansori, A/Prof. Le Chung Tran, Dr. Miftadi

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Through their expertise, hard work, and commitment, these research projects have yielded fresh insights, innovative approaches, and practical solutions aimed at strengthening community resilience, protecting the environment, and enhancing the quality of life for many. Each project has helped build awareness, inform policy discussions, and in several

cases supported policy uptake at the community and policy levels, while strengthening connections between the people of Australia and Indonesia.

We also extend our gratitude to the partners, supporters, and stakeholders who have demonstrated remarkable dedication at every stage of the research and in the production of this book. Their consistent support—whether through resources, collaboration, or encouragement—has been the foundation for the outstanding outcomes we have achieved together.

We hope this work will inspire many to continue championing international research partnerships in pursuit of a better, more inclusive, and more sustainable world for future generations.

Sincerely,
KONEKSI
Australia-Indonesia Knowledge
Partnership Platform

Women weavers from Desa Besmarak, Kupang, East Nusa Tenggara sit together, weaving threads into cloth that carries stories of heritage, kinship, and resilience.



INTRODUCTION

Climate Change, Partnerships, and Inclusion – A Path Forward

A Shared Climate Challenge

Along the northern coast of Java, the sea is slowly claiming the land. In Australia, bushfire seasons are arriving more frequently and with greater intensity. These realities point to a single conclusion: climate change is no longer a distant threat in the future, but a present reality reshaping our world.

Its impacts manifest in different forms—from coastal villages gradually submerged, to disrupted livelihoods, to increasingly severe disasters. Yet beneath this diversity lies the same

message: climate change is unfolding before our eyes and demands responses that are faster, more coordinated, and more sustainable. We can no longer afford to wait.

In the Asia-Pacific region, Indonesia and Australia sit at the crossroads of this crisis. Indonesia, a nation of more than 17,000 islands, faces the dual threats of rising seas and deforestation, with millions of lives and livelihoods at risk. Australia, with its dry interior and rugged coastline, contends with intensifying bushfires, severe droughts and destructive floods. For both nations, the stakes are high.

Coastal communities in Indonesia, like those in Pekalongan and Semarang, live in the shadow of tidal flooding that has left entire areas permanently submerged. Meanwhile, Australian regions grapple with the devastation and health impacts of recurrent bushfires that uproot communities and irreparably harm biodiversity. Despite their differences, these nations share a critical commonality: their fates are interlinked by geography, trade, and a shared dependence on natural resources. As we've seen through stories of vulnerable communities in northern Java adapting to tidal floods or Indigenous Australians safeguarding their cultural heritage, collaboration across borders is not just an opportunity—it is a necessity.

The Role of KONEKSI: A Model for Collaborative Research

Amid this urgent backdrop, KONEKSI—the Australia-Indonesia Knowledge Partnership Platform—is working to contribute meaningfully to the path forward. Founded on the principles of partnership and inclusion, KONEKSI has built bridges between Indonesia and Australia to tackle shared climate challenges. Its approach is unique: bringing together researchers, policymakers, and communities to co-create solutions that are not only scientifically robust

but also socially relevant.

The 20 research projects featured in this book are parts of KONEKSI's broader Environmental and Climate Change (ECC) research grants, which funded 38 projects. These projects, which fall under the categories of climate change resilience, mitigation, and adaptation, reflect KONEKSI's unique collaborative approach. By bringing together a wide range of institutions—universities, NGOs, communities, private sector, and government agencies—these partnerships have enabled the development of innovative, inclusive, and impactful solutions to shared climate challenges.

Take, for example, the Tide-Eye project, which leverages artificial intelligence (AI) and Internet of Things (IoT) technology to monitor tidal floods along the northern coast of Java. This cutting-edge research demonstrates how technology can empower us to prepare for and respond to disasters. Similarly, the Fire Play project on indigenous fire governance in Central Kalimantan underscores the importance of traditional knowledge in addressing modern challenges. For generations, indigenous communities have practiced controlled burning to manage land sustainably, though in recent years, regulatory approaches have not always aligned with their

traditional practices. Through this research, their voices are being brought to the forefront, offering lessons not just for Indonesia but for the world.

At the heart of KONEKSI's mission lies its commitment to GEDSI—Gender Equality, Disability, and Social Inclusion. This framework ensures that the most vulnerable groups, often overlooked in global climate discussions, are central to the solutions. For instance, the project titled *Empowering Women to Mitigate Climate Change Impacts on Health* highlights how women, particularly in rural areas, are not just victims of climate change but agents of change. These women are leading initiatives to address health issues exacerbated by rising temperatures and water scarcity, proving that inclusion drives impact.

Through these projects, KONEKSI has demonstrated that collaboration is not a one-size-fits-all approach. Each solution must be tailored to the unique contexts of the communities it serves, whether it is through advanced flood monitoring systems, health interventions, or climate education for children and youth.

Framing the Key Themes

This book brings together stories of 20 innovative research projects, united by

three core themes:

- 1. Partnerships:** At the heart of KONEKSI's work is belief in the transformative power of collaboration among countries, institutions, and communities. These partnerships demonstrate that sharing knowledge, expertise, and resources leads to far greater impact than working alone.
- 2. Inclusion:** KONEKSI's commitment to GEDSI ensures solutions prioritise those most affected by climate change: women, children, indigenous communities, and people with disabilities. Whether it's engaging vulnerable groups in flood resilience planning or developing climate education tools for youth, inclusion is a cornerstone of every project.
- 3. Impact:** From health data dashboards to community-led conservation initiatives, KONEKSI projects bridge the gap between research and real-world application, delivering tangible benefits to communities on the ground.

These themes are not abstract ideals—they are embodied in the lived experiences of the researchers and communities featured in this book.

A Pathway for the Reader

This book is structured to guide readers through a journey of collaboration, innovation, and resilience. It begins with an overarching narrative that ties together the 20 projects, highlighting how shared challenges have inspired collaborative solutions. The core of the book explores individual research stories, organised into four thematic areas:

- **Community adaptation and resilience:** These stories showcase how communities are adapting to the realities of climate change. For instance, research on Moving Towards Just Climate Governance: Understanding Climate Change from the Standpoint of Marginalized Children and Young People in Indonesia demonstrates how empowering youth can catalyse long-term change, while a study

Indigenous Papuan women move through a mangrove forest in Jayapura, a protected coastal space traditionally accessed only by women.



on advocacy networks has shown how women's groups can lead climate adaptation efforts.

- **Disaster mitigation and risk management:** This section highlights innovative technologies and traditional practices that mitigate disaster risks. From the Tide-Eye system in northern Java to indigenous fire governance in Central Kalimantan, these projects illustrate how knowledge—both modern and traditional—can save lives.
- **Health and well-being in a changing climate:** Climate change's impact on human health is profound, and this section explores initiatives to address these challenges. Projects such as the development of a climate-ready health dashboard exemplify how data-driven tools can improve access to healthcare for communities facing climate risks.
- **Environmental sustainability and innovation:** The final section looks toward the future, exploring how systemic solutions can promote sustainability. Research on climate modelling for vulnerable groups and climate-resilient water supply systems underscores the importance of forward-thinking approaches.

The book concludes with a reflective chapter that synthesises the lessons learned and offers a vision for the future. It emphasises the importance of partnerships, inclusion, and innovation in addressing climate challenges while setting the stage for future collaborations.

A Call to Action

Climate change is not just an environmental issue, it is a deeply human one. Its impacts exacerbate existing inequalities, placing the greatest burdens on those least equipped to bear them. Yet the stories in this book offer hope. They show that with collaboration, creativity, and a strong commitment to inclusion, solutions are not only possible but already within reach.

As you read these stories, you will meet the people who are turning research into action. You will hear the voices of women leading climate adaptation efforts, indigenous communities preserving traditional knowledge, and researchers developing technologies that transform lives. Let this book serve as a testament to the power of partnerships and a call to action for the work that lies ahead. ☉

Flooding on Jalan Kaligawe in Semarang City, Central Java, in April 2024. This road is a main arterial route along the northern coastal corridor (Pantura) connecting Semarang and Surabaya. (ANTARA FOTO/Aji Styawan)



SIGNIFICANCE OF COLLABORATIVE RESEARCH PARTNERSHIPS FOR CLIMATE SOLUTIONS

In Timbulsloko Village in Central Java's Demak Regency, families face relentless tidal flooding that has submerged homes and transformed fertile farmland into barren landscapes. Once thriving on productive rice fields and fish ponds, they now live on the margins, navigating their flooded village on makeshift wooden and bamboo bridges, struggling to adapt to the changing environment.

Thousands of kilometres away, in the dense forests of Central Kalimantan, indigenous farmers face a different challenge: regulations restricting traditional burning practices, which

have long been used to prepare land sustainably. Elsewhere, in the cattle farming communities of Lombok, the risk of livestock diseases threatens both culture and the economy.

These diverse stories illustrate the deeply human impact of climate change, reshaping lives and livelihoods across Indonesia.

But within these stories of hardship and uncertainty lies another common thread: resilience and the power of collaboration. Climate change is a global crisis, yet its effects are unevenly distributed, hitting the most vulnerable

hardest. Similarly, its solutions cannot come from isolated efforts. Meaningful climate action requires partnerships that transcend borders, disciplines, and communities.

This ethos forms the foundation of KONEKSI (Australia-Indonesia Knowledge Partnership Platform), an initiative that has brought together both nations to co-create inclusive, innovative, and impactful solutions. Through its 38 Environmental and Climate Change (ECC) research projects—including the 20 highlighted in this book—KONEKSI has set a precedent for how collaboration can address some of the world's most pressing challenges.

Partnerships that Transform Lives

The strength of KONEKSI lies in its extensive and diverse partnerships. More than just resource-sharing, these collaborations bring together 20 research initiatives across Indonesia and Australia, involving over 60 institutions from both Indonesia and Australia, including government institutions alongside universities, NGOs, private sector entities, and communities.

Indonesia and Australia each bring distinctive strengths to the partnership. Both countries contribute rich

knowledge systems, scientific expertise, and innovative approaches to addressing climate challenges, shaped by their unique contexts and experiences.

Together, these complementary strengths enable impactful and inclusive outcomes. KONEKSI has demonstrated that combining resources, knowledge, and perspectives from both countries can lead to transformative solutions.

For example, the Future Proofing a Basic Social Service: Climate-Resilient Community-Based Rural Water Supply project has helped rural communities restore degraded water springs, ensuring long-term water security in the face of climate change. Through these cross-sectoral collaborations, KONEKSI ensures that its research is not only scientifically rigorous but also socially relevant and impactful.

Another project, the Initiative for An Open, Inclusive, and Integrated Climate Change Model for Indonesia, showcases the role of interdisciplinary collaboration in addressing inequities. Researchers from Indonesia and Australia worked together to integrate inclusive data into climate modelling, focusing on the impacts of the energy transition on vulnerable groups, such as female-headed households and individuals with disabilities. The research employed macro-

level modelling using the Global Change Assessment Model (GCAM) to evaluate the effects of energy transition scenarios on commodity prices, paired with household-level simulations to assess the welfare impacts on marginalised communities. These innovative approaches provide policymakers with crucial insights to design more equitable and inclusive interventions, ensuring that no group is left behind.

The strength of KONEKSI lies in its extensive and diverse partnerships.

Crucially, KONEKSI's partnerships extend far beyond researchers and institutions. Communities themselves are integral to the process. For example, in Surabaya, the Strengthening the Flood Resilience Capabilities of Vulnerable Groups project engaged community members to identify their specific needs during floods. Researchers collaborated with local leaders and vulnerable groups, including women, children, and the older adults, to co-design strategies for improving disaster preparedness. Such

participatory approaches ensure that solutions are practical, inclusive and incorporate lived experience and local knowledge.

Inclusive Foundations

In a world where climate change exacerbates existing inequalities, inclusion must be at the heart of any meaningful response. KONEKSI has embraced this principle by integrating the Gender Equality, Disability, and Social Inclusion (GEDSI) framework into every project it undertakes. This approach ensures that those most affected by climate change are not only participants but leaders in crafting and implementing solutions.

KONEKSI's diverse researchers, from Indonesia and Australia, are leading an initiative supporting early career researchers, women, researchers with disabilities, and other underrepresented groups, in line with KONEKSI's GEDSI strategy. This initiative aims to produce high-quality research and publications that address the underrepresentation of diverse perspectives in the region.

The presence of a researcher who is also a person with disability in a research team significantly contributes

to making disability issues more visible. A project research in Central Java shows that including persons with disabilities in research teams not only amplifies their voices but also helps policymakers recognise the importance of inclusive solutions.

The project titled Inclusive Climate Adaptation: The Roles of Women's Climate Advocacy Networks

This holistic approach ensures that research is actionable and impactful.

exemplifies how women are leading grassroots efforts to tackle climate challenges. In regions like Poso, Central Sulawesi, women have formed advocacy networks to preserve traditional practices and strengthen their communities' resilience to environmental changes. Through participatory focus group discussions held in familiar settings like kitchens, women have shared their experiences and identified ways to adapt to a shifting climate. One key finding has been recognition of their vital role in

sustaining local ecosystems, such as protecting Lake Poso and its endemic species. This approach not only fosters collective action but also highlights the power of women to lead community-driven climate adaptation efforts.

Children, too, are emerging as climate leaders. Through projects like Enabling Children as Agents of Change Through Inclusive Edu-Games on

Climate Change and Disaster Resilience, young people are learning about climate change in engaging and innovative ways. Board games and storytelling sessions provide an accessible and interactive platform for children to understand the impacts of climate change and explore solutions. They also foster Australia - Indonesia learning exchanges, helping students in

both countries recognise that children elsewhere are facing similar challenges.

Similarly, in the Moving Towards Just Climate Governance: Understanding Climate Change from the Standpoint of Marginalised Children and Young People in Indonesia, children in Degayu Village, Pekalongan, Central Java, have been inspired to take action, such as planting mangroves along the coastline to combat erosion. These initiatives not only educate but also empower young people to actively contribute to building

climate resilient communities.

Inclusion also means valuing traditional knowledge and ensuring that indigenous voices are heard.

The Towards Future Proof Society: Adaptive Social Protection against Climate Change project in East Sumba, East Nusa Tenggara Timur explores how East Sumba has developed a unique social protection system combining government-endorsed formal protection with traditional community-based support (*umah* system). Disasters like African Swine Fever, droughts, and storms have intensified economic instability in the region, particularly for livestock-dependent communities. Through this project, researchers from Indonesia and Australia studied how social protection can enhance climate resilience.

Interdisciplinary Solutions for Real-World Impact

KONEKSI-supported projects stand out for their interdisciplinary nature, blending expertise in science, technology, social policy, and traditional knowledge to tackle complex challenges. This holistic approach ensures that research is actionable and impactful.

The Future Proofing a Basic Social Service: Climate-Resilient Community-Based Rural Water Supply project

focuses on addressing water scarcity in rural areas by restoring degraded water springs. Researchers collaborated with local communities to identify the challenges posed by prolonged dry seasons and climate change impacts. By integrating local knowledge and scientific expertise, the project has improved access to clean water and increased community resilience. This initiative highlights how sustainable water management practices can transform lives, ensuring that future generations have secure and reliable access to this vital resource.

Health is another area where KONEKSI's interdisciplinary approach has had profound impacts. The Empowering Women in Mitigating Climate Change Impacts on Health project involves rural women as key actors in addressing health challenges exacerbated by climate change, such as heat-related illnesses and waterborne diseases.

In regions like Pekalongan and Marunda in North Jakarta, women healthcare volunteers coordinate with local agencies to prepare communities for emergencies, including tidal flooding. Despite limited resources, these women demonstrate remarkable resilience and play a critical role in extending health programs to communities and groups that may otherwise not be reached.

From Local Challenges to Global Solutions

Localised approaches to climate challenges can inspire global solutions, and many KONEKSI partnerships are generating valuable knowledge to inform climate action in the wider region, and beyond.

Exploring the Practice of Restorative Justice Framework to Build Resilience and Address Climate Change Harms in Indonesia project integrates marginalised communities in Malang regency (East Java); Waingapu (East Nusa Tenggara); and Kajang (South Sulawesi) into climate resilience. It underscores the importance of implementing restorative justice to address climate change impacts in Indonesia, particularly for marginalised communities, such as women, indigenous groups, and people with disabilities. The research highlights the importance of integrating GEDSI principles into restorative justice approaches, ensuring that affected communities have a voice in climate adaptation efforts. Separately, innovations like the Community Food Security Action Information System (Sikepangmas) have enabled local governments to predict disasters and take proactive measures.

In Surabaya, the Strengthening the Flood Resilience Capabilities of Vulnerable

Groups project empowers women, older adults, and children to prepare for disasters, setting an example for inclusive disaster management globally. Meanwhile, the Initiative for An Open, Inclusive, and Integrated Climate Change Model for Indonesia project addresses how the energy transition impacts women and people with disabilities, advocating for equitable policies to ensure no one is left behind.

While climate impacts are often highly localised, findings from community-based research can have far-reaching relevance. By sharing the lessons learned through KONEKSI, this book not only highlights what is possible, but invites others to replicate these successes.

A Shared Vision for the Future

KONEKSI's 20 projects are more than case studies; they are a mosaic of hope, resilience, and ingenuity. From the children learning about climate adaptation through games to indigenous farmers reclaiming their traditions, these stories show that solutions to the climate crisis already exist—and that they thrive when grounded in collaboration.

These powerful collaborations between Indonesian and Australian researchers stand as a testament to the fact that global challenges demand inclusive,



A seaweed farmer in Bulukumba, South Sulawesi, holds his harvest. More than a livelihood, seaweed farming reflects how coastal communities adapt, endure, and build resilience at sea.

collaborative and evidence-based action. Whether cultivating cutting-edge technologies or traditional wisdom, or undertaking research in high-tech laboratories through to fieldwork in mangroves, forests and family homes, KONEKSI collaborative research partnerships are bringing together the strengths of individuals, institutions and communities in both countries to uncover hope and resilience amid the climate crisis, to

create a better future for all.

The lessons from these projects remind us all of what is possible when we collaborate and share. They call on all of us—not just as researchers or policymakers, but as global citizens—to turn knowledge into action and challenges into opportunities for a more sustainable and equitable future.☺

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CHAPTER

2

COMMUNITY ADAPTATION AND RESILIENCE

Head of tribe, Luta Ndakuanau, stands on the meadow in a Pambotajara village on March, 2013 in Sumba Island, East Nusa Tenggara, Indonesia. (Ulet Ifansasti/Getty Images)





When Climate Change Hits the Youngest

Children and youth often appear indifferent to climate change occurring around them, and perceive it as a matter of fate. Strengthening community-based approaches that actively engage youth could boost awareness, and improve climate change governance approaches



RESEARCH LOCATIONS

- South Rawa Badak, Jakarta
- Degayu Village, Pekalongan, Central Java
- Banjar Serasan, Pontianak, West Kalimantan



In Degayu Village in Pekalongan City, Central Java, tidal flooding has become a part of everyday life. In the past, residents could farm to meet their food needs. However, many plots of land are now permanently submerged, forcing people to abandon farming activities. The tangible impacts of climate change have reshaped the way of life in the village, including for children and young people.

"We used to grow vegetables here. If we wanted to eat, we could just pick them ourselves," said a 17-year-old girl from Degayu.

A similar situation is unfolding in Banjar Serasan in Pontianak, West Kalimantan, which often experiences

tidal flooding due to its location along the Kapuas River. The floods damage homes, roads, and other infrastructure, leaving residents constantly adapting to increasingly challenging environmental conditions.

In South Rawa Badak, North Jakarta, extreme temperatures, reaching 37.8°C in September 2019, have emerged as a major issue.

These climate impacts affect all people, of all ages. But children and young people not only experience the immediate effects: climate change will also shape and potentially harm their futures.

The situation is especially dire for children and young people from marginalised communities, who face climate change effects that are disproportionate to their contribution to the problem. They often lack the power and resources to engage in the debate or to demand and shape the solutions.

The testimony of the teenage girl in Pekalongan, along with countless other insights, are part of research findings from a collaborative research project carried out by the Centre on Child Protection and Wellbeing (PUSKAPA) at Universitas Indonesia, in collaboration with the Indonesia Project at the Australian National University (ANU).

RESEARCH TITLE

Moving Towards Just Climate Governance: Understanding Climate Change from the Standpoint of Marginalized Children and Young People in Indonesia

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Children participate in the participatory activities in Pontianak.



PUSKAPA researcher Widi Laras Sari said that children are most aware of weather and physical changes resulting from climate change.

"We found that children and youth link climate change issues in their communities to environmental changes, such as land subsidence and more frequent rainfall," she said.

Collaborating to Protect Youth in a Changing Climate

The research project emerged in response to concerns on child protection and quality of life, particularly for marginalised communities, in a changing climate. The initial ideas and concepts for the study were inspired by Dr. Santi

Kusumaningrum, former Director of PUSKAPA, who sadly passed away before the project commenced. Dr Kusumaningrum recognised that the perspectives of children and young people from marginalised communities were rarely explored.

When the opportunity to apply for KONEKSI presented itself, PUSKAPA invited Dr Firman Witoelar Kartaadipoetra from the ANU Indonesia Project to collaborate. A report, published as a result of the research, was titled: *Moving Towards Just Climate Governance: Understanding Climate Change from the Standpoint of Marginalised Children and Young People in Indonesia*.

The researchers aimed to gain a deeper understanding of the impact of climate change from the perspectives of children and young people in marginalised communities. They also aimed to understand the relationship between government responses to climate change and the inequalities experienced by marginalised children and youth, while exploring ways to integrate justice perspectives into climate governance to enhance the effectiveness and equity of interventions.

It was not the first time PUSKAPA collaborate with ANU was not the first.

The two institutions had previously worked together on a number of projects. The partnership spanned from the proposal design phase to the implementation of the research. Throughout the project, team members maintained regular communication via Zoom and email to share updates and receive feedback.

The two institutions divided tasks based on their respective expertise, with PUSKAPA team led by Dr Clara Siagian and the ANU team led by Dr Kartaadipoetra. The ANU team focused more on quantitative data analysis, while PUSKAPA handled qualitative aspects, data collection, and direct interviews and interactions with children and adolescents in three regions: Degayu Village, Pekalongan City (Central Java); Banjar Serasan Subdistrict in Pontianak City (West Kalimantan); and South Rawa Badak Sub-District in North Jakarta (Jakarta).

Each location was selected due to its unique challenges related to climate change. Together, they not only gathered data but also uncovered stories, emotions, and experiences of children who are often left out of broader climate discussions.

For national-level data collection, researchers conducted interviews with officials from: the National Development Planning Agency

There have not been many voices from children and young people in marginalised groups highlighted to discuss climate change issues.

(Bappenas); the Ministry of Social Affairs; the Ministry of Health; and the National Disaster Management Agency (BNPBD). At the regional level, the team interviewed officials from local government agencies such as Health Services, Social Services, Regional Disaster Management Agencies (BPBD), Environmental Agencies, and the Meteorology, Climatology, and Geophysics Agency (BMKG).

For example, in Banjar Serasan, located along the flood-prone banks of the Kapuas River, the research team interviewed 18 children and adolescents, 8 adults, and 13 government officials. Similar interviews were carried out at the other research sites.

Hearing the Voices of Young People

Ms Sari of PUSKAPA said the research focused on social inclusion by ensuring

that children and teenagers from marginalised groups had the space to talk about their experiences of climate change. The study upheld the principles of equality by involving children from diverse backgrounds, without discrimination.

"By working with children from marginalised communities, we emphasise the point of social inclusion because, so far, there have not been many voices from children and young people in marginalised groups highlighted to discuss climate change issues," Ms Sari said.

The PUSKAPA and ANU teams involved both boys and girls, and they were treated equally during interviews and discussions.

"Based on the discussions we conducted, there was no significant difference in their perceptions of climate change, whether they were boys

or girls," Ms Sari said.

In discussions, some children were less articulate, some were shy and took a while to respond, while others wanted to dominate the conversation. Generally, parents supported their children in becoming respondents. This openness is expected to help raise awareness among younger generations about the threats of climate change they face.

"By listening to their voices and experiences, this study provides an opportunity for them to understand and think critically about climate change issues," Ms Sari said.

As part of the research process, PUSKAPA and ANU also produced a documentary film. The film is not only a medium for sharing findings, but also a tool to unite children from different areas, fostering solidarity. Children who watched the clips felt that they were not alone and realised there were peers in other places facing similar challenges.

Shifting Fatalistic Views on Climate Change

While children and young people had noticed the daily impacts of climate change in their lives, they often

viewed it as something unavoidable. Both groups tended to associate these changes with fate or divine will.

"They actually noticed that when they were younger, the flooding in their area wasn't as frequent. But by the time they reached their teenage years, water was entering their homes almost every morning, sometimes lasting until the afternoon or even night. Yet, they call it fate, not climate change," Ms Sari said.

Children in Pontianak recalled the haze that shut down their schools for a week in 2023, and identified it as a natural occurrence. They failed to see the connection between forest fires and human activities contributing to the event.

In Jakarta, extreme heat is regarded merely as a physical discomfort, with little understanding of its underlying causes. One 13-year-old girl mentioned experiencing rashes and itching during particularly hot days.

In Pekalongan, children and teenagers showed some awareness of the link between rising temperatures and flooding. With tidal floods submerging certain areas permanently, these communities have lost much of their greenery and trees, which previously helped to cool down the environment.

At the same time, the orientation of existing policies tends to view climate change narrowly as major natural hazards, overlooking the more gradual, subtle, and incremental manifestations of climate change that require sustained attention and action.

"There is an opportunity to further explore the relationship between climate change and human activities. Enhancing this understanding could inform more effective strategies for addressing climate-related challenges," Ms Sari explained.

Social protection policies, such as the Family Hope Program (PKH), have the potential to play a more significant role in addressing climate change mitigation and adaptation. While these programs provide valuable short-term support, there is an opportunity to strengthen their capacity to equip vulnerable groups with sustainable adaptation skills.

As a result, younger generations often appear indifferent, focusing more on immediate needs such as social assistance or jobs.

"While poverty remains a critical concern for many communities, we also recognise the importance of addressing climate change, as it can exacerbate poverty and other social challenges," Ms. Sari noted.

Communities in the study areas have also tried to cope with climate change impacts independently. In Jakarta, people rely on self-sufficiency to protect themselves and their surroundings. In Pekalongan and Pontianak, many residents have been forced to shift professions, from farmers to fishermen or rickshaw drivers, as traditional livelihoods become unviable.

Reflecting on these findings, the research team recommends the implementation of inclusive and sustainable climate adaptation and mitigation policies. These policies should provide communities with the skills and tools to withstand the challenges of climate change. Community-based approaches involving young people should also be strengthened to raise awareness.

This study echoes earlier research showing that measures focused on short-term relief, including social protection policies, often do not build the adaptive capacity and skills that vulnerable groups need for long-term resilience, and instead risk reinforcing dependency rather than empowerment.

By integrating justice into climate governance, younger people can be empowered as agents of change – hopefully creating a safer, fairer future for themselves and future generations. ☉

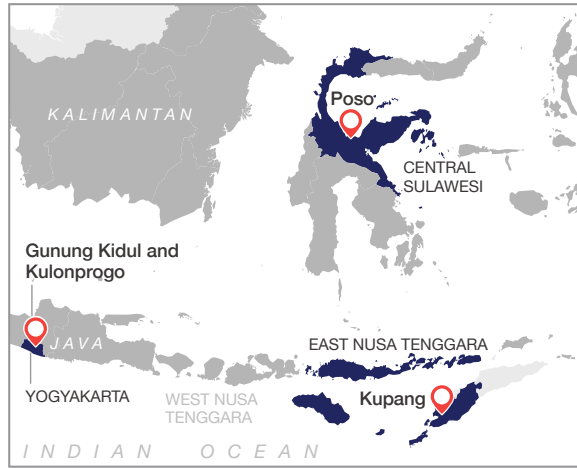
When Women Organise, Communities Adapt

Collaborative research has highlighted the dynamic role women play in climate adaptation across Indonesia, including through traditional practices, which have made a significant contribution at the community level. Socially inclusive and gender equal approaches have boosted climate awareness among women's communities and encouraged advocacy for policies that are climate responsive.



RESEARCH LOCATIONS

- Poso, Central Sulawesi
- Kupang, East Nusa Tenggara
- Gunung Kidul and Kulonprogo, Yogyakarta



In the modest kitchens of Lape and Tokorondo in Poso Pesisir district, Poso Regency, Central Sulawesi, women have unwittingly become frontline defenders against climate change.

At first, they did not fully grasp the concept of climate change, although their local traditions and practices already reflected adaptations to environmental challenges.

“It was only during focus group discussions that they realised growing their own food was a step they could take to adapt,” said Sri Sumaryani, a lecturer at the Centre for Literacy Studies at Universitas Negeri Semarang (UNNES).

In a home near Lake Poso, several women busied themselves in the kitchen. They were members of the Indigenous Women’s Community to Guard Lake Poso. There was no grand feast that day, just routine cooking for their families. Yet, the ingredients they used, mostly homegrown, carried an important story of resilience amid environmental shifts.

While cooking, their conversations drifted to the topic of sogili, an endemic eel species in Lake Poso that has become increasingly rare. Once a symbol of life and prosperity, sogili was not only a staple for traditional feasts but also marked the rice planting season for the community.

The women continued sharing, their stories revolving around one key issue: how climate change has affected their kitchens and daily lives. If discussions veered off course, facilitators from the Mosintuwu Institute, founded by activist Lian Gogali, gently guided them back on track.

This focus group discussion method, developed by the Mosintuwu Institute, uses semi-structured interviews

conducted in familiar settings rather than formal venues. “By hosting focus group discussions in kitchens—spaces where women feel most at ease—participants are more comfortable sharing stories and reflecting on their experiences,” as stated by Dr Yulida Pangastuti, co-principal investigator in this research.

In local culture, kitchens, wells, and bedrooms are regarded as central

RESEARCH TITLE

**Inclusive Climate Adaptation:
The Roles of Women’s Climate Advocacy
Network**

PARTNERS

 Indonesian Organisations

- 1.Universitas Negeri Semarang

2.Universitas Gadjah Mada

3.Mosintuwu Institute

4.Sri Institute
- 5.Solidaritas Perempuan Kinasih
(Kinasih Women’s Solidarity)

6.Eastern Indonesian Women’s Network
(JPIT)

 Australian Organisations

1. Australian National University

2.University of Western Australia

RESEARCHERS

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Ph.D.

LEAD RESEARCHER

• Dr. Rini Astuti

LEAD RESEARCHER

• Dr. Yulida Pangastuti

LEAD RESEARCHER

• Prof. Vaille Dawson

LEAD RESEARCHER

• Sri Sumaryani

• Agung Ginanjar Anjaniputra
- Zuhurul Anam

• Girindra Putri Dewi Saraswati

• Lian Gogali

• Dr. Desintha

• Dwi Asriani

• Sanaullaili

• Pdt. Dr. Merry Kolimon



Indonesian manual laborers wearing caping, traditional Asian conical hats, harvesting rice in paddy field in the Garut district on Java, Indonesia. (ARTERRA/GETTY IMAGES)

domains for women's activities. By bringing discussions into these everyday spaces, the Mosintuwu Institute has fostered a welcoming atmosphere that encourages deep reflection.

The research collaboration is drawing on these discussions to learn more about the role of women's advocacy networks in climate adaptation across the archipelago.

The project, Inclusive Climate Adaptation: The Roles of Women's Climate Advocacy Networks, brings together Indonesian and Australian researchers, along with local civil society organisations in Poso, Central Sulawesi; Kupang, East Nusa Tenggara; and Gunung Kidul and Kulon Progo, Yogyakarta. In addition to Mosintuwu in Poso, other participating groups included the Eastern Indonesian Women's Network in Kupang, Solidaritas Perempuan Kinasih, and the Sri Institute in Sleman.

"This research maps women's networks engaged in climate adaptation activities," said Rini Astuti of the Australian National University (ANU), one of the researchers involved in the study.

Connecting the Voices of Women in Academia, and at the Grassroots

Researchers employed the Feminist Participatory Action Research (FPAR) method in this study. FPAR is a research method grounded in feminist principles, aimed at empowering women, by actively involving them in the research process.

According to Dr Zulfa Sakhiyya from UNNES, FPAR was chosen for analysis to examine disparities in access and control over resources, as well as resilience to climate change. The project's thesis posits that a community's capacity to adapt to climate change is shaped by social attributes. These social attributes may include gender, class, indigeneity, or whether they belong to indigenous communities, and the ways in which gender is constructed within society.

The selection of FPAR was not made hastily. Initially, when drafting the research proposal, Dr Astuti first landed on employing a political ecology methodology, sensitive to gender equality, disability, and social inclusion and including diverse voices.

The research team also studied literature aligned with their respective backgrounds.

“We complemented each other. I brought insights into political ecology studies, while [Dr Sakhiyya] focused on critical discourse analysis,” Dr Astuti said.

The team also invited Andi Misbahul Pratiwi from the University of Leeds, United Kingdom, to share insights on interpreting policies through a gender-sensitive lens.

Eventually, FPAR was selected, a method already familiar to the researchers.

“My background is rooted in the women’s movement through Solidaritas Perempuan. I learned and practised this methodology there,” Dr Astuti explained.

Familiarity extended not only to the research methods but also to the team members themselves. Dr Astuti and Dr Sakhiyya had known each other previously, as both were Kavli fellows under the Kavli Foundation scholarship program. When Dr Sakhiyya submitted the research proposal to KONEKSI—which required collaboration between Australia and Indonesia—she invited Dr Astuti, who was at the Australian National University at the time, to join the team.

The search for team members followed a ‘word-of-mouth’ approach, drawing on personal networks. Through Dr

Astuti’s activism with Solidaritas Perempuan, they connected with Solidaritas Perempuan Kinasih in Yogyakarta and Mosintuwu in Poso, organisations focused on issues related to access and control over natural resources and climate change.

Bridging the Gap between Policy and Women’s Lived Experience

This research has uncovered many fascinating findings, highlighting the gulf between policies and the daily lives of women.

According to Dr Sakhiyya, there is a gap between the language and policy approaches adopted by the government, often fixated on big targets, such as the Sustainable Development Goals (SDGs) with their technical indicators, and the voices of the people.

“For the community, the impacts are clear and tangible,” she said.

Another finding revealed adaptation and market demands coming head to head in Kupang, East Nusa Tenggara.

Traditionally, woven fabrics in the area were dyed using natural materials. For example, blue was derived from *Indigofera tinctoria* plants, and yellow from turmeric.

Statistics also show that groups eligible for certification access generally comprise at least 99 percent men.

However, as many women needed to weave faster to meet daily needs, natural dyes became less practical, leading them to switch to synthetic dyes.

“This shift uprooted them from their identity,” Dr Sakhiyya said. “Now, many young people no longer know about the dyeing culture in their villages.”

The shift from natural to synthetic dyes also hurts the environment and generates waste, Dr Sakhiyya said, and weavers lose independence by becoming dependent on industrial products.

In Yogyakarta, a strong story of progress emerged from the research. Here, Solidaritas Perempuan Kinasih collaborates with Sustainable Women Farmers of Karisma, a group that applies traditional, sustainable methods passed down through generations. Their farming practices

avoid chemical fertilisers, pesticides, and imported seeds, “as well as monoculture farming systems,” said Solidaritas Perempuan Kinasih Chairwoman, Sanaullaili.

Crop rotation and soil rest periods are also practised “to give the soil time to rest as part of its right to recover from production work,” she added.

The crops planted by Karisma members are decided through discussions with their husbands.

“Previously, decisions were solely made by the husbands, but this has shifted,” Ms Sanaullaili said.

“This group emerged as a response to the Green Revolution, which sidelined women’s participation and political presence, aiming to restore women’s political space in agriculture,” she explained.

Karisma was initially founded by male farmers. Since most members were men, women were naturally excluded, even though they also worked in the fields and gardens. The organisation later stagnated for about five years. Evaluations concluded that a farmers' movement could not rely solely on men. Women were then involved, leading to the formation of Sustainable Women Farmers of Karisma. "Of course, men are also involved in meetings because there are areas where their participation is necessary as part of the movement," Ms Sanaullaili said.

The team's research in Yogyakarta has already shown tangible results. The Yogyakarta Provincial Government has formally recognised and certified Karisma's farming practices. The provincial government acknowledged "that their practices represent sustainable, healthy, and natural farming methods."

According to Ms Sanaullaili, this recognition elevates the status of female farmers, as farmer groups are typically male-dominated. Statistics also show that groups eligible for certification access generally comprise at least 99% men.

In Kupang, the research has also supported community dialogues around the social and environmental impacts of mining activities. The

Eastern Indonesian Women's Network (Jaringan Perempuan Indonesia Timur - JPIT), a group led by female pastors, took part in the initiative.

"The timing was perfect," Dr. Pangastuti said.

When the government enacted a regulation allowing faith-based mass organisations to participate in managing mining activities, the research team and women pastors had already been deeply engaged in discussions on climate change and sustainable natural resource management.

In various dialogues, they emphasized the importance of positioning mining as part of the solution through transparent, ethical governance that prioritizes community welfare and environmental sustainability.

Therefore, when the regulation was issued, they were able to respond promptly and take a constructive stance, that mining can serve as an opportunity to improve community well-being, provided it is managed wisely, fairly, and in harmony with sustainability principles.

"In programmatic terms, this might be considered an unintended outcome," said Dr Sakhiyya. ☉

Rolling the Dice for Our Planet

A team of cross-disciplinary researchers, with the shared belief that children have the right to know and understand the future impacts of climate change, have worked with young people to create a board game that entertains and educates. The project demonstrates that a global challenge like climate change requires connected solutions and the participation of our youngest changemakers.



RESEARCH LOCATIONS

- East Nusa Tenggara
- Australia



In a classroom at Asuhan Kasih School for Students with Special Needs (SLB) in Kupang, East Nusa Tenggara, researchers Aditya Satyagraha and Reny Rebeka Haning were engaged in discussions with students about designing a climate change-themed game. The children listened attentively, despite the sweltering December heat.

They explored concepts for the game, including rules, design, duration, and features they hoped to develop. However, the rising temperature started to make everyone uncomfortable.

Ms Haning then suggested stepping outside to find a more pleasant spot.

While dealing with the rising temperature of the classroom was easily solved, young people in Indonesia and across the globe could soon be grappling with more intractable temperature and weather problems, as their generation faces the impacts of climate change.

The day's activity was one of the stages of a collaborative research project currently being led by Dr Avianto Amri, who works with PREDIKT, a think-tank focused on disaster risk management education and advocacy. The research project, involving experts from Indonesia and Australia, aims to enhance children and teenagers' understanding of

climate change through play. It is titled: Enabling Children as Agents of Change through Inclusive Edu-Games on Climate Change and Disaster Resilience.

Dr Amri says that today's children and teenagers will be the most affected by climate change, so they must understand the repercussions.

"It would be deeply unfair if they, while still growing and developing, don't understand the situation they're facing," he said.

Dr Amri hopes that the games will support children to develop critical and creative thinking skills about climate change, developing skills to communicate risks effectively, build personal and social responsibility, and

RESEARCH TITLE

Enabling Children as Agents of Change through Inclusive Edu-Games on Climate Change and Disaster Resilience

PARTNERS



Indonesian Organisations

1. PREDIKT Tangguh Indonesia

2. Universitas Nusa Cendana

3. Universitas Multimedia Nusantara

4. ChildFund Indonesia

5. Masyarakat Penanggulangan Bencana Indonesia



Australian Organisations

1. Charles Darwin University

2. University of Western Australia

3. Harkaway Primary School

RESEARCHERS

- Dr. Avianto Amri

LEAD RESEARCHER

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• Rebeka R. Haning

• Dr. Indra Yohanes Killing

• Aditya Satyagraha, S.Sn., M. Ds

• Fonita Theresia Yoliando, S.Ds., M.A.
- Dr. Rina Suryani Oktari

• Dr. Jonatan Lassa

• Hermina Manlea, S. Si, M. Env.Sc

• Jamjam Muzaki

• Leigh Johnson

become environmentally conscious citizens.

"We hope they can become agents of change in spreading awareness about climate change," he said.

The project is also designed to include children with physical and sensory disabilities.

Children in rural areas of East Nusa Tenggara, such as Kupang Regency, Malaka Regency, and Belu Regency, as well as those in Kupang City, were the target of the research. These areas have relatively limited access to information about climate change and disaster resilience, while the province is considered one of the most vulnerable regions to climate impacts.



These edugames are designed to help children understand climate change in an inclusive, engaging, and participatory way.

Small cards, big lessons.
Building disaster awareness
one game at a time.



This vulnerability became even more evident in recent years, when the region faced a series of extreme weather events that disrupted lives and livelihoods.

In April 2021, East Nusa Tenggara was hit by the deadly Tropical Cyclone Seroja. At least 182 people lost their lives. The threat of similar weather events has risen sharply, compared to just 10 –15 years ago.

East Nusa Tenggara also frequently experiences droughts and floods. The impact of disasters compounds other vulnerabilities and risks facing children, including child abuse, early marriage, and sexual violence. High school dropout rates and low human development scores further affect the welfare of children in the province.

Dr Amri believes that children have huge potential as agents of change because they are the most connected generation. Compared to their parents, they have broad networks beyond their immediate environment, giving them unique perspectives on risks.

They are also natural 'risk communicators' who are able to quickly spread messages, viral news, or interesting information using their own language and techniques. They can identify risks, communicate them effectively, and mobilise resources or communities.

"They can create change in their surroundings, whether big or small," Dr Amri said.

Children can create change in their surroundings, whether big or small.

Cross-Border Collaboration with A Shared Goal

Dr Amri worked with an international team of collaborators to bring the research to life. PREDIKT, the organisation he heads, was working with Universitas Timor, Universitas Nusa Cendana, Universitas Multimedia Nusantara (Jakarta), ChildFund Indonesia, Charles Darwin University in Australia, Harkaway Primary School in the Australian state of Victoria, and the Indonesian Society for Disaster Management (Masyarakat Penanggulangan Bencana Indonesia).

The team consisted of 10 core researchers, two field coordinators, and eight operations team members. The collaboration brought together academics and practitioners from universities and NGOS with varied

academic disciplines and focus areas, and included institutions specialising in climate change, child protection, psychology, visual design, gender equality, disability, social inclusion and more.

"Everyone brings a different perspective, but we share the same goals. I think that's what makes this research particularly exciting," Dr Amri said.

Created by Children, Tested by Children

Children were at the centre of the edu-games development process, which was initially carried out in stages involving students and teachers in East Nusa Tenggara. Students in Jakarta and Australia were then included in the process.

All the hard work seemed especially worthwhile when children with disabilities were able to share their experiences through a conference call with friends from Australia, Yogyakarta, Jakarta, and elsewhere.

Students in Jakarta and Australia were then included in the process. They took part in the prototyping process and provided valuable feedback on the game's development. This is an important learning experience for the them.

Of course, the best way to test a board game is to play it.

After the game had been thoroughly tested, the project team organised follow-up activities to assess its success, including a conference call between children in Indonesia and Australia, questionnaires, and asking children to conduct a 'photovoice' activity where they documented changes in their perspectives through photography.

The photovoice images showed an increase in climate change awareness after playing the game, with children focusing on climate and environmental issues in their photography.

"Based on the evaluation results, the level of awareness has improved," said Dr Indra Yohanes Kiling, a child psychology expert in the project.

Universal Design

In developing the board game, the team also took into account participants with disabilities, particularly people with visual impairment. As a result, the board was designed to be tactile, allowing visually impaired participants to feel the layout with their fingers. The team also got creative by designing playing pieces in tactile shapes like stars, squares and circles, so that players could differentiate by touch. The dice were also uniquely crafted to help players distinguish the numbers rolled.

Game figurines were also crafted to embrace diversity. There were male and female figures, ones with curly



Equal roles, shared responsibilities—learning together through gender-inclusive play.

or straight hair, glasses, and even wheelchairs users. High-contrast colours were selected to ensure participants with colour vision difficulties could still fully engage.

Gender representation was kept in mind when designing the board, encouraging participants to assume roles based on their abilities while sharing equal responsibilities.

These creative efforts paid off. The inclusive design allowed students with disabilities at Asuhan Kasih School—one of the schools involved in the project—to fully participate and enjoy the learning experience.

According to Amini, the principal of the Asuhan Kasih school, the game made children happy and excited.

"They were eager to play again," she said.

All the hard work seemed especially worthwhile when children with disabilities were able to share their experiences through a conference call with friends from Australia, Bali, and elsewhere. For Dr Amri and the entire team, this moment was truly significant. The children enthusiastically recounted their stories and discussed pressing issues such as drought, extreme weather, and flooding, highlighting the challenges they face daily.

"For me, that was the most memorable part," he said.

Child-Centred, Inclusive Research Paving the Way for Change

Working with children and teenagers as research participants naturally has its own challenges, especially since not all members of the research team had experience in this field.

Students are involved in designing the edugames.



Dr Amri recognised this early on, so the project began with an orientation covering ethical guidelines, facilitation techniques, obtaining consent from schools and parents, and more.

Dr Kiling explained that in the field, the team utilised a research approach based on child-inclusive methods. This was drawn on at every stage, from recruiting participants, collecting data, in analysis, and when presenting findings.

One key concern was ensuring that children remained at the centre of the project. The children needed to be protected from fatigue, boredom, disinterest, or discomfort.

An example of this was when activities needed to be moved from hot classrooms to more comfortable spaces.

While improving the mood among the group, it also provided an opportunity to explain the direct impacts of climate change, and how extreme heat could disrupt focus and interfere with learning.

To better connect with the children, the team also collaborated with a local non-governmental organisation called the Climate Care Community. This organisation regularly disseminates knowledge about climate change to a wide range of audiences.

"They are more familiar with how to communicate these issues to children," Dr Amri said.

The collaboration successfully achieved its goal of increasing students' awareness of climate change impacts, demonstrating the power of play in



Putting the principle of “no one left behind” into action—creating inclusive play spaces where all children, including those with disabilities, can participate equally in learning through edugames.

empowering children and young people with information.

At St. Theresia Christian Junior High School in Kupang, students initially had only a basic understanding of climate change.

"Now their knowledge has significantly improved after assistance from the research team," a teacher said.

The children also learned ways to cope with the impacts of climate change.

"They can now share this information with their peers," the teacher added.

Dr Amri envisions providing further training and mentoring to children who are already connected, so that more

children can understand climate change and amplify its impact.

He also hopes to develop inclusive, technology-based learning tools, such as artificial intelligence, to create more engaging educational experiences.

The principle of "no one left behind" must be implemented to ensure all children, including those with disabilities, can participate equally, he said.

Fostering connectivity among groups of children from different regions and strengthening collaboration with local and international organisations are seen as vital steps to expand the positive impact of this program. ☺

From Headlines to Heartlands: Making Climate Change Understandable

Before communities can adapt to or mitigate climate change, they need to know about it. But media coverage on climate change and related policies is widely seen as inadequate. Rural communities are especially vulnerable to climate impacts, yet are lacking the knowledge and information they need to understand it. How can we improve communication on climate change issues?



RESEARCH LOCATIONS

- Indonesia
- Australia



What unites experts from Australia and Indonesia, spanning diverse academic disciplines, in a collaborative research effort?

The answer: a shared concern for the future of our planet, our common home.

Bringing together computer scientists, industrial engineers, environmental experts, and communication and journalism specialists, this KONEKSI collaborative research project aims to recognise and understand the critical role communication plays in addressing climate change: a complex and urgent issue that affects us all.

A joint effort between Deakin University and Universitas Gadjah Mada (UGM), the Building Resilience in At-Risk Rural Communities through Improving Media Communication on Climate Change Policies project aims to empower some of the most vulnerable and isolated communities through improved information access.

By disseminating clear and accessible information, the research hopes to empower rural populations in both Indonesia and Australia to better understand, critically assess and evaluate climate change policies. Rural communities are among the most vulnerable to the impacts of climate change, yet often have the most limited access to relevant information.

To begin, project researchers analysed media reports on climate change policies in Indonesia and Australia.

Then, researchers gathered and assessed rural communities’ knowledge and perceptions of climate change and related policies. They then identified common challenges faced by both countries.

The second phase of the research focused on understanding and comparing media in Indonesia and Australia, particularly how coverage highlights climate risks faced by rural populations.

The third phase involved designing and implementing comprehensive information dissemination strategies through trusted platforms.

RESEARCH TITLE

Building Resilience in At-Risk Rural Communities through Improving Media Communication on Climate Change Policies

PARTNERS

 Indonesian Organisations

- 1.Universitas Gadjah Mada
- 2.University of Tasmania (UTAS)

 Australian Organisations

- 1.Deakin University
- 2.University of Tasmania (UTAS)

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 - Dr. Adam Cardilini
 - Prof. Catherine Bennett
 - A/Prof. Hassan Vally
 - Dr. Justin Lawson
- Dr. Ming Liu
 - Dr. Chathu Ranaweera
 - A/Prof. Kevin Lee
 - Dr. Yun Mulyani
 - Dr. Yunita Saril
 - Dr. Arif Nurwidyantoro
 - Dr. Gabi Mocatta
 - Dr. Novi Paramita Dewi



A photographer takes photos of peatland fires, On October 06, 2019 in Pekanbaru regency, Riau Province, Indonesia. (Photo by Afrianto Silalahi/NurPhoto via Getty Images)

KONEKSI workshop project
at Deakin University in
August 2024.



In an era of information overload, distinguishing accurate and truthful content from misinformation and disinformation is increasingly difficult, especially on a topic as vast and complex as climate change.

The situation is further complicated by the diversity of public perceptions regarding 'truth'. People often believe what they perceive to be 'true' even when it is false, and some continue to deny the existence of climate change altogether.

Deakin University and UGM view these challenges as research opportunities. Both institutions already have a solid foundation for partnership, having collaborated previously on another complex issue: COVID-19.

At the time, the Victorian Government launched the Study Melbourne

Research Partnerships scheme to support academics to continue international research during the pandemic. The Deakin-UGM project focused on detecting misinformation about COVID-19 in Indonesia and Australia was one of 15 grantees, with the goal of developing joint strategies to counter the flood of false information about the virus and the public health response.

"After the COVID-19 project ran for 1.5 years and was nearing its conclusion, we learned about the KONEKSI research grant," Professor Xiao Liu said.

The opportunity was appealing due to the cross-border character of both topics, and some of their shared information challenges. COVID-19 and climate change are both complex global issues that transcend national boundaries, and misinformation and

disinformation have significantly shaped public discourse around both.

As an information technology expert, Prof Xiao understood that this project required more than data collection and analysis through high-tech digital tools and artificial intelligence (AI). It demanded a deeper exploration of how media and communication on climate change influences individuals, communities, and decisionmakers.

After discussions with A/Prof Hilya Mudrika Arini, the lead researcher from UGM, Prof Xiao proposed forming a multidisciplinary team. Within days, academics from both Deakin and UGM who were interested in joining the project had signed up.

One team member is Dr. Adam Cardilini, an environmental science lecturer at Deakin University. Dr. Cardilini was keen to participate because he believes climate change and policy are critically linked. As an ecologist, he stressed the need for accountability in addressing human-induced environmental issues.

“Climate change could lead to the collapse of modern civilisation. Disasters may occur within this century, possibly even before its midpoint,” Dr Cardilini warned.

Dr Gabi Mocatta, another project researcher and a communication and journalism lecturer at the University of Tasmania, echoed Adam’s sentiments. Through her academic focus on climate change in the media, Dr Mocatta is studying how the media communicates climate change issues, the extent of media coverage, and how this coverage frames necessary climate actions.

“This involves examining public understanding and the politicisation of climate change—a broad and complex field of study,” Dr Mocatta explained.

Dr Mocatta has extensive experience on this topic. As a former journalist, she has collaborated with researchers from various countries on climate communication studies. “However, I have never worked with Indonesian colleagues before,” she admitted.

Two Nations and A Shared Climate Literacy Problem

In Indonesia, a group of researchers began gathering perspectives from rural communities and other stakeholders.

“We spoke with youth organisations, local government officials, and farmers,” said Dr Fitri Trapsilawati, a researcher from UGM.

...most outlets only focused on the Paris Agreement, electric vehicles and energy. These findings reinforced the assumption that climate change has not yet become a media priority in Indonesia.

During these discussions, farmers expressed concerns about declining agricultural income. However, they didn't use the term "climate change". Instead, they referred to *pranoto mongso*, or seasonal patterns.

Interviews with young people revealed limited familiarity with the concept of climate change, reflecting a need for broader public awareness initiatives. Local government officials acknowledged the absence of detailed operational guidelines to address climate change issues effectively. While the Indonesian government has established comprehensive climate policies at the national level, there remains an opportunity to enhance support and coordination mechanisms to facilitate their implementation at local levels.

According to Dr. Trapsilawati, an associate professor in the industrial engineering program, the survey results indicated respondents' understanding of climate change was far from

satisfactory. On average, only 5 out of 10 climate-related questions were answered correctly.

Based on this assessment, a media analysis was then conducted to assess the trustworthiness of reporting on climate change. The research showed that most outlets only focused on the Paris Agreement, electric vehicles and energy. These findings reinforced the assumption that climate change has not yet become a media priority in Indonesia.

The situation is similar in Australia. According to Dr Mocatta, Australian media tends to focus heavily on sports and celebrity news, with climate change receiving comparatively limited coverage. When reported, climate-related stories often struggle to maintain prominence within the news cycle, except during major disasters when the issue briefly captures heightened attention.



Focus group discussions with farmers in Cangkringan, Yogyakarta, explore climate impacts and community-led adaptation strategies.

Globally, Dr Mocatta argued, journalism and the media have responsibility to spread information about one of the most critical issues of our time.

“We need to act as if our house is on fire, as (activist) Greta Thunberg said,” she emphasised.

So, what should be done?

“Start acting at the local level,” said Dr Cardilini. “This way, rural communities can directly approach and knock on the doors of local government authorities.”

Rural communities experience the impacts of climate change daily. However, due to their lack of understanding of the issue, they struggle to articulate what they are facing.

Dr Trapsilawati noted that respondents described climate impacts they encountered in everyday life, but may

not have connected it to climate change. For instance, young people working in dairy farming observed that cows were falling sick more often.

To make a real impact, the research findings show a need to strengthen education, coverage, and reporting on climate change. These efforts should target everyone with access to communication tools, including social media.

“Every story should be a climate story. Every aspect of our lives will increasingly be affected by climate change,” Dr Mocatta emphasised.

“For me, this project is just the beginning,” said Prof Xiao.

“We want to take it further, beyond the scope of this study. This is a massive mission that cannot be achieved by journalists, researchers, or governments alone. It requires a collective effort from all communities.” ☺

Changing the Tide on Women and Children's Resilience to Flood Threats

Climate change is threatening the livelihoods of coastal communities along the northern coast of Java. While migration is often seen as a solution, it poses unique challenges for women and children. More inclusive and comprehensive approaches are needed to address their specific vulnerabilities and ensure they remain protected and empowered.

RESEARCH LOCATIONS

- North Jakarta
- Pekalongan City & Regency
- Demak Regency
- Semarang City



Rising sea levels and significant land subsidence have become a nightmare for impoverished coastal communities along the northern coast of Java. Large tidal floods that send seawater surging into residential areas have left many people homeless, landless, and without possessions.

These hydrometeorological disasters have forced many people to change their livelihoods to meet their daily needs: they have also forced many women and children into the workforce in order to help their families survive.

Affected communities include those living in densely populated urban areas, such as Muara Angke in North Jakarta, as well as communities in mid-size cities, villages and suburbs in Semarang, Pekalongan, Demak and elsewhere along the Central Java coast.

Many women and children in these areas work as green mussel shellers. Some children have even been forced to

drop out of primary school and take up jobs as rubble carriers. They perform strenuous tasks for hours in dangerous environments. Exposure to smoke, sand, and dust affects the health of these vulnerable workers.

Through KONEKSI, researchers from Indonesia and Australia have turned their attention to their plight.

The Compelled Labour and Climate Change: Keeping A Focus on Women and Children project involved experts from Griffith University, Australia; Universitas Diponegoro in Semarang; and the National Research and Innovation Agency (BRIN) with the support of two non-governmental organisations: the Urban Initiative for Climate Change (IKUPI); and the Centre for Regional Research and Information (Pattiro).

The research is led by Dr. Amy Young, an expert in violence prevention, including children's rights, gender-based violence, and domestic and

family violence, from Griffith University; Professor Wiwandari Handayani from the Department of Urban and Regional Planning at the

Faculty of Engineering, Universitas Diponegoro; and Dr. Laely Nurhidayah, Head of the Research Center for Law at BRIN.

RESEARCH TITLE

Compelled Labour and Climate Change: Keeping A Focus on Women and Children

PARTNERS

 Indonesian Organisations

- 1.Universitas Diponegoro
- 2.Research Center for Law, National Research and Innovation Agency (BRIN)
- 3.Urban Initiative for Climate Change (IKUPI)
- 4. Centre for Regional Research and Information (Pattiro)

 Australian Organisations

- 1.Griffith University

RESEARCHERS

- Dr. Amy Young

LEAD RESEARCHER
 - Prof. Dr. Ing. Wiwandari Handayani

LEAD RESEARCHER
 - Dr. Laely Nurhidayah

LEAD RESEARCHER
 - Prof. Patrick O’Leary
 - Prof. Elena Marchetti
 - Prof. Sara Davies
 - Dr. Ana Borges Jelinic
 - Prof. Jennifer Boddy
 - Dr. Febi Dwirahmadi
 - Prof. Donna McAuliffe
 - Prof. Susan Harris Rimmer
 - Dr. Landung Esariti
 - Intan Hapsari Surya Putri
 - Dr. Aditya Rahmadhony
 - Josefhin Mareta
- Vera Bararah Barid
 - Agus Suntoro
 - Nurahman Aji Utomo
 - Ahmad Fathony
 - Nawawi
 - Ade Angelia Marbun
 - Adis Nurhayati
 - Inayah Nurhidayati
 - Dewi Analis Indriyani
 - Yudi Wahyu
 - Citra Tatius
 - Mega Anggraeni
 - Untung Prasetyo Ilham
 - Putri Milasari



Residents of the green mussel farming community peel freshly harvested mussels cultivated by local fishermen in Muara Angke, Penjarangan, North Jakarta. The area is a major processing centre for green mussels along Jakarta's northern coastline. (Photo by SOPA Images/Getty Images)

This project places special emphasis on the risks of rising sea levels in coastal villages, the threat of forced migration due to land loss, and its connection to forced labour. The study also addresses critical areas related to the environment and climate change, with a specific

focus on promoting gender equality, disability, and social inclusion.

The research applies gender- and child-focused analysis to current policies and business responses in Indonesia regarding compelled labour and climate

change in coastal villages. It also aimed to map the prevalence of forced labour among women and children in Central Java and Jakarta.

The project is a first-time collaboration among the researchers and institutions involved.

The partnership began in 2023 when Dr Young contacted the Jakarta office of the Sweden-based Raoul Wallenberg Institute of Human Rights and Humanitarian Law, an independent academic institution.

The institute told her about funding opportunities through KONEKSI and connected her with Dr Nurhidayah and Prof Handayani. This is Dr Young's first research project in Indonesia.

"We started from there because Griffith University has a very strong team in gender-based violence, gender understanding, and social issues. [Dr Nurhidayah]'s team has a solid track record in human rights and law. And [Prof Handayani]'s team brings expertise in engineering and urban planning," Dr Young said.

Dr Nurhidayah had conducted extensive research on sea level rise and climate change, including disaster risk reduction and social justice impacts on civil rights. When Dr Young proposed a project highlighting compelled labour,

Dr Nurhidayah felt this was a topic that had not been explored before.

"I thought this was an excellent proposal that we needed to support, and we want to explore its implementation and solutions to these problems," she said.

Prof Handayani said the research sparked stimulating discussions.

"Through this process, we learned how our urban planning background can contribute to or enrich discussions related to social issues," she said.

The research team chose the northern coast of Java as the study location because the impacts of climate change are profoundly visible in that region. The researchers aimed to highlight the realities faced by the local population and the social consequences of climate change.

Central Java is the province most affected by rising sea levels and land subsidence, Dr Nurhidayah said.

In Demak, for instance, some areas have already been submerged, such as Mondoliko Hamlet and Rejosari Hamlet in Bedono Village, requiring residents to be relocated. Pekalongan, Semarang City, and North Jakarta face similar problems.

For years, solutions for communities affected by climate change have largely focused on physical infrastructure and resilience. Yet, the social impacts are just as disruptive.

Prof Handayani stressed that this research is vital because, for years, solutions for communities affected by climate change have largely focused on physical infrastructure and resilience. Yet the social impacts are just as disruptive.

Tidal Flood Victims Need More Than Relocations

Researchers invited women and children from study areas to participate as respondents. Surveys and interviews focused on understanding the impact of climate change, particularly rising sea levels, on daily life and community well-being.

The findings revealed that climate change has far-reaching effects on women and children. Key challenges include land subsidence, tidal flooding, rising temperatures, economic decline, poor sanitation, water supply issues, waste disposal problems, and diseases.

Women and children also frequently face difficulties caused by floods, including unfulfilled rights, negative

impacts on education, poverty levels, employment, and well-being. While the government views migration as a solution, many see relocation as a potentially damaging social cohesion and community ties, which are crucial for dealing with the ongoing and increasing effects of climate change.

Communities in Muara Angke, North Jakarta, for instance, have experienced migration waves from surrounding urban areas, such as Cirebon and Indramayu in West Java, and Tegal in Central Java, making livelihoods harder to sustain. Migrants face challenges accessing public services due to weak population data systems – for example, migrant children find it difficult to enroll in schools.

In Semarang, communities rely heavily on the sea for livelihoods. Communities have a strong understanding of climate change impacts, with women's groups in Kampung Tambaklorok, Tanjungmas Sub-District, North Semarang, leading adaptation efforts through activities such as urban farming. They sell their crops for extra income or use them to prevent malnutrition.

Meanwhile, residents in Panjang Wetan, Pekalongan City, who mainly depend on the fisheries sector, prefer to stay despite environmental changes. They feel attached to Panjang Wetan as their birthplace and home. They are also reluctant to migrate due to uncertainties about jobs, potential business losses, and unfamiliar environments.

In Pekalongan, rising waters have submerged farmland and fish auction centres. Women and children work in informal sectors like batik production, which lack regulation. Poverty-related stigma leads to bullying and school dropouts.

Demak Regency also faces severe challenges due to gradual climate change impacts like tidal flooding and land subsidence. Some hamlets in Bedono Village, Sayung District, are submerged. These conditions pose physical safety threats to children living in the area.

Children's education is disrupted due to climate change and related poverty. They often work more than they should, impacting their health and well-being.

Climate change exposes women and children to risks of exploitation and abuse, while also worsening poverty. Gender inequality exacerbates the effects of climate change.

"Some children don't go to school because their villages are flooded or because their parents lost their livelihoods. Yet, they feel obligated to stay and help their parents," Dr Young said.

Women often face significant challenges in their work environments, including inadequate health standards and remuneration that can exacerbate socio-economic disparities. These conditions highlight the need for improved support systems to address the intersecting issues of health, income, and poverty.

The research team noted that there are some areas in laws and regulations, particularly the Disaster Management Law, that could be improved regarding civil rights and migration issues related to climate change.

Based on these findings, the research team proposed several policy options aimed at enhancing women's economic empowerment and resilience. These include improving the effectiveness of existing programs through targeted training, access to soft loans, marketing support, and strengthening women's groups and communities in coastal areas. Additionally, the team recommended preparing regulations to ensure equitable access to social security for women working in informal sectors and enhancing



Amid tidal flooding and land loss, coastal communities in Northern Java demonstrate resilience. However, it is women and children who bear the greatest additional economic burden.

supervision and enforcement of labour laws to address workplace violations.

The researchers also highlighted the need for adaptive policies to guarantee educational access for children affected by rising sea levels

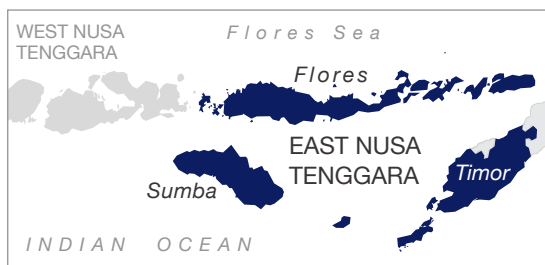
and land subsidence in coastal areas. "We need to collaborate and develop a constructive solution to address this issue. This is a highly complex problem that requires all stakeholders to come together and work toward resolving it," Dr Nurhidayah said. ☺

Unearthing Lessons for Resilience from A Unique Regional Model

From enduring one extreme disaster to another, the people of East Sumba have developed a complex social protection system—an essential foundation for confronting climate change.

RESEARCH LOCATION

East Sumba Regency, East Nusa Tenggara



Falling into poverty in East Sumba Regency, East Nusa Tenggara, can be as swift as flipping a coin.

For one woman in Tarimbang Village, about two hours from Waingapu, an outbreak of African Swine Fever at the end of 2023 wiped out her herd of 20 pigs. In an instant, her economic security vanished.

“From being self-sufficient, she suddenly became impoverished,” said Dr Dominggus Elcid Li, Director of the Institute of Resource Governance and Social Change (IRGSC), who was also involved in this research project.

This is not an uncommon story. Economic losses from such disasters typically result in sudden poverty.

For the people of East Sumba, pigs, buffaloes, and horses are more than just livestock. They are living savings, symbols of social status, and sources of livelihood. When the swine fever hit, the community not only lost economic assets but also their social identity.

With a livestock-based economy, the local population is highly vulnerable to massive losses when disasters or outbreaks occur. A report by PRISMA, a partnership program between the Governments of Indonesia and Australia to support the growth of the national agricultural market, estimated that the swine fever outbreak in East Nusa Tenggara caused losses amounting to IDR 2 trillion AU\$ 192 million).

RESEARCH TITLE

Towards Future Proof Society: Adaptive Social Protection Against Climate Change

PARTNERS		RESEARCHERS	
 Indonesian Organisations			
1. Resilience Development Initiative		• Dr. Saut Sagala	LEAD RESEARCHER
2. Universitas Pendidikan Indonesia		• Dr. Ayu Krishna	
3. Universitas Kristen Wira Wacana		• Dr. Maklon Killa	
4. The PRAKARSA		• Dr. Victoria Fanggidae	
5. Habitat for Humanity Indonesia		• Andreas Hapsoro	
6. Institute of Resource Governance and Social Change		• Hestin Octalina Klass	
		• John Talan M.DS	
		• Dr. Dominggus Elcid Li	
 Australian Organisations			
1. Charles Darwin University		• Dr. Jonatan Lassa	

In addition to outbreaks, East Sumba also faces challenges from extreme natural disasters. The island has repeatedly been hit by droughts, storms, and locust infestations. Many families lose their crops due to challenges to anticipate droughts.

This situation highlights how vulnerable the region is to the impacts of climate change, which continues to increase the frequency of disasters.

Dr Jonatan Lassa, a researcher at Charles Darwin University, described East Sumba as “an island with climate scars.”

However, amid such vulnerabilities, East Sumba possesses a unique social structure. Its people have developed a social protection system that blends formal government assistance programs, such as social aid (*bansos*), with informal community- or clan-based support.



Household survey with the local community in East Sumba.

“The concept here is *umah*, an extended family unit,” said John Petrus Talan, a researcher at IRGSC.

While social protection appears effective, researchers have identified vulnerabilities in biosecurity systems, which are measures to reduce biological risks. These systems are increasingly under threat from climate change, which affects ecosystems and pathogens.

Had East Nusa Tenggara’s biosecurity systems been stronger, the swine fever outbreak that began in Timor-Leste in 2019 might have been contained before spreading to the province.

Since East Nusa Tenggara has the largest pig population in Indonesia, there is great potential to elevate such an issue to a national priority for future development.

Multidisciplinary and Cross-Border Collaboration

Through KONEKSI, a multidisciplinary research project aimed at understanding how adaptive social protection systems can support climate resilience has brought together researchers across Indonesia and Australia.

The project, titled Towards a Future Proof Society: Adaptive Social Protection against Climate Change, is resulting in impactful innovations.

Through a synergy between Charles Darwin University in Australia and Indonesian institutions including the Resilience Development Initiative (RDI), Universitas Pendidikan Indonesia, IRGSC, the Policy Advocacy and Research Institute The PRAKARSA, Habitat For Humanity Indonesia (HFHI), and Universitas Kristen Wira Wacana, this research has brought together cross-disciplinary expertise and fostered mutual learning.

From the Australian perspective, researchers observed how East Sumba communities rely on social solidarity, such as the *umah* system and reciprocal practices, to endure crises. Indonesian researchers gained new insights into integrating modern technology with traditional approaches to develop sustainable solutions.

The research engaged multiple disciplines to provide a comprehensive perspective. Dr Lassa, the research coordinator, explained that the main objective was to identify how social protection, both formal and informal, could be enhanced to address the impacts of climate change.

One of the innovations explored is the Community Food Security Action Information System (Sistem Informasi Aksi Ketahanan Pangan Masyarakat - Sikepangmas), an early warning system that enables local governments to predict disasters and take proactive measures.

“This system is a prime example of how the local government can creatively utilise available resources to build adaptive formal social protection systems, which at the national level largely remain in development,” said Dr Lassa, expressing admiration for the system.

The concept envisions governments and stakeholders predicting potential disasters before they occur, facilitated by science and technology.

“For instance, if Sikepangmas forecasts heavy rain within two days and signals that a large harvest is at risk, the government can deploy harvesting machines,” added Maklon Killa, a researcher in this project, who is also

The concept of Sikepangmas envisions governments and stakeholders predicting potential disasters before they occur, facilitated by science and technology.

the Rector of Universitas Kristen Wira Wacana in East Sumba.

Sikepangmas allows local governments to prepare interventions before disasters strike, such as deploying water pumps during droughts or mobilising harvest equipment ahead of storms, as well as drafting policies to anticipate food shortages.

Researchers praised this innovation as an adaptive formal social protection model with potential for replication in other regions. However, national adoption of Sikepangmas still faces significant hurdles. Concerns over legal repercussions remain a major obstacle.

Dr Lassa stated that announcing potential disasters is often considered a sensitive issue, both politically and legally.

According to Maksi Nenabu, Head of the Regional Border Management Agency (BPPD) of East Nusa Tenggara, in an interview with researchers, the process of declaring disaster status often requires careful consideration,

especially when it involves climate change impacts that are not immediately visible.

These concerns become even more pronounced during politically sensitive periods, such as regional elections, where anticipatory measures can be subject to various interpretations by the public and key stakeholders.

Therefore, the existence of social protection models like the Sikepangmas, offer hope at the local government level to bridge policy gaps at the national level.

Another key finding in the research is the presence of social capital through reciprocal practices among families. The people of East Sumba maintain social memory by recording every act of giving in special books to ensure fairness and balance in social relationships.

“The goal is clear – to ensure every act of giving is reciprocated fairly,” Dr Lassa explained.

This tradition not only strengthens solidarity but also serves as an essential resource for managing crises and climate change.

According to Mr Talan from IRGSC, preserving such social capital is vital given its widespread practice in East Sumba.

Researchers observed that when formal social protection mechanisms were absent during disasters, such as the April 2021 Cyclone Seroja Disaster, informal systems played a crucial role.

“These findings highlight the significant role of social capital in helping households become more adaptive,” added Dr Killa.

Scaling Social Protection to Meet the Needs of Vulnerable Groups

The research team also assessed that innovations, such as Sikepangmas, demonstrate significant potential for creating inclusive protection measures. With improved data and advancing technology, local governments can respond more swiftly to the needs of vulnerable groups before disasters escalate.

One key focus of this research was identifying social protection systems

that address the impacts of climate change, especially for marginalised groups such as women, children, and other vulnerable populations.

Therefore, the study recommends the development of social protection policies that are more responsive to the specific needs of vulnerable groups. Sikepangmas should serve as a scalable model to anticipate future disasters while also preparing social assistance, particularly for vulnerable communities.

Another recommendation is to strengthen biosecurity measures to prevent outbreaks such as swine fever in the future. By improving surveillance and biological risk management, the potential for massive losses due to outbreaks can be minimised.

Equally important is maintaining the tradition of social capital, such as reciprocal practices among families, which are already widespread in East Sumba.

Through this research, the researchers also hope that East Sumba’s adaptive social protection model can inspire other regions in Indonesia. With collaboration involving multiple stakeholders, local innovations like the Sikepangmas and community-based social capital could be key to building more resilient societies in the future. ☺



Respondents participate in the household survey in East Sumba.

ECHOES OF PARTNERSHIP

Stories From the Australia-Indonesia
Research Collaborations
Facing Shared Climate Challenges

CHAPTER

3

DISASTER MITIGATION AND RISK MANAGEMENT

A police officer attempts to extinguish a fire burning on a plot of land in Palangkaraya, Central Kalimantan, on 14 September 2019. (Photo by Ulet Ifansasti/Getty Images)





Tide-Eye: A Technological Guardian for Java's Northern Coast

Using artificial intelligence, Tide-Eye is keeping digital watch over areas of Central Java affected by tidal flooding, supporting early and informed decision-making to reduce the impact of floods on the economy and vulnerable communities.



RESEARCH LOCATIONS

- Pekalongan, Central Java
- Demak, Central Java
- Semarang, Central Java



Daily tidal flooding poses a significant threat to cities like Semarang, Demak and Pekalongan on the north coast of Central Java, with far-reaching consequences for people and the environment.

But what if flood risks could be predicted in real time?

Tide-Eye leverages Internet of Things (IoT), drones and artificial intelligence (AI) technologies to make this idea a reality, improving how the cities use their flood mitigation infrastructure to reduce the impact and severity of floods.

Tide-Eye automatically monitors sea levels and water heights in areas prone to tidal floods, while providing accurate

early warnings thanks to radar and camera surveillance. The radar serves as the primary tool for detecting sea surface levels, while cameras mounted on water storage facilities and drones continuously monitor and measure water levels. An artificial intelligence system processes the data collected from all these devices, issuing early warnings and estimating the extent of possible inundation.

As a result of this collaboration between Australian and Indonesian institutions, the Pemali Juana River Basin Authority (BBWS) in Semarang – which operates Tide-Eye – has gained a sophisticated new tool. Previously, early warnings for tidal floods could only be issued within a narrow timeframe. Sometimes,

there were no warnings at all. Through Tide-Eye, water level increases can now be monitored in real time, allowing communities to prepare for possible flooding or disruption.

The Tide-Eye team collaborated closely, despite the physical distance.

Associate Professor Le Chung Tran, the lead researcher from the Faculty of Engineering and Information Science at the University of Wollongong (UOW), has not had the chance to visit the project sites in Central Java. A/Prof. Tran led the research team entirely from Wollongong, located south of

RESEARCH
TITLE

Tide-Eye - An AI/IoT Powered Airborne System for Monitoring Water Levels and Tidal Floods in The North Coast of Central Java

PARTNERS

 Indonesian Organisations

- 1.Telkom University

2.Pernali Juana River Basin Authority (BBWS) of the Ministry of Public Works and Housing

3.PT. Hilmy Anugerah Consulting Engineer Ltd.

 Australian Organisations

- 1.University of Wollongong

RESEARCHERS

- A/Prof Le Chung Tran

LEAD RESEARCHER

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Prof Hoa Khanh Dam

Prof Christian Ritz

Prof Faisal Hai

Prof Son Lam Phung

Mr Huy Anh Dinh

A/Prof Montse Ros

Prof Jiangtao Xi

Prof Farzad Safaei

Dr Miftadi Sudjai

A/Prof Aloysius Adya Pramudita

Dr Erna Sri Sugesti

Dr Asep Suhendi

Mr Mohamad Afif Rizal

Ms Ike Marlinda

Mr Aldi Rivaldi

Ms Wahyu Primadia Kusumaningrum

Dr Achmad Ali Muayyadi

Dr Harya Muldianto



An employee of PT Kereta Api Indonesia (KAI) Operational Area IV Semarang walks across chairs to exit the office at Semarang Tawang Station, which was flooded in Semarang, Central Java, in January 2014. TEMPO/Budi Purwanto

Economic losses caused by tidal floods in the northern coastal region of Central Java amount to at least IDR 2.5 trillion (more than AU\$ 240 million) per year.

Sydney on Australia's eastern coast. In the technological spirit of Tide-Eye, all communication – including detailed discussions, photo exchanges, and data sharing – was conducted via Zoom, email, and other digital platforms.

The smooth communication between the two teams was made possible thanks to the strong relationship between A/Prof. Tran and Dr Miftadi Sudjai, a researcher from Telkom University in Bandung. Their connection began when Dr Sudjai pursued his doctorate at UOW in 2011, with A/Prof. Tran as his principal supervisor. After graduating in 2015, the pair stayed in touch and developed a close bond.

"Since 2011, we've had a great relationship, not just as a student and supervisor, but also as friends whose families know each other well," Dr Sudjai said. "We even share the same hobby—football. Things get lively whenever Indonesia plays against Vietnam!"

When KONEKSI opened applications for its research grants in early 2023, A/Prof. Tran immediately reached out to Dr Sudjai. Their discussions led to an agreement to form an Australia-Indonesia collaborative research team to assist BBWS Pemali Juana in addressing the challenge of tidal floods.

The Australian and Indonesian teams each brought unique strengths to the table. UOW partners with technology company VIGREEN, which has expertise in AI, IoT, computer vision, machine learning, wireless communication engineering, network security, front-end and back-end web development, and application design. A/Prof. Tran and VIGREEN have collaborated on several projects both within and outside Australia.

The Telkom University team excels in radar technology, satellite-assisted communication, and computer networking. Dr Sudjai's team was supported by PT Hilmy Anugerah Consulting Engineer Ltd, a construction

company responsible for building Tide-Eye facilities within the BBWS Pemali Juana in Semarang.

The Indonesian team also brought a deep understanding of local culture, communities, logistics, and technical matters, which was key to implementation success.

"Since the Australian team couldn't be on-site, I greatly appreciated Telkom's role in facilitating interactions with Tide-Eye users, BBWS, and other parties in Indonesia," A/Prof. Tran said.

The hard work paid off. Tide-Eye received enthusiastic responses and praise when it was demonstrated for stakeholders and the broader public at events in 2024 – particularly its smartphone application that makes flood data available to all.

Personal Experience Drives Research Ambition

For Dr Sudjai, the damage and disruption of tidal floods is personal. His wife comes from Pacar village in Pekalongan City, approximately five kilometres from the coast, where tidal flooding is a real threat. Karangjampo Village, just behind Dr Sudjai's in-laws' residence, has already been permanently submerged by seawater inundation. The damage to Karangjampo village

occurred after a severe tidal flood in 2010. But the tide never retreated – the village remains submerged under 1 to 1.5 metres of water. As a result, residents started abandoning their homes. "Including my wife's family," Dr Sudjai said.

The situation in Demak is even more severe: seawater has pushed inland up to 10 kilometres. It is not uncommon there to see houses that appear to be floating on water. Many areas along the northern coast of Java are facing a similar fate. In some places, fish ponds have visibly merged with the sea.

Semarang is slightly better off. Flood mitigation facilities, such as water pumps, sea walls, and retention ponds, have been constructed, and in 2015, a long storage system was constructed – a water containment structure designed to store water in rivers, canals, or ditches on relatively flat land. As a result, areas that were once submerged have gradually dried out.

Despite these efforts, tidal floods are still disrupting the local economy and everyday lives. The Tanjung Mas Port in Semarang is one of the casualties. Kaligawe Road, which connects to the port, is affected by tidal floods, disrupting the movement of large trucks carrying goods and cargo. During the rainy season, the road is impassable for three to four hours each day.

The Terboyo Industrial Estate in Semarang has also been impacted by tidal floods. The area houses factories, including Polytron, an electronics manufacturer, whose pumps operate 24 hours a day to remove floodwater. Terboyo even had to shut down for nearly two weeks due to flooding.

"Economic losses caused by tidal floods in the northern coastal region of Central Java amount to at least IDR 2.5 trillion (more than AU\$ 240 million) per year," Dr Sudjai said.

Supporting Resilience for Vulnerable Groups

Tide-Eye technology is expected to ease the burden on coastal communities affected by flooding, particularly vulnerable and marginalised groups: the most impacted by such disasters. Limited resources often leave women-headed households, people with disabilities, older adults or the poor with no choice but to remain in flood-affected areas.

Researchers have ensured that the technology developed is accessible and inclusive for all, including people with disabilities, with multiple access formats and an accessible smartphone app.

Inclusive technology naturally stems from an inclusive research team. The

Tide-Eye project committed to ensuring at least 30 percent female participation in the research team, or 10 out of 32 actively involved members. In practice, this percentage has risen to 34 percent, or 11 members, with 9 percent (3 members) of the total team identifying as people with disabilities.

Women have played an active role not only in meetings and training sessions but also in specialised taskforces on gender issues.

"As the project leader, I am deeply impressed by the GEDSI [gender equality, disability, and social inclusion] driven work carried out by the Indonesian team, led by Dr Erna Sugesti, and Telkom University, along with all participants from women's groups and people with disabilities," A/Prof. Tran said.

Turning Challenges into Benefits

Like all projects worth doing, Tide-Eye encountered a few hurdles along the way. Importing components from Australia for project technology proved to be complex, with the supplier lacking permits to ship directly to Indonesia. An option through Singapore proved successful – but not without additional paperwork.



The Yos Sudarso Pump House is one of the locations where the Tide-Eye system has been implemented, supporting tidal flood control with real-time tide data.

Another technical obstacle was related to the equipment being designated for research purposes rather than commercial use. The team applied for a tax exemption, but since this type of component was being imported for the first time, Indonesian customs and the shipping company, FedEx, required a month to process the tax-free facility.

To ensure the project stayed on track, A/Prof. Tran began the development of a Tide-Eye dashboard, IoT, and artificial intelligence algorithms at UOW while other logistical challenges were solved. Given the importance of strong and high-quality data as the foundation for decision-making and policymaking, this approach proved effective.

The integration of IoT technology, AI, and drone usage in Tide-Eye has enabled the BBWS Pemali Juana to build a data repository on water levels and tidal flooding over time. The Head of

Key Performance Indicators for Water Resources (KPI SDA) at BBWS Pemali Juana, Anggraeni Achmad, hopes that the Tide-Eye innovations will be able to overcome the impacts of climate change, as sea level rise and water levels in residential areas can be monitored in real-time and more accurately.

Looking ahead, A/Prof. Tran hopes the knowledge gained from Tide-Eye research can contribute to shaping climate resilience policies in both Indonesia and Australia. The data repository developed by Tide-Eye holds significant potential as a foundation for decision-making, and can be utilised across various sectors, including fisheries, mangrove plantation development, healthcare, transportation, and regional planning. "Data is collected every 15 minutes. Over time, patterns will certainly emerge thanks to AI technology," Dr Sudjai said. ☺

Indigenous Communities Battle Blazes on the Frontlines

Indigenous communities stand on the frontlines, working shoulder to shoulder with authorities to put out forest and land fires in Central Kalimantan.



RESEARCH LOCATIONS

- Central Kalimantan



“When we're deployed to the field, we have to extinguish the fires. But if we hit a snag, we can't do any firefighting. We can only put out the fire if we're fully equipped, have enough hose, and there's a water source nearby,” said Juni, the Chairman of Indigenous Fire Brigade Tanjung Taruna Village.

There are also times when Juni and his team have to figure out how to reach a hotspot deep in the forest.

“So, there are three routes to get to the hotspot. If we go by the middle school, it's a nearly 3-kilometre walk along a trail. If we go by the river, it's about 2 kilometres from the riverbank to the fire site. If we go through the company's

land, it's about 500–600 metres from a water source,” Juni explained, talking with an officer who'd be joining them to fight the fire.

This snippet of conversation forms part of *Gesture of Care*, a documentary that captures the daily lives of indigenous communities fighting against forest and land fires in Central Kalimantan.

The film is part of a research project titled *Fire Play: Understanding and Documenting Indigenous Fire Governance in Indonesia*. The study delves into how indigenous communities manage fire as part of their traditions, and how they adapt to evolving laws and environmental changes.

Gesture of Care not only documents the communities’ activities, but also shows the impact of the government’s burning ban policy, in place since 2015, on their lives and local wisdom.

Indigenous communities in Kalimantan have long practised traditional land management through controlled and cautious slash-and-burn methods. But ever since the burning ban, they’ve stopped doing that.

The ban has changed their farming methods, including how they handle piles of lemongrass stalks after harvest. This is depicted in a scene where a mother and her two daughters are harvesting their field. As they work, they discuss ways to deal with the scattered stalks.

“How should we get rid of these lemongrass stalks?” asked one of the teenage daughters.

“Just burn them,” her sibling replied.

RESEARCH TITLE

Fire Play: Understanding and Documenting Indigenous Fire Governance in Indonesia

PARTNERS

 Indonesian Organisations

- 1.Universitas Indonesia
- 2.Puter Indonesia Foundation
- 3.Regional Research Centre of the National Research and Innovation Agency (BRIN)

 Australian Organisations

- 1.The University of Melbourne

RESEARCHERS

- Dr Aryo Danusiri

LEAD RESEARCHER
- Sri Paramita Budhi Utami

LEAD RESEARCHER
- Sofyan Ansori

LEAD RESEARCHER
- Andaman Muthadir
- Angela Iban
- Dr Edwin Jurriends
- Dr Jemma Purdey



Fire burns peatland and forest inside Sebangau national park on September 14, 2019 in the outskirts of Palangkaraya, Central Kalimantan, Indonesia. (Photo by Ulet Ifansasti/Getty Images)

“I told you, you can use them for cooking,” the mother reminded her daughters. “The police will arrest you if you burn them, right?”

They are cautious, fully aware of the legal ban clearly displayed on a notice board in the area: Burning forests and land is punishable by 12 years’ imprisonment, Article 187 of the Penal Code.

Documenting Local Community Participation in Fighting Forest and Land Fires

This research is conducted by the Institute for Socio-Political Research and Development (LPPSP) at the Faculty of Social and Political Sciences of Universitas Indonesia (FISIP UI), in collaboration with Puter Indonesia Foundation, the Regional Research Centre of the National Research and Innovation Agency (BRIN), and the Asia Institute of Faculty of Arts at the University of Melbourne in Australia. This study was conducted across four major river basins in Central Kalimantan: the Kapuas, Kahayan, Katingan and Mentaya.

Using an interdisciplinary approach, the research, which was carried out from July 2023 to January 2024, aims to understand and document the role of local communities as frontliners in

forest and land fire mitigation efforts, even though they often unfairly associated with fires.

According to one of the lead researchers, Sofyan Ansori, the term “fire play” was chosen because fires are also inherently political.

“Forest and land fires in Indonesia cannot be seen as isolated incidents. They are political, social, and cultural events,” he said.

This is why the research team focused on documentation, dissemination, and understanding the struggles of local communities in mitigating fires.

“We want their efforts to be acknowledged,” Mr Ansori said.

To address forest and land fires, the Indonesian government has issued regulations. These range from Government Regulation No. 28/1985 on Forest Protection, which was centralised, to grassroots solutions during President Joko Widodo’s term (2014–2024), through the establishment of Fire-Care Community (MPA) and Fire Response Teams (RSA).

Members of the Fire Response Teams receive IDR 100,000 per day if they assist in extinguishing fires. However, as this amount is insufficient to meet their needs and firefighting projects are

Forest and land fires in Indonesia cannot be seen as isolated incidents. They are political, social, and cultural events.

irregular, many residents are reluctant to participate.

The study highlights opportunities to strengthen forest fire management policies by moving beyond punitive and centralised approaches toward more sustainable, locally driven systems with secure long-term funding.

Engaging Audiences in Research Findings with Multimedia

From its inception, this research was designed to produce materials for dissemination on the ways indigenous communities responsibly manage fire for land preparation and farming.

One of the lead researchers, Sri Paramita Budhi Utami, has been deeply involved in Central Kalimantan since 2010. She initially joined a project to study the failed one-million-hectare land development program, and later researched plantation companies' readiness for the carbon trading era in 2014.

When KONEKSI announced its research grants, Mr Ansori reached out to Ms Budhi Utami and Dr Aryo

Danusiri, colleagues at FISIP UI.

Dr Danusiri, who serves as the Head of the Anthropology Studies Center at FISIP UI, agreed to collaborate with Mr Ansori and Ms Utami on a study examining the use of fire by Indigenous communities for land management.

The team proposed a multimodal research approach, integrating diverse methods to capture the social, cultural, and ecological dimensions of fire practices.

Mr Ansori and Dr Danusiri led the ethnographic and qualitative components of the research. While Mr Ansori translated the research materials into creative outputs in the form of animation and a comic book, Dr Danusiri documented the findings through a feature-length documentary film.

Meanwhile, Ms Utami led the quantitative components of the study, including baseline assessments and survey design and analysis.

Mr Ansori, an expert in ethnography and qualitative data, collected research materials in the form of comics and

animations. Dr Danusiri documented the findings through films, while Ms Budhi Utami focused on quantitative data, baseline assessments, and surveys.

At the same time, the team from the Asia Institute of the Faculty of Arts at the University of Melbourne, including Dr Edwin Jurriens, examined media and the cultural aspects. Another team member, Dr Jemma Purdey, analysed the policy and politics of land and forest fire. Dr Jurriens is an associate professor in Indonesian Studies at the institute while Dr Purdey is a lecturer.

The Australian researchers had prior experience conducting studies in Indonesia and had even published books about the country. Dr Jurriens authored *The Art of Environmental Activism in Indonesia*, while Dr. Purdey wrote *Anti-Chinese Violence in Indonesia, 1996–1998*.

Ms Utami gathered field data by interviewing 400 respondents, assisted by facilitators from the Puter Foundation and research assistants recruited from local communities.

Meanwhile, Dr Danusiri and Mr Ansori, supported by eight young research assistants who were Anthropology graduates, interviewed various community members—including women, local firemen, local authorities, and young people. He also

observed posters prohibiting forest and land burning, which were displayed in public areas, shared in community WhatsApp groups, and uploaded on social media platforms like TikTok.

Dr Danusiri, whose expertise is in environmental humanities, and two other researchers followed volunteers and members of MPA and RSA as they patrolled to extinguish forest and land fires. He also observed indigenous farmers practicing land cultivation without burning, including their challenges.

The research findings were shared with the public through exhibitions and film screenings at the Universitas Indonesia campus from May 27 to 31, 2024. The outcomes included an animated film titled *Ignited* and a feature-length ethnographic film titled *Gestures of Care*. These materials can be accessed on the project website <https://fireplay.fisip.ui.ac.id/>.

The data collected through fieldwork and research were analysed using a novel approach to studying environmental issues called the humanities environment. This interdisciplinary field examines the relationship between human life, culture, and its dynamics with nature.

Based on the analysis, three key recommendations were proposed for



Local communities in Tumbang Nusa, Jabiren, Central Kalimantan, are actively involved in firefighting efforts, demonstrating their role as first responders in the face of increasing forest and land fire risks. The area, located within the Kahayan River Basin, is part off the Fire Play research project.

the government and stakeholders to prevent and manage forest and land fires in Central Kalimantan:

1. Strengthening disaster preparedness culture

Enhancing disaster preparedness by involving communities in mapping and understanding disaster risks in their environment. This fosters collaboration between communities and the government for mitigation efforts.

2. Integrating local knowledge in fire mitigation

The Central Kalimantan government should incorporate local wisdom in fire mitigation

efforts, including traditional knowledge and experiences of marginalised groups such as women and people with disabilities in managing fire and the environment.

3. Increasing funding for fire mitigation

The Central Kalimantan government needs to boost budgets for fire mitigation programs. One option is proposing a special General Allocation Fund (DAU) for regions with large forest areas, similar to what has been implemented by the Papua and West Papua provincial governments. ☉

Preparing Vulnerable Groups to Face Flood

The city of Surabaya is still grappling with the persistent problem of flooding, which continues to intensify.

Vulnerable groups in flood-prone areas need special attention.



RESEARCH LOCATIONS

- Surabaya, East Java, Indonesia
- New South Wales, Australia



There was something unusual about the massive flood that hit Surabaya, East Java Province, on 4 April 2024. Several main roads were submerged, something that had never happened in previous years. One of the areas affected was the busy thoroughfare of Ahmad Yani Street, where floodwaters stretched from the lush Pelangi Park to a fast food outlet. What made it even more surprising was that it happened during the dry season. It was the first time residents had seen one of Surabaya's wealthy neighbourhoods submerged.

Surabaya Mayor Eri Cahyadi claimed that the unexpected flooding was due to an ongoing box culvert installation project.

"I apologise because the project isn't finished yet, and then the rain came," Mr Cahyadi told the media.

However, there may have been other factors behind the unseasonal flood event.

Anthropogenic climate change has dramatically altered global rainfall patterns, increasing the frequency of extreme weather events.

The ecological impacts of climate change are a deep concern for Professor Connie Susilawati, an associate professor in property economics at the School of Economics and Finance, Queensland University of Technology (QUT). She is particularly troubled because Surabaya is her birthplace and childhood home.

Although Professor Susilawati has been living in Brisbane, Australia, for the past 22 years, she still remembers her childhood home being hit by floods several times. Now, the problem has worsened.

"Neighbourhoods that used to be flood-free are now affected," she said.

Simply put, rainfall and dry season patterns have changed. Everything has become more extreme.

"We still have rain and drought, but the situations are much more intense," Professor Susilawati explained.

This means floods are bigger and occur more frequently.

Indonesian cities are not alone in grappling with these challenges. Professor Susilawati noted similar events had recently occurred in Brisbane. In November 2024, the city was hit by a massive storm, followed by hailstones the size of ping-pong balls. Such events were rare in the past.

RESEARCH TITLE

Strengthening the Flood Resilience Capabilities of Vulnerable Groups

PARTNERS



Indonesian Organisations

- 1. Institut Teknologi Sepuluh Nopember
- 2. Surabaya City Government



Australian Organisations

- 1. Queensland University of Technology
- 2. University Technology of Sydney

RESEARCHERS

- Prof Connie Susilawati (LEAD RESEARCHER Researcher)
 - Prof Sara Wilkinson
 - Prof Ashantha Goonetilleke
- Prof Ria Asih Aryani Soemitro
 - Dr Melissa Teo
 - Dr Farida Rachmawati
 - Mohamad Iman Rachmadi, ST



A senior citizen is evacuated from his flood-affected home in the Mendawai Street area of Palangkaraya, Central Kalimantan, in March 2025. ANTARA PHOTO/Auliya Rahman

"Now, it can happen more than once a year," she said.

Lismore, a town about two hours south from Brisbane, experienced the biggest flood event in Australian history in 2022, and there are concerns about its future. Residents in some areas of the town are being encouraged to relocate through a government scheme.

Prof Susilawati explained even though governments in Australia already had programs in place to anticipate disasters, with changing weather patterns, these measures were no longer enough.

"We need to re-evaluate," she said.

That's Australia. What about Surabaya?

Vulnerable Groups Often Overlooked

After seeing Surabaya grapple with higher-intensity floods, Prof Susilawati was motivated to embark on a KONEKSI-funded collaborative research partnership to look at community disaster preparedness in the city, particularly among vulnerable groups.

The research is a collaborative effort between QUT and several universities in Indonesia and Australia. These include Institut Teknologi Sepuluh Nopember (ITS) in Surabaya and the University of Technology Sydney (UTS).

The team is led by QUT, where Prof Susilawati teaches. The title of the research project is Strengthening the Flood Resilience Capabilities of Vulnerable Groups.

Prof Susilawati said people with more resources are generally better prepared to deal with floods, and their aftermath.

"So, we're focusing on helping vulnerable groups in Surabaya become more resilient in facing floods," she explained.

Fellow researcher Dr Farida Rachmawati from ITS said the main objective was to develop a framework for vulnerable communities.

"Flooding itself is a very technical issue. But ensuring vulnerable groups are resilient requires serious attention. Communities need to know how to respond to floods," Dr Rachmawati said.

Prof Susilawati explained that the research aimed to identify strategies to strengthen resilience among vulnerable groups. Using case studies and a mixed-

method approach, the research focused on identifying vulnerable groups and their specific needs during floods. The team also mapped out key information sources used by these groups.

Within this team, Prof Susilawati has acted as the central connector since the project's inception. She has long-standing relationships with the researchers who eventually joined the team.

The research team was supported by additional field staff to reach a large sample size—600 household respondents and 60 community leaders.

Research assistants were recruited to visit residents and conduct interviews, and helped fill out responses in online surveys. They also participated in workshops, focus group discussions, and organising seminars. The research assistants—mostly final-year master's students—received training from Prof Susilawati online and in-person during her visits to Surabaya.

Sampling A Sprawling City

Six suburban areas of Surabaya – with different flood infrastructure, environments and socio-economic composition – were selected as study sites.

All research sites are prone to flooding and take a long time to drain. They are also home to vulnerable groups. The team also took input from the city government when identifying research areas.

Data Gaps Keep Vulnerable Groups in the Shadows

Before embarking on field work, finding data on vulnerable groups in the community proved challenging. The research team undertook considerable effort to gather data, but were left unsatisfied with what they found. Field surveys shone more light on the different kinds of people living in the affected communities, including three distinct groups: older adults, children,

and those living in multi-generational households where older adults and children were under the same roof.

Individuals with disabilities were a very small proportion of those sampled, approximately 1 to 2 percent, and thus lacked significant representation.

Advancing Careers

Cross-country collaboration, and the challenging nature of the research, have left lasting impacts on the research team, both professionally and personally.

For Dr Rachmawati, as her first international collaborative research project, her involvement is a significant career boost. Since earning her PhD five

Six Flood-Affected Sub-districts in Surabaya

No	Region	Characteristics
1	Sidotopo Wetan	Close to business districts and urban slum pockets. Box culverts have been constructed in the last five years.
2	Gundih	Close to business districts and urban slum pockets. Box culverts have been constructed in the last five years.
3	Dukuh Pakis	Lowland urban area. Predominantly open drainage infrastructure.
4	Medokan Ayu	Coastal lowland area with tidal pumps, floodgates, and levees in certain areas.
5	Lidah Kulon	Lowland area near Sepat Reservoir. Poor drainage system and urban expansion issues.
6	Pakal	Close to aquaculture zones and administratively borders Gresik Regency.

Individuals with disabilities were a very small proportion of those sampled, approximately 1 to 2 percent, and thus lacked significant representation.

years ago, she had only been involved in local and national research projects.

"So, this is a valuable experience for me to be part of an international collaboration and research," she said.

Meanwhile, Professor Sara Wilkinson highlighted the cultural exchange she experienced during the research, especially when visiting Surabaya.

"Aside from enjoying delicious food, I learned about cultural differences here. And, I also experienced a rainstorm here," she said with a laugh.

She later shared her experience in Surabaya during her inaugural lecture for new students at the University of Technology Sydney. She also showcased photos taken during her research.

"They were very excited to see me conducting research here," she said.

Despite language barriers, the Australian researchers received substantial support from their Indonesian counterparts, who acted as interpreters during interviews and data

collection. On the other hand, research assistants, interviewers, and surveyors who were not yet fluent in English had the chance to improve their language skills through discussions with the Australians.

For broader impact, Prof Susilawati hopes the research findings can raise awareness about the needs of vulnerable groups. They should not be overlooked when government programs are being designed. So far, no specific disaster preparedness programs have been identified for vulnerable groups.

"Their numbers may be small, but they must be prioritised because their needs are unique," she said.

The logic is simple: if a program is designed with the needs of vulnerable groups in mind, it will naturally cater to everyone else as well. Prof Susilawati also hopes for the development of teams within local neighbourhood units that can assess the conditions and needs of each area. ☺



(Top) Motorcyclists navigate through floodwaters inundating Kali Kundang Street, Simorejo, Surabaya, East Java, on 13th of October, 2016. Heavy, high-intensity rainfall caused flooding in several areas of the city. ANTARA PHOTO/Didik Suhartono

(Bottom) EVACUATION. Several residents sit aboard a boat belonging to the 1st Marine Division in Surabaya after being successfully evacuated when floods submerged parts of Krisikan Village, Geneng, Ngawi, East Java, on 12th of October 2017. Floodwaters reaching up to four meters inundated half of Ngawi Regency, claiming at least eight lives and submerging thousands of homes. ANTARA PHOTO/Arief Priyono



Restorative Justice for the Earth and Humanity

Indigenous communities in Indonesia have long upheld local wisdom and concrete practices to preserve the earth's sustainability. Restorative justice can serve as a platform to bring them together—to sit, talk, and collectively identify the threats posed by climate change.



RESEARCH LOCATIONS

- Ngadas Village, Malang Regency, East Java
- Waingapu, East Sumba Regency, East Nusa Tenggara
- Kajang, Bulukumba Regency, South Sulawesi



Indigenous communities have their own ways of preserving the environment. For example, the Kajang indigenous people in Bulukumba Regency, South Sulawesi, carefully manage the use of forests, including sacred forests, as part of their ancestral beliefs. They deeply respect the earth, which they regard as a mother, or “anrong.”

Meanwhile, for the Tengger people in Ngadas Village, Malang Regency, East Java, nature and the environment, comprising forests, water sources, fields, and wildlife, are blessings from Sang Hyang Widhi. This community, residing in the conservation area of Bromo Tengger Semeru National Park (TNBTS), conducts various traditional rituals that reflect their devotion to

nature and the universe.

The Marapu community in Waingapu, East Sumba Regency, East Nusa Tenggara, also shares a strong connection between humans and the Earth. For these indigenous groups, values of environmental preservation are deeply embedded and ingrained in their culture.

These three communities were selected as sources of information for a research project titled Exploring the Practice of Restorative Justice Framework to Build Resilience and Address Climate Change Harms in Indonesia. This study, a collaboration between the Australian Catholic University (ACU), Universitas Brawijaya, and the Australia-Indonesia Disability Research and Advocacy

Network (AIDRAN), focuses on marginalised groups, such as women, people with disability, and indigenous communities.

Through field research and data collection from these indigenous groups, the joint research team explored local knowledge on environmental sustainability, women’s perspectives, and the voices of people with disabilities.

Discussions with indigenous communities on how to implement

restorative justice to tackle the impacts of climate change in their living environments served as critical input for this study.

Professor Patrick Keyzer, a professor of law and public policy at ACU and a human rights expert, served as the lead researcher for this project. The research partnership underpinning this project was developed from AIDRAN’s sustained collaboration with the Faculty of Law at Universitas Brawijaya (FH UB) since 2019.

RESEARCH TITLE

Exploring the Practice of Restorative Justice Framework to Build Resilience and Address Climate Change Harms in Indonesia

PARTNERS

 Indonesian Organisations

1. Universitas Brawijaya

 Australian Organisations

1. Australian Catholic University
2. Australia-Indonesia Disability Research and Advocacy Network

RESEARCHERS

- Professor Patrick Keyzer

LEAD RESEARCHER
 - Dr. Aan Eko Widiarto, S.H., M.Hum
 - Dr. Mark Hamilton
 - Dr. Dina Afrianty
 - Rayna Smith
 - Linc Yow Yeh
- Prisca Listriningrum, S.H., L.L.M.
 - Daru Adianto, S.IP., M.Si.
 - Elo Kusuma Alfred Mandeville, S.Tr. Ds
 - Janisa Pascawati, S.Sos., M.I.Kom.
 - Filipus Yudiandito, S.H., LL.M.
 - Mahalli, S.Sos., M.Sos.



(Top) Villagers produce palm sugar from surrounding forest resources, reflecting a close relationship with nature where sustainable use supports both livelihoods and forest conservation.
(Photo by Wahyu DJ/Katadata Green)

(Bottom) After meeting with the Ammatoa, the leader of the Kajang community, Dr Dina Afrianty (middle) was leaving Tana Toa, the customary territory of the inner Kajang (Ammatoa) community in Bulukumba Regency, South Sulawesi. Entry into this traditional area is restricted, and visitors are required to wear black clothing in accordance with local custom. She was accompanied by research informants from Bulukumba.



AIDRAN, founded by Dr Dina Afrianty, a lecturer and researcher at ACU, had established this partnership, through which ACU subsequently became formally engaged in the collaboration. The selection of research areas was based on the established research experience of both FH UB and AIDRAN in indigenous communities and disability inclusion, developed through their respective prior projects.

Prof Keyzer, an academic specialising in accessibility to justice, has a strong relationship with Universitas Brawijaya in Malang. He acknowledged receiving significant assistance from Daru Adiinto, an environmental law expert from Universitas Brawijaya. Mr Adiinto was noted for his extensive experience in research on indigenous communities. Prof Keyzer also praised Rayna Smith and Linc Yow Yeh, the Indigenous Australians who were part of the ACU research team.

“I first visited Indonesia 27 years ago to teach intellectual property rights, and I have collaborated extensively with Universitas Airlangga,” said Prof Keyzer, who has since maintained academic and personal connections with lecturers at the Universitas Airlangga in Surabaya, and Universitas Brawijaya, both are in East Java, Indonesia.

Meanwhile, Dr Dina Afrianty, an Indonesian academic and a lecturer at the Australian Catholic University, an expert in women’s rights, disability rights, and gender equality, has done extensive research on disability rights in Indonesia since 2012. Her research has led her to establish AIDRAN in 2017.

The establishment of AIDRAN aims to facilitate collaboration between Australian and Indonesian disability advocates and researchers. This research collaboration involving ACU and Universitas Brawijaya is another example of the work of AIDRAN, mainstreaming GEDSI (Gender Equality, Disability, and Social Inclusion) throughout the research process, making sure that voices and experiences of marginalised groups of people with disability and women are included in the research. “This research is crucial because it placed people with disability at the centre of the project, ensuring their voices were heard directly,” Dr Afrianty emphasised.

She highlighted that the success of the research stemmed from the freedom to form the right team—a team with strong alignment and empathy towards issues of gender equality, disability, and social inclusion. Although the study was conducted only for 12 months and required visits to remote areas such as Tengger, Bulukumba, and Sumba, the



Researchers with community leaders and the Village Head of Kajang, Bulukumba. Meeting was held under the house of the Kajang Village Head.

The Ngadas community is aware of climate change and has taken new steps to face it.

Indonesian and Australian researchers managed to produce meaningful and significant findings.

Every research team member brought different expertise to the research project. Dr Mark Hamilton (ACU) contributed knowledge and wisdom on the operation of restorative justice processes in environmental contexts. Researchers from Universitas Brawijaya shared their expertise by teaching the team about environmental law and policy in Indonesia. AIDRAN researchers shared their knowledge and skills in ensuring that research is conducted in an inclusive manner, and that people with disability should not only be the object of research but are involved in the whole research process.

One of the most important outcomes from this research collaboration was that everyone in the team learned about the importance of co-design,

equal partnership, respect for different academic cultures, and the importance of turning GEDSI approaches and principles into practical research processes.

According to Prof Keyzer, this is the first study to integrate gender equality, disability, and social inclusion issues into the restorative justice framework facing climate change challenges. “This is extraordinary research,” he said.

The Application of Restorative Justice

In this study, there was a notable difference in the team’s understanding of restorative justice. In Indonesia, the term restorative justice is more commonly associated with legal efforts for criminal offenders, where imprisonment is replaced with compensation or restitution.

Research team member from Universitas Brawijaya, Prisca Listiningrum, said that after the research team commenced their research, there had been prior caution from the Indonesian Attorney General's Office regarding the use of the term restorative justice.

Restorative justice, in the context of building resilience and addressing the impacts of climate change on marginalised groups, carries a more fundamental meaning. It is an approach that emphasises restoring relationships among people, communities, and the environment damaged by climate change. This approach aims to create inclusive, community-based, and recovery-oriented solutions by involving all affected parties.

Prof Aan Widiyanto from Universitas Brawijaya, a renowned expert in Indonesian constitutional law, confirmed that the restorative justice framework and GEDSI approaches are consistent with the Indonesian government commitment to meaningful participation in all government responses to social problems including climate change. This approach is to ensure an inclusive, participatory process with equal representation.

According to Prof Keyzer, over the past 10 years, environmental law

experts and activists have argued that restorative justice is useful in environmental law applications. For example, if someone illegally cuts down forests, replanting the trees can be part of the restorative justice process. Dr Hamilton has pioneered international research in this area. Research in Bulukumba found that the traditional practice has always been for whoever cuts trees to be obliged to replant and pay compensation as a sanction.

This becomes even more significant when considering indigenous communities, women, and people with disability—groups most affected by climate change. These are the people who protect rivers, plant trees, and care for wildlife and rely on them for their livelihoods.

Prof Keyzer stressed the importance of listening to their voices and perspectives, as they possess extensive knowledge about preserving nature, protecting local environments, and tackling climate change impacts.

Researchers divided their tasks

With three research areas and three research institutions, research fieldwork was divided equally.

Prof Keyzer visited the indigenous Ngadas community in Tengger, East Java. Dr Afrianty, Ms Listiningrum

(Universitas Brawijaya), and Ms Janisa Pascawati (AIDRAN) visited Makassar and Bulukumba in South Sulawesi to meet with the Kajang indigenous community South Sulawesi. Meanwhile, Mr Adiinto (Universitas Brawijaya) and Mr Elo Kusuma Alfred Mandeville (AIDRAN) went to Marapu indigenous community in East Sumba, East Nusa Tenggara. The fieldwork confirmed all of research team members' experiences and findings were similar regarding restorative justice and awareness of climate change impacts in these regions to women, people with disability, and indigenous groups.

For instance, Dr Hamilton and Prof Keyzer shared their efforts to explain restorative justice to the Ngadas indigenous community. However, Prof Keyzer admitted he gained valuable insights instead: the indigenous communities had already been practising restorative justice and local wisdom to protect their environment. Although they were unfamiliar with the concept of climate change—referring instead to extreme weather phenomena—they already had ways to address and maintain their relationship with nature.

“The Ngadas community is aware of climate change and has taken new steps to face it. For example, they plant potatoes using seeds that are resistant to extreme conditions,” said Prof Keyzer.

The researchers formulated an appropriate approach to gather information about climate change impacts at the grassroots level. They decided to ask about concrete challenges, focusing on practical matters like ensuring whether crops could survive and yield produce, as well as identifying the right planting seasons.

Surprisingly, the information obtained was quite revealing. Farmers already had well-established communication with one another to exchange information about the climate. Their understanding of agricultural and forestry policies was also very strong, even though they did not use the term climate change.

They could clearly describe excessive rainfall and month-long sandstorms. The Ngadas people talked about prolonged coughs and colds that were previously rare. They also complained about the increasing difficulty of accessing groundwater when digging wells.

After gaining these valuable experiences, the research team became convinced that the Indonesian government would benefit from listening to the views and experiences of indigenous communities. As a result, the team is keen to further develop research on restorative justice within



Researchers from AIDRAN, ACU, and Universitas Brawijaya with the Head of Bontomangiring Village in Bulukumba.

indigenous communities and use the findings to raise broader awareness of restorative justice issues.

The team hopes that with further research, methods can be developed to enable these marginalised groups to respond effectively to climate change and build climate resilience. “Climate change is already happening. It’s real. We must be resilient in facing it and keep global warming below 1.5 degrees Celsius,” said Prof Keyzer.

The research theme, which positions restorative justice for indigenous communities amidst the threat of climate change, is highly relevant to current and future conditions. Climate resilience cannot be achieved without incorporating the participation and voices of indigenous and marginalised communities as a whole.

Coming, Sitting, and Talking

Dr Afrianty said that one of the objectives of this research partnership is to explore the way society understands disability and how the experience of people with disability with climate change has informed policy action on climate change. People with disability and women are mostly marginalised in decision making process.

Dr Afrianty explained that based on GEDSI approaches, the research team found consistency between a restorative justice framework, principles and values within GEDSI, and the Indonesian government commitment to meaningful participation. Through data analysis, the research team found that in building climate resilience it is important that climate change responses are based upon the voices and experiences of people with disability, women, and indigenous communities. The three methods in the framework of restorative justice are, first, to focus on encouraging women, people with disability, and indigenous groups to come together. The second is to sit together in a shared meeting. The third involves talking—being willing to identify harmful and threatening issues that result in discrimination and marginalisation. In this way, a connection is established between restorative justice and gender equality, disability, and social inclusion.

Dr Afrianty then shared her experience in Bulukumba. The area has been known to have a significant number of people affected by leprosy since the Dutch colonial era. In one of the villages visited by Dr Afrianty and two other researchers, they found several community members with physical disabilities resulting from long-term leprosy. Although they genuinely

wanted to attend village meetings, it was not possible for them to come to the village office.

Many times, we are the ones who make Indonesia inaccessible to people with disabilities,” said Dr Afrianty. “People with disability live among us, yet we don’t know how to treat them or how to respect them.”

Dr Afrianty noted that the inclusion of two researchers with disabilities—Elo Mandaville and Filipus Yudiandito—in the team, showed how lived experience was an essential part of the research process.

She shared a story about a researcher with physical disabilities at AIDRAN who was often asked more about his physical condition than his work as a researcher. “But having people with disabilities within our research group makes disability visible,” Dr

Afrianty said. These researchers were able to connect with community members with a disability, and showed to government stakeholders the importance of inclusive solutions.

“So, the essence of restorative justice as coming together, sitting together, and talking—are methods, which are also the underlying principles of GEDSI. The need to ensure that everyone’s experiences and opinions are respected and included is important in identifying threats related to climate change,” said Dr Afrianty.

Prof Keyzer also reiterated that the aim of the research is to listen to and learn from people with disabilities, women, and Indigenous communities about environmental and climate change issues, and then share their knowledge with the world. “Think globally, act locally. That is the essence of restorative justice,” Prof Keyzer emphasised. ☉

AIDRAN researcher, Elo Mandaville, at the FGD with members of civil society organisations in Waingapu.



ECHOES OF PARTNERSHIP

Stories From the Australia-Indonesia
Research Collaborations
Facing Shared Climate Challenges

CHAPTER

4

HEALTH AND WELL-BEING IN A CHANGING CLIMATE

The research team and staff at UPTD Puskesmas Ampenan discuss the patient data recording system.





PTD
AS AMPENAN



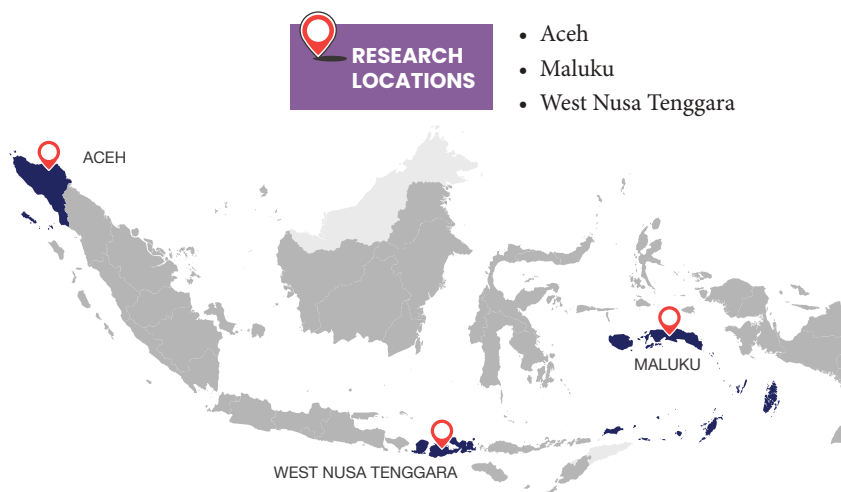
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Planning for Climate Change Impacts on Community Health

A collaborative study by researchers from Indonesia and Australia is demonstrating the power of data in supporting primary health care providers, policymakers and planners to prepare for the health impacts of climate change.



- Aceh
- Maluku
- West Nusa Tenggara

In 2019, Associate Professor Rina Suryani Oktari from Universitas Syiah Kuala, Aceh, and Dr Connie Cai Ru Gan from Griffith University, Australia, crossed paths at the World Association for Disaster and Emergency Medicine conference in Australia. At the time, both were doctoral candidates at the universities they now work for.

A/Prof Oktari had established herself in the field of community resilience and disaster education academia, while Dr Gan brought practical experience in sustainability and climate change adaptation in healthcare.

From that initial meeting came a simple agreement: one day, they would collaborate on a research project.

This vision gradually transformed into a bold and challenging plan—to design a centralised health service dashboard or application capable of addressing the impacts of climate change.

Four years later, through the KONEKSI program, they had the opportunity to bring their plan to life.

"Many said it was a daring idea, as it required support from multiple institutions," said Dr Oktari, who, together with Dr Gan, leads a team of 22 researchers from Universitas Syiah Kuala in Aceh, Universitas Pattimura in Maluku, Universitas Mataram in West Nusa Tenggara, and Griffith University.

This cross-institutional collaboration stands as clear evidence that big dreams

RESEARCH TITLE

CORE-STEP: Advancing Innovative Knowledge-Based Solutions for Inclusive and Climate Ready Primary Health Care Systems

PARTNERS**Indonesian Organisations**

- Universitas Syiah Kuala
- Universitas Mataram
- Universitas Pattimura
- Kementerian Kesehatan
- ICLEI Indonesia – Local Governments for Sustainability
- Cerdas Antisipasi Risiko Bencana (CARII)
- Yayasan Lingkar Pemberdayaan Perempuan dan Anak (LAPPAN) Maluku

**Australian Organisations**

Griffith University

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LEAD RESEARCHER
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- Alfy Hidayati, S.Stat
- Gaisha Hayya Alhaura Muchsin



A capacity-building session led by A/Prof. Rina Suryani Oktari, PhD strengthens frontline health workers' understanding of gender-inclusive climate services, supporting primary healthcare responses to climate-related health impacts.

PRIMARY DATA FOR THE RESEARCH:

- A survey of 959 respondents in three cities across three provinces.
- Three (3) FGDs in Ambon (24 participants), Mataram (23 participants), and Banda Aceh (23 participants) each featured distinct groups, including Healthcare Providers, Stakeholders, and the General Public.
- Key stakeholders interview with Puskesmas staff and Banda Aceh, Mataram and Ambon.

SECONDARY DATA FOR THE RESEARCH:

- Meteorology, Climatology and Geophysics Agency (BMKG)
- Social Security Agency on Health (BPJS Kesehatan)
- Central Bureau of Statistics (BPS)
- Health Agency in Banda Aceh, Mataram, and Ambon
- Environment Agency in Banda Aceh, Mataram, and Ambon
- Social Welfare Agency in Banda Aceh, Mataram, and Ambon

demand hard work, courage, and persistence.

"But the challenge only fuelled our enthusiasm," A/Prof Oktari said.

The team conducted research in three coastal cities across three provinces: Banda Aceh (Aceh), Ambon (Maluku), and Mataram (West Nusa Tenggara). They gathered data on primary healthcare services, employed knowledge management approaches, and facilitated knowledge-sharing sessions on climate change mitigation and adaptation.

Their work examined historical extreme weather events, community awareness, local vulnerabilities, adaptive capacities, and health service preparedness, as well as community

initiatives and best practices already in place.

The outcome was a groundbreaking study, titled CORE-STEP: Advancing Innovative Knowledge-Based Solutions for Inclusive and Climate Ready Primary Health Care Systems.

Their first joint research effort, bringing together Australia, Indonesia, China and Vietnam, began in 2021 with the World Health Organization (WHO), researching sub-populations vulnerable to health impacts of climate-related disasters under the Health Emergency and Disaster Risk Management (Health-EDRM) framework.

Their collaboration later expanded through the KONEKSI-supported initiative, which enabled them to lead a

larger team and work together over the longer-term.

In mid-2023, the research team designed their research conceptual framework. They conducted focus group discussions and qualitative research from September through December. The team has analysed their findings and released policy recommendations in mid-2025.

"We focused on climate change adaptation in the health sector because it remains relatively unexplored.

Most studies have concentrated on agriculture and coastal areas," A/Prof Oktari said.

A/Prof Oktari and Dr Gan recruited research coordinators in each study location by leveraging Dr Oktari's existing research network – one she had established during a 2018 study on coastal disasters funded by an international donor organisation.

The research team comprises 23 Indonesian researchers, mostly women, and four Australian researchers – all women. They maintained biweekly meetings and established multiple communication channels, including a website and several WhatsApp groups.

A/Prof Oktari noted that the researchers, predominantly young people, felt at ease interacting with

senior researchers both in meetings and fieldwork.

"Perhaps it's because Connie [Dr Gan] is very egalitarian and easy-going. It really helps with communication," she said.

The team implemented several measures to ensure inclusivity, particularly for members requiring translated materials. All meetings were recorded and transcribed in real time to ensure accessibility.

In the field, during surveys and focus group discussions held across various cities, the team collaborated with organisations advocating for gender equality and disability rights.

In Aceh, they worked with the Aceh Women's for Peace Foundation (AWPF) and the Children and Youth with Disabilities for Change (CYDC). In Ambon, they partnered with the Indonesian Women with Disabilities Association, Walang Women's Foundation, and the Pelangi Foundation. In Mataram, they involved Solidaritas Perempuan and the LombokCare Foundation.

Working alongside local community members, they gathered and validated data, advocated for the project, raised participant awareness, and mobilised grassroots support.

"We follow a principle: 'there is nothing about us without us.' So, we involve women, people with disabilities, older persons, and marginalised groups. The results have been truly fascinating," A/Prof Oktari said.

In Ambon, women proved to be particularly engaged participants in the research activities. They not only attended but actively contributed opinions and critiques. They also helped develop visual concepts for communication materials about health risks and climate change. These materials were distributed as pamphlets and posters at local Community Health Centres (Puskesmas) and published on their official website.

These women were also active in their communities.

"They have a strong influence in community empowerment and are capable of mobilising grassroots movements," A/Prof Oktari said. "They were the ones pushing for a dashboard to be launched as soon as possible."

Digitalisation of Health Data

The dashboard at the heart of the project incorporates climate data, disaster vulnerability mapping, and disease distribution data for specific

areas. For example, at the local Puskesmas in Poka Rumah Tiga, Ambon City, Maluku, an information map shows the distribution of diseases in the area.

The Poka Rumah Tiga Village Head often visits the Puskesmas and studies the map to gain insights into local public health issues. Despite being manually created and appearing quite simple, the map serves as a practical resource for the community to formulate health mitigation strategies.

In Mataram City, West Nusa Tenggara, health service initiatives have progressed further with the digitalisation of health data. All Puskesmas in Mataram, including the three visited by the research team, have utilised the E-Puskesmas application.

Data from the Integrated Health Service Post (Posyandu) – a maternal and child health service centre – in all villages are reported to Puskesmas via WhatsApp. Surveillance teams subsequently input the data into the E-Puskesmas application.

However, data integration remains challenging due to the use of different applications for various diseases. The E-Puskesmas application also presents accessibility issues for people with disabilities.



CORE-STEP Dashboard presentation.

In contrast, health centres in Banda Aceh's Lueng Bata District and Lampulo village (Kuta Alam District) lack disaster vulnerability maps and disease distribution maps to guide staff and community members. These centres also have no online presence through websites.

While Ambon and Mataram primary

health services have developed greater awareness of the impact of climate change on public health, Banda Aceh's services and policies maintain a focus on tsunami mitigation.

"Disaster education and community capacity building have largely been directed towards tsunami preparedness," A/Prof Oktari said.

CORE-STEP recommends strengthening collaborative efforts among the health and environment sectors, especially data management stakeholders at both national and local levels.

The CORE-STEP dashboard is essential for the Ministry of Health, local governments, and primary health services to manage climate-related interventions and risks.

"In the future, we could even simulate climate-related disaster scenarios and design contingency plans accordingly," A/Prof Oktari added.

The dashboard can help Puskesmas manage resources more efficiently. For example, by using available data, they can identify areas vulnerable to heatwaves and prioritize emergency services, health education campaigns, and medical supply distribution. This approach strengthens both healthcare

worker preparedness and community resilience during emergencies.

Exchanging Learning in Brisbane and the Gold Coast

Building on the opportunities provided by international collaboration, the research team organised a study visit to Brisbane, Australia, in early 2024. The delegation included 17 Puskesmas managers, key stakeholders from three regions, and researchers. The visit aimed to gather insights on best practices that could be adapted for implementation in Indonesia. Following the visit, a Puskesmas head in Mataram implemented several



Researchers from the CORE-STEP project visit a Program Kampung Iklim (ProKlim) site in Ambon, engaging with local initiatives that strengthen climate-ready and inclusive primary healthcare through community-led adaptation.

The Australian researchers also gained valuable insights during their time in Indonesia, particularly noting the inspiring role of grassroots groups like Posyandu volunteers and health cadres (community health workers).

improvements that are friendly to older adults. Most notably, they relocated the seniors' examination room from the back to the front of the building for better accessibility. The facility also introduced a digital queuing system and added a children's playground to create a more welcoming environment for families.

This initiative demonstrates how international best practices can be effectively adapted to enhance local healthcare services and improve community access.

"It was truly remarkable. We were thrilled to see these small yet meaningful changes in Puskesmas. Australian researchers were also touched by the transformations implemented because we are

encouraging Puskesmas to deliver more inclusive healthcare services," A/Prof Oktari explained.

The Australian researchers also gained valuable insights during their time in Indonesia, particularly noting the inspiring role of grassroots groups like Posyandu volunteers and health cadres (community health workers).

One researcher, a master's student at Griffith University, was so impressed that she redirected her final research project to study Posyandu volunteers in Banda Aceh, focusing on their role in strengthening climate resilience.

"They said the community-based participation here is extraordinary in building public health capacity," A/Prof Oktari noted.

For young Indonesian researchers and A/Prof Oktari, this international collaboration has significantly expanded their professional networks. The initiative's strength lies in its collaborative relationships, both domestically and internationally.

"They were excited to finally connect with prominent figures and experts at national and international levels," A/Prof Oktari said. "For me, this experience also broadened my knowledge about climate change, GEDSI [gender equality, disability, and social inclusion], and expanded my connections within government institutions."

Policy Recommendations for Government

CORE-STEP recommends strengthening collaborative efforts among the health and environment sectors, especially data management stakeholders at both national and local levels.

The Ministry of Health had initiated plans for a Climate-Resilient Village program, but its implementation was postponed due to the COVID-19 pandemic. Researchers argue that now is the time to revive and enhance this initiative, along with other climate change adaptation and mitigation activities for the health sector.

A key recommendation from the researchers is developing a health services dashboard focused on climate change adaptation. The dashboard would enable data-informed policymaking by integrating information about community vulnerabilities, climate risks, and health services capacity—providing a foundation for effective climate change adaptation. Through this evidence-based approach, the government could implement more targeted decisions to protect public health from climate change threats. ☉

Shining Light on the Forgotten Health Impacts of Climate Change

Women across diverse regions of Indonesia have linked climate change to a range of health issues affecting themselves and their families. Yet there is limited policy guidance on the issue. Researchers recommend climate change be mainstreamed across the health sector so that communities are more informed and empowered to respond.



In the westernmost part of Indonesia, in a village called Kuta Baru in Aceh, researchers were surprised to discover the majority of women surveyed thought that climate change was merely the usual seasonal shift between wet and dry months.

Even though their understanding of the term was far from accurate, these local women were already aware of the causes of climate change, such as deforestation, vehicle emissions, and waste pollution. They wanted policymakers to take firm action against illegal logging, provide education, and conduct regular outreach programs about health and environmental issues.

On their own, they had also begun linking these changes to tangible health

impacts — ranging from headaches and coughs to infectious diseases.

To address these health issues, they typically relied on traditional or over-the-counter medicines available at local pharmacies, village midwives, integrated health service posts (Posyandu), or community health centres (Puskesmas).

Similar stories were found elsewhere. In remote regions like Alor Regency in East Nusa Tenggara, most women only have a primary school education. Despite this, they had experienced the effects of climate change firsthand, despite not having formal education on the issue. They had observed how worsening droughts affected sorghum—their staple food. When sorghum crops

fail, their children face food shortages, malnutrition, and stunted growth. The women clearly identified drought as the root cause of these health problems.

In Jeruksari village, Pekalongan Regency, Central Java, an area frequently hit by tidal floods, residents have raised the ground floor of their houses to cope. Yet the tidal floods continue to rise year after year, while the houses' foundations sink further. As a result, in Jeruksari, houses are in a constant race to keep up with rising tides.

In urban areas like Marunda in North Jakarta, the impacts differ. In June 2024, which should have been the peak of the dry season, heavy rains belted down, worsening tidal floods in the crowded and poor neighbourhoods. These floods not only submerged homes up to knee-deep, but also triggered clean water crises, health problems, and filled the lives of locals with ongoing uncertainty.

"It's June. It shouldn't be raining this much, but we're flooded," said a local health worker, as recounted by Dr Suryane S. Susanti, a researcher from the Faculty of Nursing at the Universitas Indonesia.

RESEARCH TITLE

Empowering Women in Mitigating Climate Change Impacts on Health

PARTNERS



Indonesian Organisations

1. Universitas Indonesia



Australian Organisations

1. Monash University
2. The University of Melbourne

RESEARCHERS

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 - Ns. Rona Cahyantari Merduaty, S.Kep., M.AdvN
 - Ns. Indah Permata Sari, S.Kep., M.Kep., Sp. Kep. Kom

LEAD RESEARCHER

 - Dessie Wanda, S.Kp., M.N., Ph.D
 - A/Prof. Zerina L Tomkins
 - A/Prof. Ann Borda



The data were collected through interviews with women in Fanating Village, Alor, who experience drought and water shortages as key impacts of climate change.



One underexplored area is how the changing climate harms individual and community health.

"If it's already like this in June, what about November or December? The water will definitely rise higher, possibly chest-deep. Our lives feel like we're living in Waterworld [the movie]."

These stories from Kuta Baru, Alor, Pekalongan, and Marunda offer a vivid illustration of how climate change presents different challenges across the vast Indonesian archipelago, demanding not just adaptation, but also systematic and comprehensive mitigation efforts.

One underexplored area is how the changing climate harms individual and community health.

Through a collaborative research project supported by KONEKSI, titled Empowering Women in Mitigating Climate Change Impacts on Health, a team of researchers from Indonesia and Australia have examined the impacts.

Learning across Two Countries

In the face of an urgent need, Dr Susanti and her team had realised that most climate change policy guidelines in Indonesia focused on environmental, economic, and food security risks. There was not much in-depth discussion about how climate change affects public health.

Under the leadership of Dr Susanti, who has extensive experience in community health and disaster response, the team involved Rona Cahyantari Merduaty, Indah Permata Sari, and Dr Dessie Wanda from Universitas Indonesia. They also collaborated with two Australian academics, Associate Professor Zerina Tomkins from Monash University and Associate Professor Ann Borda from the University of Melbourne. The Australian academics contributed their expertise in environmental health, participatory design, and digital health policy.

Supported by a KONEKSI grant, this cross-country collaboration aimed to deliver impactful solutions while also building research capacity in Indonesia.

"Our research partners from Australia provided substantial expertise, guidance, and training to help transform this project into a productive collaboration," Dr Susanti said. "Both professors have skills that align perfectly with the focus of this study."

A/Prof Tomkins, a seasoned researcher in climate change, played a highly active role as a collaborator. From the outset, she demonstrated exceptional enthusiasm for the project. Her experience in other Southeast Asian countries, such as Malaysia, offered valuable insights for comparing the impacts of climate change across the region.

"A/Prof Tomkins even conducted field visits to research areas, such as Marunda in Jakarta and Muara Gembong in Bekasi, West Java. She worked closely with local community leaders to understand how residents adapt to floods and droughts," Dr Susanti noted.

A/Prof Tomkins was particularly interested in observing how climate change affects public health in Indonesia, which presented a different

context from her experiences in Malaysia.

Meanwhile, A/Prof Borda took on a more strategic role. Although she was unable to visit Indonesia due to time constraints, A/Prof Borda made significant contributions to data analysis.

"Her expertise in data interpretation helped the team gain a broader perspective on the link between climate change and public health," Dr Susanti added.

Throughout the process, the collaboration ran smoothly, grounded in a shared vision and mutual respect between both teams. Each side brought distinct expertise to the table—A/Prof Tomkins and A/Prof Borda contributed their research experience, while Dr Susanti drew on her extensive background in community health and disaster response. Together, they combined global and local perspectives to strengthen the research and its impact.

A/Prof Tomkins was particularly impressed by the resilience of Indonesian communities, who managed to cope with climate change challenges despite limited resources.



An interview activity that involves community cadres and residents in Lambro Bileu Village. According to the information gathered, the weather in Aceh is becoming increasingly hot, which affects children's health.

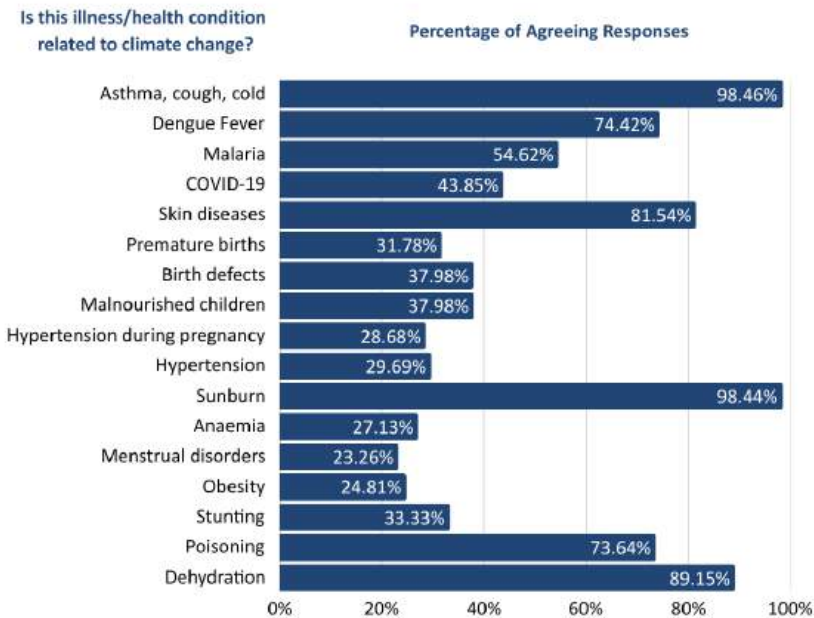
Dr Susanti acknowledged that the collaboration also faced challenges, especially on logistics and cross-country coordination. However, through effective communication and a spirit of mutual support, the team overcame these hurdles. They utilised technologies such as video conferencing and online discussion groups to streamline their efforts.

Women's Remarkable Resilience on the Climate Frontlines

Researchers gathered information from approximately 1,200 respondents across seven regions in six provinces, including

healthcare volunteers, Puskesmas heads, and village leaders. The research sites selected were in areas reported to have been affected by climate change. Surveys, forum group discussions, and interviews were conducted with healthcare volunteers in each region.

"In addition to Marunda, Jakarta, we conducted surveys in Aceh Besar, Aceh Province; Pekalongan and Demak, Central Java Province; Bontang, East Kalimantan; Makassar, South Sulawesi; and Alor Island in East Nusa Tenggara. These areas include flood-prone zones and, conversely, regions frequently affected by drought," Dr Susanti said. A similar survey was also conducted in Bekasi, West Java.



Climate change is known to have serious health impacts. These effects are often complex and limited adaptability to extreme temperature changes. Therefore, increasing public knowledge, particularly among women, is deemed essential to mitigate these impacts.

The study documented Indonesian women's perceptions of how climate change impacts their health and that of their children. It also collected insights from local stakeholders about the challenges and opportunities in protecting public health from climate threats.

Climate change is known to have serious health impacts. These effects are often complex and limited adaptability to extreme temperature changes. Therefore, increasing public knowledge, particularly among women, is deemed essential to mitigate these impacts.

"To start building community capacity, we need to measure women's understanding of climate change and its health-related disruptions," Dr Susanti said.

The research findings revealed that although women are more vulnerable to the effects of climate change, they demonstrate remarkable resilience. In various regions, healthcare volunteers, who are predominantly women, play a key role. With direct affiliations to Puskesmas, they effectively extend government programs to the community level.

For instance, in Pekalongan, healthcare volunteers have access to the Meteorology, Climatology, and Geophysics Agency (BMKG) and the Regional Disaster Management Agency (BPBD) through WhatsApp groups to coordinate disaster response. When BMKG issues warnings about tidal flooding, volunteers promptly coordinate with the community to prepare for emergencies. Unfortunately, despite their crucial role, healthcare volunteers receive only around IDR 600,000 (AU\$ 58) per year, with variations depending on the area's economic status.

The study also found that in urban areas such as Makassar and Bontang, communities are better prepared for climate change due to higher education levels and greater awareness. Nevertheless, residents in these affluent areas still show solidarity by assisting more vulnerable neighbouring regions.

Interviews with Puskesmas heads and healthcare volunteers highlighted a gap between public awareness and health institutions' understanding of climate change impacts. While the public has become aware of these effects through daily experiences, Puskesmas lack specific guidelines on climate change and health.

According to A/Prof Tomkins, this situation is unsurprising, as many countries, including Indonesia, do not yet have specific frameworks linking climate change to health. In Indonesia, climate change guidelines primarily focus on environmental, food security, or economic issues, with limited coverage of health aspects, such as rising cases of dengue or malaria.

As a result, researchers recommend mainstreaming climate change within the health sector so that communities do not rely solely on learning through experience. Additionally, Indonesia should establish a Climate Change and Health Research Centre, inspired by Monash University, which already operates a similar centre.

"We have shared this idea with A/Prof Tomkins, as she leads the research centre at Monash. She is ready to assist in making it a reality," Dr Susanti added.

Equally important, the study underscores that cross-country collaboration can produce more holistic solutions. The team hopes these recommendations will help the Indonesian government formulate more inclusive and sustainable policies. ☉

Unpacking the Health and Food Security Impacts of Decades of Tidal Flooding

Tidal flooding along the northern coast of Central Java has persisted for well over a decade. A research team from Indonesia and Australia has found strong evidence that this phenomenon accelerates environmental degradation, worsens food insecurity, and triggers health issues.



RESEARCH LOCATIONS

- Pekalongan Regency, Central Java
- Demak Regency, Central Java
- Semarang City, Central Java



Residents of Timbulsloko Village in Sayung District, Demak Regency, Central Java, never imagined their hometown would be surrounded by seawater. They used to enjoy homes with views of the beach, productive rice fields, and fish ponds that supplemented their livelihoods, as their children played freely around the village.

But since 2014, coastal flooding caused by climate change and land subsidence – driven by high urbanisation rates and massive industrial development along Central Java's northern coast – has made Semarang City, Pekalongan Regency, and Demak Regency prone to frequent flooding.

Timbulsloko Village, with its 4.5-kilometre coastline, is not just submerged but has almost disappeared underwater, in scenes reminiscent of the 1990s Hollywood movie *Waterworld*.

Rice fields, once a source of livelihood, have vanished, replaced by water. Houses have been elevated, yet flood barriers have given way under the relentless assault of the sea. Village roads have disappeared, replaced by wooden and bamboo bridges crisscrossing the flooded area. Bicycles, motorcycles, and minibuses once used as public transport have been replaced by small boats.

Over the one past decade, the population in Timbulsloko Village has dwindled from 400 families to less than 150 by 2024 due to frequent tidal floods. Food quality and public health have deteriorated, with diseases such as diarrhea, skin infections, respiratory problems, and digestive disorders becoming prevalent.

Similar situations have occurred in Jeruksari and Mulyorejo Villages in Tirta District, Pekalongan Regency, as well as Tambakrejo and Tambak Mulyo in Semarang City, and Loireng in Demak.

These areas have become the focus of research conducted by a team from

RESEARCH TITLE

Exploring Links Between Food Security and Health to Inform Policy and Service Priorities for Communities Living in High Flood Risk Areas of the Northern Coast of Central Java

PARTNERS

 Indonesian Organisations

- 1.Universitas Brawijaya
- 2.Universitas Sebelas Maret
- 3.Percik Institute
- 4.The Habibie Centre

 Australian Organisations

- 1.The George Institute for Global Health

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 - Hery Wibowo Trisaksono
 - Dr. Julia Novrita
 - Dr. Kathy Trieu
 - Dr. Briar McKenzie
- Dr. Arpita Ghosh
 - Dr. Moh Shadigur Rahman
 - Dr. Hery Toiba
 - Hesti Retno Budi Arini
 - Syefira Salsabila
 - Nurulita Aida Rahmasari



Flooded roads in villages along the northern coast of Demak, Central Java, reveal how recurring floods shape food security, health, and everyday life in high-risk coastal communities.

(Top): The road to the Loireng Village, Demak, a few days after flood.

(Bottom): Tidal Flood in Timbulsloko Village, Demak.

So far, policies on flood management have focused more on emergency response rather than proactive efforts to build community resilience.

three universities in Indonesia and Australia, along with two national social policy and advocacy institutions.

The research, titled Exploring links Between Food Security and Health to Inform Policy and Service Priorities for Communities Living in High Flood Risk Areas of the Northern Coast of Central Java, was carried out through 2023-2024.

The project, led by Associate Professor Anna Palagyi from the George Institute for Global Health, Australia, involved Universitas Brawijaya,

Universitas Sebelas Maret, the Social Research Institute for Democracy and Social Justice (Percik Institute), and The Habibie Centre.

The research focused on food insecurity, health, and the impact of climate change and environmental degradation on vulnerable communities' livelihoods. It also examined critical areas in climate change adaptation, emphasising resilience-building among vulnerable populations while exploring aspects of gender equality, disability inclusion, and social inclusion.

For women and the older adults, unexpected and extreme flooding has forced them to adapt to sustain household economies.

"Women bear the primary responsibility for food security in households. So, when flooding occurs, women often leave home to maintain their families' livelihoods," said Dr Haryani Saptaningtyas, a researcher from the Graduate School of Universitas Sebelas Maret and Percik Institute.

Women in these villages have adapted by working as factory labourers, market vendors, opening small food stalls, or even assisting with fishing activities. In Timbulsloko, it is common to see women setting out in boats in the morning to fish or make use of mangrove resources in Demak's coastal waters.

Local governments and non-governmental organisations have introduced women's empowerment programs to increase income using local food sources. These include processing fish and producing flour, crackers, coffee, and sweets from mangrove fruit.

However, Dr Saptaningtyas acknowledged challenges in developing mangrove-based food products.

"Food is closely tied to culture. Not everyone likes these products," she said.

A/Prof Palagyi added that livelihoods in these villages have shifted from rice farming to aquaculture. This transition has not improved food security, but rather serves as an economic activity.

"The fish are sold elsewhere. We even found that some communities do not like fish anymore. They are bored with it, even though it's their main and nutritious food source," A/Prof Palagyi said.

"Instead, they prioritise earning income and use the money to buy packaged and processed foods."

According to Dr Saptaningtyas, as land use shifts from agriculture to fish ponds and eventually to seawater, communities adapt to the changing landscape.

"But this adaptation is only about livelihoods, not food security. Livelihoods and food security are different issues," she explained.



Residents walk through floodwaters on Masjid Terboyo Street, Semarang, Central Java, Wednesday (October 29, 2025). ANTARA PHOTO/Aprillio Akbar.

"When they switch to factory work, it's a livelihood transformation. But their eating habits remain the same. They still need rice," she added.

"Meanwhile, during disasters, the government often provides instant food because availability is prioritised over nutrition. I think this is a key finding."

So far, policies on flood management have focused more on emergency response rather than proactive efforts to build community resilience. These efforts include supplying instant foods with low nutritional value and rebuilding roads to facilitate deliveries to flood-affected villages.

This policy approach risks reducing local capacity to grow subsistence crops, shifting the food system's focus from production to consumption, and fostering dependence on ready-made meals. This dependency was reported by more than half the households surveyed in all affected villages. In Pekalongan, the dependency rate reached 73 percent of households.

The study found that when residents have sufficient funds, they tend to spend them on home repairs, fixing frequently damaged motorbikes, or covering the high costs of living with floods. They often choose to save

money by cutting back on nutritional food.

This reliance on processed and instant foods has led to worsening health conditions. Based on Body Mass Index (BMI) measurements and other indicators, the research team found a rise in obesity rates in flood-affected villages since 2007. Obesity rates are higher among women, peaking at 45 percent in Demak.

Hesti Retno Budi Arini, one of the researchers, and the nutrition and health team from The Habibie Centre linked the rising obesity rates to poor nutrition, lifestyle patterns, and increased stress levels. In flood-affected areas, Ms Hesti highlighted several food security issues, including access to and availability of nutritious food.

"Ensuring access to and availability of nutritious food must be a priority for government assistance. It should not just focus on instant foods that only meet energy needs but fail to fulfil other nutritional requirements," Ms Arini concluded.

Collaboration with Equality

The researchers began their partnership in February 2023,

initiating research ideas, designing the study, holding regular meetings, drafting surveys and focus group discussion guides, and eventually heading out to the field. Collaboration was quickly established, partly due to institutional and personal connections among some of the researchers.

The George Institute for Global Health has maintained a long-standing partnership with Universitas Brawijaya. Meanwhile, Percik, Universitas Sebelas Maret, and Universitas Brawijaya have ties to The Habibie Centre, strengthened by a history of friendships.

Dr Saptaningtyas, Dr Sujarwoto from Universitas Brawijaya—who is also part of the research team—and Dr Julia Novrita, who is the Program and Development Director at the Habibie Centre, happen to share a common background as 'alumni' of the Ford Foundation.

The team then divided responsibilities. Universitas Brawijaya took charge of survey activities. Percik and Universitas Sebelas Maret focused on qualitative research, while The Habibie Centre contributed to policy design and research on nutrition and health.

Additionally, the George Institute for Global Health provided technical expertise, particularly in food and

nutrition surveys, statistical analysis, and the formulation of policy recommendations.

A/Prof Palagyi said team meetings were held every two weeks.

"We always discussed and reached decisions collectively. Everyone contributed equally," she said.

The intense communication across countries, regions, and villages helped forge close relationships.

"I genuinely enjoy working with this team. You don't often look forward to meetings, but I enjoy every single one we've had," Dr Palagyi added.

Throughout the research process, the team occasionally faced challenges related to fieldwork and communication. Language barriers were especially prominent in the qualitative team, where interview results often had to be translated from local languages into Indonesian, analysed, and subsequently translated into English—all while racing against reporting deadlines.

"When quick solutions were needed, the focus was on conveying ideas first, with refinements to translations following later. In the field, we uncovered more detailed stories about



A vendor waits for customers amid floodwaters inundating the Genuk Traditional Market area in Semarang City, Central Java, Thursday (October 23, 2025). ANTARA FOTO/Aji Styawan.

Another recommendation emphasises strengthening local food systems. Land-use planning and cooperation in food cultivation, such as innovative aquaculture and water-based farming, are also proposed to enhance village resilience during floods.

food security and climate change," Dr Saptaningtyas explained.

Over time, these challenges were effectively addressed as the project progressed.

Three Recommendations for Government

In its policy recommendations, the team outlined three main priorities: strengthening local food systems to

achieve sustainable food security during flood events; integrating a nutrition focus in policies relating to disaster management and emergency relief; and improving coordination between government and non-government organisations at village, provincial and national levels, ensuring inclusion of community voices.

The team concluded that flood emergency responses contributed to food insecurity. They discovered that food supplies for residents in villages

are severely disrupted during floods. However, disaster mitigation policies continue to be reactive rather than focusing on building community resilience. Vulnerable groups, including older adults and people with disabilities, also face significant challenges in accessing food aid distribution.

"There needs to be long-term policies and strategies that empower communities to address their problems, rather than merely providing emergency assistance year after year," their research stated.

Another recommendation emphasises strengthening local food systems. Land-use planning and cooperation in food cultivation, such as innovative

aquaculture and water-based farming, are also proposed to enhance village resilience during floods.

Dr Saptaningtyas pointed out that village administrations have been allocating a portion of village funds for flood emergency management each year. The allocation ranges between 10 and 20 percent of village funds. In Semarang City and Pekalongan Regency, the 20 percent allocation is seen as a positive example.

Moving forward, these funds should be directed towards providing nutritious food to bolster village food security and reserves, as well as improving food access and distribution networks. ☺

ECHOES OF PARTNERSHIP

Stories From the Australia-Indonesia
Research Collaborations
Facing Shared Climate Challenges

CHAPTER

5

ENVIRONMENTAL SUSTAINABILITY AND INNOVATIONS

Farmers in Sungai Sintang, Sintang Regency, West
Kalimantan, celebrate a harvest shaped by collective
labour and local stewardship.





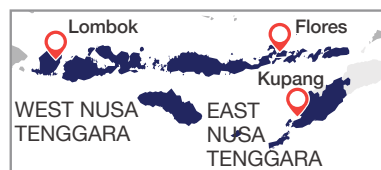
Helping Grassroots Communities Adapt to Climate Change

Climate change has triggered an increase in extreme weather events and disasters. Women and children are among the most vulnerable groups, as shifting weather patterns disrupt livelihoods and pose significant social and environmental challenges in rural communities across Indonesia: especially for those dependent on the land and sea for livelihoods.



RESEARCH LOCATIONS

- East Flores and Kupang regencies, East Nusa Tenggara
- East Lombok and Central Lombok regencies, West Nusa Tenggara
- South Lampung Regency, Lampung
- South Pesisir Regency, West Sumatra



The drought season is a challenging time for cattlemen in Pringgasela Village, East Lombok Regency, West Nusa Tenggara. During the season, which can stretch from April to October, these women often travel more than 10 kilometres outside their district in search of animal feed.

Riding motorbikes, they scour rice fields for leftover corn stalks or grass. Some even join groups of farmers on trucks, venturing to the easternmost parts of Lombok Island.

Most cattle farmers in Pringgasela are women, as the men in the village typically work in Malaysia. Those left behind must shoulder the

responsibility of caring for the cattle, from sourcing feed, to ensuring their safety at night and maintaining their health.

Lombok is well-known for its cattle farming. According to data from the West Nusa Tenggara Husbandry and Animal Health Agency, the largest cattle populations are in Central Lombok and East Lombok, totalling 299,400 cows, or 67.65 percent of the island's total cattle population in 2022.

Yet Lombok Island is a small island and is particularly vulnerable to climate change: a very real threat to communities' ways of life, including the livelihoods of farmers and livestock breeders.

East Lombok and Central Lombok regencies are two of six areas selected as research sites for a collaborative study on the impacts of climate change on grassroots communities and rural livelihoods.

The regencies were carefully chosen based on the diversity of their primary livelihoods, reflecting their unique social, economic, and geographic conditions.

RESEARCH TITLE

Understanding Climate Impact on the Grassroot Communities and Rural Livelihood in Indonesia: Catalysing Changes Toward Adaptation and Resilience

PARTNERS

 Indonesian Organisations

1. Universitas Mataram
2. Institut Teknologi Sepuluh Nopember
3. Consortium for Study and Development of Participation (KONSEPSI)
4. Advocacy Workshop for Village Empowerment and Development (Bengkel APPEK)
5. Social Development Research Foundation (YPPS)
6. West Nusa Tenggara (NTB) Transform Institute
7. Research and Community Empowerment Institute (LP2M)
8. Way Seputih Conservation Foundation (YKWS)

 Australian Organisations

1. Charles Darwin University

RESEARCHERS

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• Melky Koli Baran

• Suyono
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• Ramadhaniati

• Febrilia Ekawati

• Dr. Jonatan Lassa

• A/ Prof. Kerstin Zanders



A cattle farmer in Pengengat Village, Central Lombok, West Nusa Tenggara, tends his livestock—reflecting how grassroots livelihoods adapt and build resilience in a changing climate.

In East Lombok and Central Lombok, the research focuses on cattle farming, which serves as the primary source of income for local residents.

In East Flores, East Nusa Tenggara, the study examines dryland farming practices that have long been relied upon to sustain food security and economic stability.

In Kupang Regency, buffalo farming is the focus: an activity that not only provides income, but holds significant cultural value. In South Lampung, researchers explored the lives of coastal communities that depend on fisheries and marine activities to support their economy. In West Sumatra, the study focuses on wetland farming, particularly rice paddies, which are the main source of food and income.



A woman farmer in Central Lombok, West Nusa Tenggara, gathers grass for her livestock. Her work reflects rural women's resilience at the heart of a KONEKSI research project on how climate change is reshaping rural life in Indonesia.

These locations across the Indonesian archipelago were selected because they all depend on livelihood activities that are highly vulnerable to losses, damage, or hardship from climate change. This vulnerability stems from their heavy reliance on natural resources, making them particularly susceptible to disasters and other climate impacts.

East Flores, for instance, faces a significant risk of drought. Irregular rainfall patterns and prolonged dry seasons exacerbate the situation, leaving the region heavily reliant on its limited groundwater resources.

Meanwhile, Kupang is well-known as one of the key centres for buffalo farming, yet the buffalo population in the region has been steadily declining.

With its extensive coastline, South Pesisir Regency on the west coast of

Sumatra is highly vulnerable to climate impacts. Agriculture, which serves as the backbone of the local economy and the primary source of livelihood, depends heavily on stable weather conditions. Extreme weather patterns have reduced agricultural productivity and threatened food security in the region.

In South Lampung, the incomes of fishermen along the coast are dependent on fish catches. Climate change has triggered extreme weather, high waves, and storms that disrupt fishing activities. The uncertainty of catch size has increased, jeopardising the economic well-being of fishermen and local food security. The threat of earthquakes caused by tectonic plate activity in the Sunda Strait and eruptions from Mount Anak Krakatau adds to the region's vulnerability.

This research, led by Dr Moh. Taquiuddin, a socio-economy lecturer at the Faculty of Animal Husbandry at Universitas Mataram, aims to explore ways to identify, facilitate, and catalyse adaptation strategies and collective actions among communities, non-governmental organisations and universities. The focus is on transforming grassroots conditions and rural livelihoods to promote climate adaptation and resilience.

Titled Understanding Climate Impact on the Grassroot Communities and Rural Livelihood in Indonesia: Catalysing Changes Toward Adaptation and Resilience, the study involved researchers from Charles Darwin University, Australia; Universitas Mataram in West Nusa Tenggara; and Institute Teknologi Sepuluh Nopember in East Java.

The team was also supported by researchers from six non-governmental organisations, including: Consortium for Study and Development of Participation (KONSEPSI); Advocacy Workshop for Village Empowerment and Development (Bengkel APPEK); Social Development Research Foundation (YPPS); West Nusa Tenggara Transform Institute; Research and Community Empowerment Institute (LP2M); and Way Seputih Conservation Foundation (YKWS).

Collaborating with local non-governmental organisations (NGOs) is not new for Dr Taquiuddin. As the director of KONSEPSI, a Mataram-based organisation, he has previously worked with these groups on projects related to food security and climate change.

In early 2023, the team learned about the KONEKSI research grant. One of the grant's requirements was collaboration with an Australian university. A colleague of Dr Taquiuddin's from Kupang suggested partnering with Dr Jonatan Lassa, a lecturer at Charles Darwin University and a fellow Kupang native.

"Dr Lassa has extensive experience working on climate change and disaster-related topics, including in Indonesia," Dr Taquiuddin explained.

They agreed to submit a proposal, with an Indonesian university in the lead, since the core ideas and research focus were based in Indonesia.

Dr Taquiuddin, who has a doctorate degree in Environmental Sociology from the Universitas Indonesia, obtained a recommendation letter from Charles Darwin University to lead the research project on behalf of Universitas Mataram.

While the partnership delivered strong results, the teams also navigated differences in approach during the initial phase of drafting the research report. Partners from universities and NGOs brought diverse strengths—ranging from field data collection and community engagement to academic analysis and publication experience. Dr Taquiuddin helped coordinate these varied contributions into a cohesive report, which was later reviewed by Dr Lassa and Associate Professor Kerstin Zander at Charles Darwin University. The process ultimately strengthened the consortium's collaborative capacity and underscored the value of integrating multiple perspectives in research.

Another challenge was the time difference between Indonesia and Australia, which made it difficult to schedule regular meetings to discuss research progress. Dr Lassa briefly visited Kupang to monitor water buffalo shortages, but could not travel to all research sites due to time constraints. As a result, most project updates were discussed online.

Women and Children Most Affected by Climate Change

The research, which was conducted in rural communities, showed that women and children were the most

vulnerable groups to the impacts of climate change.

The study involved 30 to 60 respondents in each regency, with 30 percent of them women. Among these, 10 women respondents were heads of households. Women were also invited to participate in focus group discussions. In some regencies, these discussions were held separately for men and women to create a safe space and gain broader insights into gender equality, disability, and social inclusion.

To ensure effective communication with respondents, researchers avoided complex terms. Instead, they used simple questions with multiple choice answers, such as, "Have you noticed any changes in temperature over the past 10 years?"

In South Pesisir, Ramadhaniati, a specialist from LP2M, was embedded within the community to strengthen observations on gender equality, disability, and social inclusion throughout the study.

Findings showed 70-80 percent of respondents noticed temperature changes in their regions, Dr Taquiuddin said. They also reported longer dry seasons and shorter, but more intense, rainy seasons—clear indicators of climate change. These conditions have

Findings showed 70-80 percent of respondents noticed temperature changes in their regions

led to crop failures and increased pest infestations.

Researchers did more than observe daily life; they conducted in-depth interviews and discussions with women and children. Their responses demonstrated climate change has directly affected livelihoods, especially for women.

For instance, when fish catches declined in South Lampung due to rough weather, wives were forced to seek jobs outside their villages, or even in other cities. They took on various roles, from teaching to working as domestic helpers, to support their families.

However, working far from home had social consequences. Women often had to leave their children in the care of grandparents or other relatives, affecting parenting patterns and emotional bonds between parents and children.

The study produced a number of recommendations to help communities

adapt. Village governments, traditional institutions, and farming groups should collaborate to develop innovative, climate-friendly agricultural techniques, particularly for drylands.

"Enhancing community capacity and leveraging data is crucial, as data is scattered across various sources with differing methodologies, leading to inconsistent data. Therefore, a single reference standard is needed. Additionally, the agricultural sector must be adaptive to climate change. To achieve this, contingency planning is essential, utilising climate projections from BMKG to anticipate the impacts of climate change," Dr Taquiuddin explained.

In conclusion, the research findings showed communities have become aware of climate change and recognise the need to adapt. Smart and innovative adaptation strategies are essential to ensure community resilience in facing future challenges. ☉

Planning the Future of Rural Water Supply in the Face of Climate Change

Water supply systems in rural areas, whether they use springs, groundwater or rivers, are not designed to cope with the impacts of climate change. New research aims to support climate resilience planning for community-based drinking water systems in rural areas, and see it integrated into government monitoring frameworks.



RESEARCH LOCATIONS

- East Nusa Tenggara
- Lampung
- West Java
- West Kalimantan
- Yogyakarta



For residents of Pakembangan Village, Kuningan Regency, West Java, queuing to collect water is a routine chore during the dry season. The situation worsens when the dry season drags on, and wells run dry. As a result, locals have no choice but to rely on water supplied through Community-Based Drinking Water Supply and Sanitation (Pamsimas) pipelines to access clean water, a system which also struggles to provide sufficient supply.

Illustrating the problem, on an average day in late August 2024, assorted water containers – such as jerry cans, buckets, and gallon bottles – were neatly lined up near the pipelines, holding spots

for residents waiting for their turn to collect water in the long, slow-moving queue.

"Our wells have been dry for two months, and the water supply from the Pamsimas pipes has also stopped. The flow of water from the pipe is very weak. We have to queue all day," Emi, a 78-year-old resident, told news website detikJabar at the time. Residents reported that they sometimes have to wait overnight due to the extremely low water flow.

The head of Hamlet I in Pakembangan Village, Warta Sudarto, admitted that the Pamsimas system in their area is no longer functioning properly.

There are leaks in the pipes: understandable given their age. But that is not the only issue affecting supply.

"During the dry season, the water flow from the Cidangdeur spring also decreases," he explained.

The impacts of climate change on the springs, groundwater or rivers that supply these systems cannot be ignored: lower rainfall, drought and rising sea levels are all playing a part in water scarcity challenges.

RESEARCH TITLE

Future Proofing A Basic Social Service: Climate-Resilient Community-Based Rural Water Supply

PARTNERS

 Indonesian Organisations

- 1. Universitas Indonesia
- 2. Universitas Ibn Khaldun Bogor
- 3. Universitas Gadjah Mada

 Australian Organisations

- 1. University of Technology Sydney

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- Sucipta Laksono
- Rioneli Ghaudenson
- Danisha
- Kamilia Insani
- Dr. Mova Al Af'ghani
- Dyah Paramita

- Bahagia
- Dr. Daniel
- Adhin Harum Wulaningtyas
- Chris Dwina Anggiana BR Silalahi
- Satriani
- Elsa Febriana Devi
- Jeremy Kohlitz
- Tim Foster



(Top) The reservoir in Desa Mbatakpidu, East Sumba built through the Pamsimas program in 2017. Photo by Satriani, Universitas Gadjah Mada.

(Bottom) Pamsimas reservoir tower in Mekar Sari sub-district, Dumai supporting community access to clean water since 2019. Photo by Iqbal, Universitas Indonesia.



By 2023, the programme had reached 37,000 villages and benefited 25.9 million residents, though emerging challenges highlight the need for new approaches.

Professor Juliet Willetts, from the University of Technology Sydney, said that despite the very real impacts, there is limited awareness in rural communities about the ways in which climate change is affecting water services.

"We are already seeing some of these [climate] risks occurring in the field," she said.

Prof Willetts and her team have completed a collaborative study on water supply across five areas of Indonesia, titled Future Proofing A Basic Social Service: Climate-Resilient Community-Based Rural Water Supply.

The research collaboration is led by the University of Technology Sydney in collaboration with three Indonesian universities: Universitas Indonesia,

Universitas Gadjah Mada (UGM), and the Centre for Regulation, Policy, and Governance at Universitas Ibnu Khaldun Bogor. The National Development Planning Agency (Bappenas) also joined the initiative as a partner.

According to Prof Willetts, the Pamsimas program, which has been running for several decades, was simply not designed to deal with climate change impacts. While it has brought significant benefits, reaching 37,000 villages and 25.9 million residents by 2023, emerging challenges require new approaches.

"At the time, future climate scenarios were not yet part of the program's planning considerations," she explained.

The Ministry of Public Works has a national monitoring system for rural water supply services. This system collects data on the condition of equipment and fee collection – but it does not gather information about the state of the water resources on which these systems rely.

Prof Willetts pointed out that community groups managing local water systems often lack the resources and capacity needed to adapt, and gender equality challenges within the sector further limit progress.

Building stronger, more inclusive systems, she noted, will be vital in the next phase of the Pamsimas program and to sustaining the benefits of investments to date.

The findings from this research project are one part of the puzzle to improve the management and resilience of these crucial systems.

Analysing Regional Differences and the Impacts of Gender Inequality

To ensure comprehensive findings, research was conducted across five locations that experience varying climate change impacts. These areas are Sleman (Yogyakarta), Garut (West Java), Sintang (West Kalimantan), East

Sumba (East Nusa Tenggara), and South Lampung (Lampung).

Sintang was selected due to its recurring flooding issues, whereas East Sumba faces extremely dry conditions, but also suffers from seasonal floods that damage raw water intake systems.

Garut is undergoing massive agricultural development, which requires extensive land, leading to deforestation. This deforestation has caused problems related to water resource availability.

"Catchment areas are not adequately protected," Prof Willetts said.

In addition to examining regional characteristics, the research team also prioritised gender equality, disability, and social inclusion. When conducting fieldwork, factors such as disadvantage and access to water in the area were carefully considered.

Community-Based Drinking Water Supply and Sanitation System Management Groups (KPSPAMS), which have responsibility for operating and maintaining water supply systems, are meant to comprise 40 percent women membership. In reality, this quota is often unmet. As a result, decisions made by these groups too often fail to reflect women's interests.

The research team has taken proactive steps to highlight the implications of these issues through their research, including in policy recommendations. They have also evaluated the current state of the Pamsimas program and suggested practical improvements.

Beyond unmet quotas, very few women serve as KPSPAMS leaders and technicians. Only one female chairperson in Garut was identified amongst the research sites. Female members also tend to be assigned administrative tasks rather than leadership roles.

So why does this happen?

Prof Willetts said one reason for this is that persistent stereotypes lead many women to believe that water-related

work is primarily a man's responsibility. Additionally, many women feel overwhelmed by their domestic responsibilities, leaving little room to take on leadership roles.

The research team had taken proactive steps to highlight the implications of these issues through their research, including in policy recommendations. They had also evaluated the current state of the Pamsimas program and suggested practical improvements.

Prof Willetts explained that the primary focus of their research was to create monitoring systems that central and local governments can use to maintain sustainable and more resilient water supply management and services.

Dr Cindy Rianti Priadi, a researcher from the Universitas Indonesia, highlighted the critical need for a reliable framework to address climate adaptation in planning and operating sustainable, community-based drinking water systems.

Respectful Collaboration Based On Shared Principles

Working across two countries and multiple research sites can have its challenges, but setting out agreed partnership principles at the very beginning of the project helped unite the team on their shared goal.

"We collectively identified values we considered important, such as open communication, equal opportunities to voice opinions, and so on," Dr Priadi said.

Every three months, the team conducted a partnership health check to evaluate the implementation of these values, both quantitatively and qualitatively.

"We reviewed points that needed improvement and decided on actions moving forward," Dr Priadi added.

The team also utilised the Mentimeter app to provide anonymous feedback. Mentimeter is an interactive presentation platform that enables users to create online surveys and interactive presentations. Using this tool, team members assessed themselves and then reviewed the results together. From these evaluations, they identified areas that required improvement.

Challenges were inevitable. The team members had diverse academic backgrounds, which sometimes led to complications. Rioneli Ghaudenson, a researcher and PhD student from Universitas Indonesia, said some difficulties arose at the start of the research project. At that stage, members were still trying to grasp their roles and responsibilities. Midway through, another challenge surfaced regarding the verification process for remote assessment results. Both times, the team sat down together and found solutions.

The team strengthened their bonds through knowledge sharing, including internal training sessions on areas where some team members felt their skills were lacking.

Professionally, the research provided Mr Ghaudenson with opportunities to deepen his knowledge and skills in areas such as water availability and water supply system resilience.

After being divided into smaller groups for fieldwork, teams reported back to the full group, sharing photos and experiences from their activities.

"Everyone learned a great deal from one another," Prof Willetts said.

This was the case for Dr Priadi, who said the project taught her valuable skills in leading a large, transdisciplinary research team. She also discovered how conflicts could be resolved assertively and empathetically.

Mr Ghaudenson also found working in a large team beneficial, strengthening his ability to manage complex and diverse projects. His awareness of the

importance of cross-disciplinary and cross-cultural collaboration to address global challenges was also increased.

"My commitment to continuing work in this field has grown even stronger," Mr Ghaudenson said.

Professionally, the research provided Mr Ghaudenson with opportunities to deepen his knowledge and skills in areas such as water availability and water supply system resilience.

Through her management approach, Prof Willetts aimed to help each organisation and individual involved enhance their research capabilities.

"I hope to support their career development in research," she said.

Prof Willetts added that she hopes to collaborate again in the future.

"I have built friendships and truly enjoyed working with them," she said.

Climate Adaptation for Sustainable Community-Based Drinking Water and Sanitation

Dr Priadi is hopeful that the framework developed through their research can support more holistic planning by government and communities, taking into account external impacts such as climate change.

She firmly believes that effective climate adaptation is essential for sustainable operation of community-based water systems.

Prof Willetts hopes that the research recommendations and tools developed through the project can be integrated into the central government's monitoring systems for water services and resources. This would enable the collection of climate resilience data alongside existing monitoring activities.

At the regional government level, Prof Willetts wants to encourage local

authorities to prepare for the impacts of climate change, such as flooding.

"Because such events [caused by the impacts of climate change] are likely to persist or increase," she said.

The team has also conducted workshops in several regions to gather input from local stakeholders on the condition of water services, the climate risks they face, as well as community needs and capacities. Based on this process, local government officials have developed plans to support communities.

"However, implementation ultimately depends on them," Prof Willetts said.

As for rural areas, Prof Willetts wishes to raise awareness among residents about the risks of flooding and water shortages, empowering communities to do what they can to enhance their resilience.

"However, implementation ultimately depends on them," Professor Willetts said. Adoption of the monitoring tools and research findings by national and local governments, along with improved awareness among communities, could substantially strengthen the climate resilience of rural water supply systems. ©

Without Women, Sustainable Forests are An Impossible Dream

A collaborative study by Indonesian and Australian researchers highlights the importance of women's participation in managing social forestry, and the need to realise the aspirations of gender equality policies initiated by the government.



RESEARCH LOCATIONS

- South Sumatra
- West Kalimantan
- Yogyakarta
- South Sulawesi



Dawn has yet to break. Tetteng and Sutia, two middle-aged female farmers from Pundi Lemo Village in Enrekang Regency, South Sulawesi, have already begun their journey through the Sipatuo social forestry area in their village. Carrying machetes, they trek for about three hours uphill through the forest to reach the water source that sustains their community.

This routine takes place every two to three days. They inspect water flow channelled through pipes and bamboo at several collection points, ensuring that filtration processes remain

undisturbed by wild boars and that water reaches the final reservoir.

Not only maintaining the water supply to villagers' homes, Tetteng, Sutia, and other women of Pundi Lemo Village also gather forest produce, such as spices, coffee, cocoa, tubers, and fruits. These are either taken home or collected by the Social Forestry Business Group (KUPS) for processing and sale. KUPS also manages various types of businesses, including organic fertiliser production, seedling nurseries, and organising farmer skills training programs.

RESEARCH TITLE

Evaluating the Contribution of Social Forestry Management Rights Towards Climate-Proof Livelihoods of Women and Men in Indonesia

PARTNERS

 Indonesian Organisations

- 1.Association for Small Business Improvement (PUPUK)
- 2.The Asia Foundation
- 3.Institute of Social Sciences and Humanities, National Research and Innovation Agency (BRIN)
4. Universitas Airlangga

 Australian Organisations

- 1.The University of Melbourne

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- Dr. Imiawan Auwalin
- Mokhamad Farid Fauzi
- Sendri Lentari

KUPS are a mandate from the Ministry of Environment and Forestry aimed at empowering communities living around forest areas. Their primary goal is to improve community welfare and preserve forest sustainability. KUPs are established by Forest Farmer Groups (KTH) that hold social forestry permits.

Social forestry is a government program that grants legal rights and access to forest management for communities living around forest areas. By the end of 2023, more than 6.3 million hectares, out of the 12.7 million-hectare target, had been allocated under this program. At least 9,642 permits had been granted to individuals and groups.



Women take part in a focus group discussion in Enrekang Regency, South Sulawesi, sharing experiences and insights on how social forestry management supports climate-proof livelihoods for women and men.

Through KONEKSI, a collaborative research team from Indonesia and Australia has evaluated gender participation in social forestry management, which has been ongoing for over a decade.

Through KONEKSI, a collaborative research team from Indonesia and Australia has evaluated gender participation in social forestry management, which has been ongoing for over a decade. They focused on the roles of women like Tetteng and Sutia in preserving forest sustainability.

The study, titled Evaluating the Contribution of Social Forestry Management Rights towards Climate Proof Livelihoods of Women and Men in Indonesia, was conducted in four locations: Tanjung Agung, Muara Enim, South Sumatra; Banyusoco, Gunungkidul, Yogyakarta; Sungai

Garong, Sintang, West Kalimantan; and Pundi Lemo, Enrekang, South Sulawesi.

The team was led by Dr Rumayya from Universitas Airlangga, who is also a research associate at the Association for Small Business Improvement (PUPUK), and Ike Sulistiowati, PUPUK's director. PUPUK is a non-governmental organisation focused on community development that supports local communities in the four social forestry sites studied.

The research team comprised five lead researchers, eight field researchers, and additional researchers involved in

training and evaluating survey data. Qualitative research was led by Dr Tessa Toumbourou from the University of Melbourne, Australia, together with Dr Lilis Mulyani from BRIN, Indonesia, while quantitative research was managed by Dr Rumayya and Dr Ilmiawan Auwalin from Universitas Airlangga.

Forest cover analysis was handled by researchers from the National Research and Innovation Agency (BRIN). Meanwhile, the Asia Foundation contributed to the initial research design and policy recommendations.

The team conducted their research throughout 2023, starting with survey design early in the year, followed by three months of field research, using qualitative and ethnographic methods.

One key finding from surveys across the four sites was the level of community participation. Out of approximately 100 villagers surveyed in each of the four locations, 67 percent of respondents did not know about the Social Forestry permits over their village land.

This reflects realities across Indonesia, where they study found that women are often underrepresented in management groups. From the study review of 400 most recent Social Forest permits issues in Indonesia in 2024, only 19.54

percent of members in Village Forest's management bodies were women. This number was even lower in Community Forests, averaging 13.95 percent women.

One key factor limiting broader participation in social forestry is the lack of access to clear and comprehensive information.

Information is typically shared only with selected village representatives, often men, during one-off information sessions (or “*sosialisasi*” meetings in Indonesian) organised by sub-national forestry agencies. As a result, many community members remain unclear about the purpose, location, and implementation of social forestry initiatives, which constrains wider engagement.

In Pundi Lemo Village, for instance, the government grants a 35-year permit to manage 52 hectares of protected forest to the Sipatuo Forest Farmer Group. This group consists of just 27 male household heads. Meanwhile, women are only involved in managing KUPS, the business arm of the Sipatuo Forest Farmer Group.

Many diverse factors contribute to gender inequality in social forestry management participation. Amongst these factors is access to membership groups: discussions where social forestry management groups are

initially formed are often by invitation, with only household heads invited. As household heads are typically men, this creates an initial barrier to women's participation in early group formation.

Secondly, formal land management and ownership systems are male-dominated, requiring proof of family history in forest use and farmer status on identity cards. As a result, men are typically registered as farmers, while women are recorded as housewives—even when women play active roles in farming.

Other factors include gendered social norms that often designate unpaid household and caregiving duties to women, positioning men as the primary decision-makers. This affects women's confidence and participation in meetings where forest management decisions.

Additionally, the study found that women in social forestry households averaged fewer years of education (6.6 years) compared to men (8.1 years). Lower education levels, socio-economic challenges, and low confidence in public forums, where education often boosts credibility, can further exclude women.

This is despite Article 21 of the Ministry of Environment and Forestry

(KLHK) Regulation Number 9 of 2021, which guarantees equal opportunities for both men and women.

The 2013 KLHK Guidelines for Monitoring and Evaluating Gender-Responsive Activities also clearly highlight women's participation as a key indicator of successful forest development within social forestry areas.

Tetteng, 58, is a prime example. Despite her current role in securing water supplies, she was initially excluded from social forestry policy discussions. Meetings often sidelined women, people with disabilities, youth, and landless households. Women attending these meetings typically served as caterers.

"Our findings are intriguing. KUPS in the four research locations are dominated by women. They actively participated in processing and selling forest products," Dr Rumayya said.

"However, this trend is not reflected nationally, as women's involvement in decision-making related to forest management remains limited at the national level, even within the Social Forestry Business Groups."

Dr Rumayya noted that the increased participation of women in KUPS at



Women gather for a focus group discussion in Sungai Garong village, Kayan Hilir District, Sintang Regency, West Kalimantan, voicing experiences of social forestry and climate resilience shaping their livelihoods.

the surveyed locations resulted from ongoing support provided by non-governmental organisation PUPUK.

"We recommend extending non-governmental organisations assistance to other social forestry areas," he added.

A Multidisciplinary Research Team

To obtain solid research data, Dr Toumbourou explained that the research team used several mechanisms: from training researchers, developing highly-detailed fieldwork research manuals, and deploying experienced researchers and research assistants specialising in qualitative social research in Indonesia to validate qualitative data.

Mia Dunphy, a doctoral student in Human Geography, and Annisa Hartoto, a PhD student in Political Science, both from the University of Melbourne, supported the development of the fieldwork research manuals.

Ms Dunphy conducted her dissertation research in West Kalimantan, while Ms Hartoto focused her studies in South Sulawesi.

"They have a very strong contextual understanding of these regions," Dr Toumbourou said.

Dr Toumbourou also invited Dr Indri Sari, a lecturer in International Relations at Universitas Parahyangan, Bandung, to provide feedback on the field notes. Dr Sari, who earned her

doctorate from the Australian National University, has extensive experience in supporting scholars working on environmental governance issues.

Input from Dr Sari, along with guidance from the lead researcher, served as a key foundation for a five-day training workshop held in Bali. The team provided training on conducting in-depth interviews and facilitating focus group discussions with various social groups across villages. They also covered ethnographic research methods, participant observation, and household surveys.

During the workshop, they also visited a community forest area in Wanagiri, Buleleng Regency, Bali, to meet with a group of farmers who have the rights to manage the forest. This group shared their experiences about obtaining the community forest permit and how it has benefited their livelihoods.

"Visiting the community forest site was incredibly valuable because all the field researchers gained insights into the realities of social forestry, including examples of best practices to compare with the locations where they will be working," Dr Toumbourou said.

With such extensive support, field researchers faced very few obstacles. They were even able to quickly

integrate into the community and were often involved in village activities.

For Dr Rumayya and Dr Toumbourou, the nearly year-long collaboration has left a lasting impression and impact. It has resulted in both academic and non-academic publications from the research, but also much more.

"It has been an incredible experience in leading a research project," Dr Rumayya said.

Women Show Greater Concern for Forest Conservation

Over a three-month period, the research team conducted 40 face-to-face focus group discussions and four online sessions. Some groups were separated by gender to create a more comfortable space for respondents to share their views on social forestry and welfare issues.

The team also held online focus group discussions via WhatsApp to promote inclusivity in the research. This method enabled participation from individuals living in remote areas, those unable to travel, or people with lower confidence levels when speaking in face-to-face forums.

The research team found women were generally more active in Whatsapp FGDs [focus group discussions] than they were in face-to-face discussions as they were able to respond in their own time, enabling them to fit their contribution to the discussion around their social reproductive roles and responsibilities, rather than further burdening their time, as other less flexible (synchronous, in-place) methods can.

"FGDs [focus group discussions] via WhatsApp offer strong 'ecological validity.' It is a cost-effective method to encourage genuine participation from a larger group of participants," Dr Toumbourou said.

This flexibility not only boosted inclusivity but also broadened insights across all groups. As a result, the collected data was richer and more diverse.

Beyond gender inequality, the team also uncovered intriguing data related to improvements in community welfare targeted by the social forestry program. These improvements were measurable through indicators such as improved household protein consumption patterns, higher subjective well-being, and stronger social relationships – not just economic income.

According to Dr Rumayya, measuring

material income increases proved inconclusive.

"We can't measure income based on forest product sales because logistics costs vary by location," he said.

"Instead, we observed changes through before-and-after questions, such as how people are now happier because they can save for a pilgrimage, have more friends, and so on."

Despite overall improvements in welfare, communities still experienced disparities in access to and benefits from social forestry.

"As a recommendation, researchers propose a minimum quota of 25-30 percent female and marginalised group involvement in social forestry management bodies to enhance representation and participation," Dr Rumayya said.

Women were also found to be more concerned about forest preservation. Their knowledge of forest biodiversity was often distinct to that of men. In many cases, women demonstrated extensive knowledge of edible plants, medicinal herbs, and passed this knowledge down to future generations.

Their knowledge and concern could hold the key for managing Indonesia's forests well into the future. ☉

Modelling A Net Zero Future to Ensure An Inclusive Energy Transition

Despite its good intentions, the global energy transition to achieve net zero carbon emissions risks leaving vulnerable groups further behind, including in Indonesia. By taking a more inclusive approach to climate modelling, new research has demonstrated the potential pitfalls – and the possible solutions – to support a better transition for all.



RESEARCH LOCATIONS

- Indonesia
- Australia



Vulnerable groups, such as women, older adults, children, people with disabilities and those living in poverty, face significant risks due to climate change. The increasing frequency and intensity of climate-induced extreme weather events, such as floods, droughts, and storms, can severely impact their health, safety, economic security and daily lives.

Yet some of the steps being taken to mitigate climate change could also further entrench social and economic inequalities, even unintentionally.

To avoid this, Indonesia's push for an energy transition to reduce global warming risks and achieve net-zero emissions must consider the needs of these groups. Higher energy costs or reduced access could widen the gap for those already facing disadvantage, unless the transition is managed carefully.

This research has worked to identify the challenges and impacts of the energy transition on vulnerable groups in Indonesia to support more equitable policies and approaches.

RESEARCH TITLE

Initiative for an Open, Inclusive, and Integrated Climate Change Model for Indonesia

PARTNERS



Indonesian Organisations

1. LPEM FEB Universitas Indonesia

2. Institute for Essential Services Reform (IESR)

3. SMERU Research Institute



Australian Organisations

1. Australian National University

RESEARCHERS

- Dr. Alin Halimatussadiah

LEAD RESEARCHER

• Dr. Milda Irhamni

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• Prof. Frank Jotzo

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- Muhammad Yudha Pratama

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• Affandi Ismail

• Pintoko Aji

• Fendhi Birowo

The collaborative project, titled Initiative for An Open, Inclusive, and Integrated Climate Change Model for Indonesia, was carried out by the Institute for Economic and Social Research of the Faculty of Economics and Business at Universitas Indonesia (LPEM FEB UI) in collaboration with the Australian National University (ANU), SMERU Research Institute, and the Institute for Essential Services

Reform (IESR).

Led by Dr Alin Halimatussadiah from Universitas Indonesia (UI), in collaboration with Professor Frank Jotzo and Professor Budy Resosudarmo from ANU, the research aimed to analyse the impact of the energy transition from an inclusive perspective, focusing on women and people with disabilities.



Power lines in Poso Regency, Central Sulawesi, Indonesia, on Tuesday, June 14, 2022. (Photo: Dimas Ardian/Bloomberg via Getty Images)

The project also explored opportunities for designing fiscal policies that promote equity, and undertook climate modelling specifically incorporating vulnerable groups.

While climate modelling related to the energy transition has been widely conducted at the international level, the research team noted there had been

limited effort to include vulnerable groups, particularly in Indonesia.

Dr Milda Irhamni, a lecturer at UI, said the project's approach to climate modelling used secondary data and incorporated insights from focus group discussions involving policymakers, non-governmental organisations, and academics.

The more ambitious the net-zero emissions scenarios targets are and the tighter the timeframe, the greater the increase in commodity prices.

"We strive to include as many diverse perspectives as possible to ensure the results are accountable," Dr Irhamni said.

The research team observed that women remain underrepresented in energy policies, and their potential contributions are often overlooked, leaving their role limited to that of energy consumers. Women from low-income groups, particularly in rural or remote areas, struggle to access the benefits of new energy sources.

Meanwhile, people with disabilities are more vulnerable to poverty and energy poverty—the inability to afford or access sufficient energy to meet basic needs. They are less likely to be employed, frequently face workplace discrimination, and are often excluded from economic opportunities. In the energy sector, people with disabilities are almost always excluded from all stages of the production process.

The research team believes that

representation and participation of vulnerable groups are essential to ensure more inclusive climate policies, so incorporated inclusion considerations into their energy transition modelling.

While sharing findings at a public discussion on inclusive energy transition in Jakarta in July 2024, Dr Halimatussadiah explained that the study combined national-level analysis using the Global Change Assessment Model (GCAM) to assess the effects of the energy transition on commodity prices, with household-level analysis through consumption pattern-based simulations.

Dr Halimatussadiah, Head of the Green Economy and Climate Change Study Group at LPEM FEB UI, said that macro analysis using GCAM evaluates how different net-zero emissions achievement scenarios could impact commodity prices. Household-level simulations then examine the effects of these price changes on the welfare of vulnerable groups, such as female-

headed households, families with people with disabilities, and households with older adults and children. The simulations also highlight impacts on poverty and social inequality, including the Gini ratio, a statistical measure of inequality.

According to Dr Halimatussadiyah, the more ambitious the net-zero emissions scenarios targets are and the tighter the timeframe, the greater the increase in commodity prices.

The impact on poverty is more pronounced in households with people with disabilities, even when compared to other household types with and without vulnerable household members. Inequality impacts are also more evident in female-headed households.

Researchers found that these negative impacts could be mitigated through robust fiscal responses. An additional simulation showed that policy can help reduce much of the negative impact of the energy transition to vulnerable groups, through interventions such as redistribution of carbon tax revenue to social protection schemes.

Dr Irhamni said her interest in this topic arose because there were no studies, either domestically or internationally, addressing the impact

of the energy transition on vulnerable groups, and discussions about the energy transition often seemed elitist, confined to policymakers or experts in Jakarta.

The research team sought to highlight the potential consequences if the energy transition fails to consider its impacts on all parts of society.

Learning from One Another and Incorporating Lived Experiences

After hearing about the opportunity for a KONEKSI project, LPEM FEB UI reached out to ANU, SMERU and IESR to bring together the collaboration.

LPEM FEB UI took the lead in managing all aspects of the project, setting objectives and targets, and serving as the central hub for partnership coordination and communication among stakeholders. LPEM FEB UI actively contributed to discussions related to the GCAM model and micro-simulations; IESR led the GCAM modelling team; SMERU led the micro-simulation team; while LPEM FEB UI and ANU were involved in the modelling and analysis.

The research team also invited organisations advocating for people with disabilities and women to

participate in focus group discussions held in Jakarta. During the process, the research team collaborated with disability experts, and engaged with trade unions and civil society organisations focusing on disability issues.

Throughout the process, Dr Irhamni said everyone involved learned from one another. Researchers gained insights into the real challenges faced by people with disabilities, while people with disabilities learned from the researchers how the study's subject matter could significantly impact their lives.

"It has been an incredible journey. I feel I have gained a wealth of knowledge and received many benefits from being involved in this project, and I am confident that others who participated in this project feel the same," Dr Irhamni said.

Khairunnisa Rangkuti, a researcher from LPEM FEB UI, stated that labour confederations participating in discussions emphasised that workers' basic needs remain unmet. One of their key concerns was the necessity of adjusting multiple factors, including support for vulnerable workers, to align with the requirements of the energy transition.

Despite being in different countries, Dr Irhamni noted that the institutions involved in the research have been engaged since the beginning, from idea collection to drafting proposals for the project.

Most progress discussions were held through regular online meetings. The research team held large group meetings once a month and regular technical team meetings every two weeks.

Coordination with ANU was made easier because one of the researchers involved in the study, Professor Budy Resosudarmo, who is the Head of the ANU Indonesia Project, had previously taught at the Universitas Indonesia.

Another challenge was aligning perspectives, including whether the researchers' views matched those of people with disabilities.

"So, the process of aligning perceptions took quite a while because this was a completely new area," Dr Irhamni said.

The most significant impact of this study on vulnerable groups, according to Dr Irhamni, was that those working in gender and disability fields had not previously considered the impact of the energy transition. They were still preoccupied with addressing basic



A solar-powered system converts brackish water into safe drinking water, offering a climate-resilient solution to meet the daily needs of remote communities.

needs. Their perspectives began to shift after participating in discussions with researchers about these issues.

Dr Irhamni noted that interviews and focus group discussions uncovered several stories about people with disabilities who had been victims of climate change-related disasters. In one case, a person with a neurological disability was left unrescued during floods due to their restricted mobility.

"If we hadn't had these conversations, we would never have uncovered examples like these," she said.

The research produced five policy recommendations. These included: improving access to renewable energy technologies; integrating gender and disability considerations into energy policies; implementing targeted social protection programs; enhancing inclusivity in Just Energy Transition

Partnership initiatives; and increasing the availability of data and research on women and people with disabilities.

Dr Irhamni emphasised that the most important aspect of these policy recommendations was the need to address the challenges related to renewable energy penetration, and the various factors currently making renewable energy in Indonesia uncompetitive. One issue is that new renewable energy facilities are often constructed in areas where sufficient infrastructure already exists, rendering additional facilities unnecessary, such as on Java Island.

"As a result, the government needs to conduct a comprehensive evaluation," Dr Irhamni said. "Addressing these issues will require the government to take a closer, more comprehensive look at existing plans and priorities," Dr Irhamni said. ☺

A Living Laboratory for Zero Waste

Recycling facilities only make an impact when communities understand their value and actively use them.

Through the Citarum Action Research Program, Indonesian and Australian researchers are working with two West Java communities to demonstrate the circular economy in practice in real time, while using research and co-design to build genuine, long-lasting community participation.

RESEARCH LOCATIONS

- West Java



Waste management infrastructure can be built relatively quickly, but shifting mindsets takes far longer. A staggering 90 percent of Indonesia's 3,779 recycling processing facilities are not functioning, according to researcher Dr Reni Suwarso. Not because technology or infrastructure is flawed, but because people have never been shown their value.

These recycling facilities, known as Tempat Pengolahan Sampah Reduce, Reuse, Recycle (Reduce, Reuse, Recycle Waste Processing Facility, or TPS3R), are designed to help communities

manage waste close to its source. Yet, as Dr Suwarso has observed from many years working in sector, their effectiveness depends not only on machinery and buildings, but also on everyday habits, routines, and the social structures that encourage people to sort waste at home.

This is where research can play a transformative role. Dr Suwarso, from the University of Indonesia, is one of the lead researchers in the Citarum Action Research Program (CARP), a participatory research initiative in Padamukti and Cibodas Villages along the Citarum River Basin in Bandung, West Java.

RESEARCH TITLE

The Citarum Action Research Program (CARP) - Circular Economy Transitions for Resilient Climate and Environmental Futures

PARTNERS

 Indonesian Organisations

- 1.Universitas Indonesia (UI)
- 2.Yaksa Pelestari Bumi Berkelanjutan (YPBB)

 Australian Organisations

- 1. Monash University
- 2. Commonwealth Scientific and Industrial Research Organisation (CSIRO)

RESEARCHERS

- Professor Diego Ramirez-Lovering

LEAD RESEARCHER
- Dr Tanvi Maheshwari

LEAD RESEARCHER
- Prof Reni Suwarso (UI)

LEAD RESEARCHER
- Prof Dwinanty Marthanty (UI)

LEAD RESEARCHER
- David Sutasurya (YPBB)

LEAD RESEARCHER
- Prof Tony Wong

CO-LEAD RESEARCHER
- Dr Paris Hadfield

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- Dr Ilya Fridman

CO-LEAD RESEARCHER
- Prof Rob Raven

CO-LEAD RESEARCHER
- Dr Michaela Prescott

CO-LEAD RESEARCHER



Local residents use small boats to try to navigate through densely packed piles of waste clogging the flow of the Citarum River in West Bandung Regency, West Java, in June 2024. ANTARA PHOTO/NOVRAN ARBI

The Citarum River has long been regarded as one of the world's most polluted rivers, affected by industrial and domestic waste. Communities burn rubbish and dispose of solid waste directly into the river, adding some 15,000 tonnes of waste per day. Over the years, the local government has built waste management facilities, but infrastructure alone has not been enough to change practices. A deeper, community-based approach was required.

A KONEKSI-supported research project has taken a deep dive on the potential for circular economy transitions in CARP, exploring whether income opportunities like ecotourism could motivate actions such as waste sorting. Professor Diego Ramirez-Lovering of Monash University led the Australian team, while Dr Suwarso and Dr Dwinanti Marthanty from Universitas Indonesia led the Indonesian team.

CARP brought together at least 15 researchers from Universitas Indonesia (Department of Civil Engineering and Department of Political Science), Monash University, Monash Art, Design, & Architecture and Monash Sustainable Development Institute, non-profit organisation Yaksa Pelestari Bumi Berkelanjutan (YPBB), and Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO).

"We each came with different areas of knowledge, expertise, and experience. Initially, we faced challenges due to sectoral egos. But over time, we united under a shared vision to build a 'living laboratory' that demonstrates zero waste at source and circular economy transitions for climate resilience and environmental futures. The process had its ups and downs, but mutual trust and team cohesion grew," Dr Suwarso said.

Prioritising healthy environments, wellbeing and access to clean water and waste services has never been more important.

Dr Suwarso explained how her team selected Padamukti and Cibodas as the project sites. The first question they faced was deceptively simple: which part of the vast Citarum Basin would be most suitable for the research? The Citarum stretches 296 kilometres from the slopes of Mount Wayang southeast of Bandung to the Java Sea at Ujung Karawang, covering 6,910 square kilometres and supporting a population of 25 million. Choosing the right segment required careful consideration.

To determine the study location, the team used three criteria: (1) biophysical; (2) health and wellbeing; and (3) socio-political and cultural readiness. Biophysical parameters included contamination levels, sanitation risks, the location and characteristics of settlements and villages, and infrastructure availability. Health and wellbeing were assessed via community health and vulnerability indicators. The final variable considered was local policy alignment and community openness to change.

“Is the local community and government open to new ideas and willing to adapt? Is the research topic aligned with policy priorities?” Dr Suwarso explained.

The initial list of 130 candidate villages was narrowed down to 10, and finally to Padamukti and Cibodas. A

2.3-kilometre stretch of the Citarik River was selected as the primary research area.

The team then engaged all relevant stakeholders—from the national to village level, and internationally. This included government, academia, civil society, media, and the private sector.

“We needed buy-in from all levels to ensure support and participation,” said Dr Suwarso. “Given our commitment to GEDSI (Gender Equality, Disability, and Social Inclusion), we focused on women and adolescent girls—who are often the primary actors in household waste management.”

The researchers sought to instil in communities the belief that successful ecotourism—and income opportunities—could begin with simple actions like sorting waste at home.

“It takes time to shift behaviours around waste disposal and sorting. Sustained, effective behavioural interventions are essential. Household-level sorting is the key,” Prof Ramirez-Lovering emphasised.

The team began with a desktop study, built a baseline dataset, conducted field studies, carried out surveys, and organised a wide range of academic activities, including focus group

The researchers sought to instil in communities the belief that successful ecotourism—and income opportunities—could begin with simple actions like sorting waste at home.

discussions, workshops, seminars, and in-depth interviews. Weekly and fortnightly coordination meetings were held, with quarterly evaluations and reporting sessions.

The TPS3R facility in Padamukti was constructed by the West Java Provincial Housing and Settlement Agency in late 2023 and began operations in April 2024. Nearby, two abandoned facilities—one for black soldier fly farming and another for fish cultivation—were rehabilitated and integrated into the site. The TPS3R processed inorganic waste, while black soldier fly technology was used for organic waste.

Valuable inorganic waste like plastic bottles and cardboard was separated, compressed, and sold to recyclers. Unfortunately, a large portion of the plastic waste was non-recyclable and low-value, consisting of plastic bags,

straws, Styrofoam, sachets, and bottle caps.

“TPS3R has started generating income, although it is not yet sufficient to cover operational costs,” Dr Suwarso noted.

Community Engagement

Community engagement in the research was high, possibly due to the researchers’ respectful and non-punitive communication style—engaging locals like friends or family, recognising local wisdom, and involving marginalised groups such as women, children, older adults, and people with disabilities.

To mobilise communities, the researchers were supported by a core team of seven, comprising village officials and local leaders—four of whom were women. “We ensured at



A student visit from Universitas Indonesia, Institut Teknologi Bandung, Universitas Padjadjaran, Telkom University, and STAI Bhakti Persada to TPS3R Padamukti.

least 30 percent women's participation in every activity," Dr Suwarso said.

Prof Ramirez-Lovering noted that one of the most significant outcomes of the 'living laboratory' was the ability to produce evidence-based policy recommendations. Field data underscored the need for systemic waste management policies at the village level.

He also emphasised the importance of coordinated action and multi-level partnerships across government,

private sector, and community actors to mobilise resources, improve waste collection systems, expand recycling markets, and increase public investment.

There was also a critical need to shift the entrenched 'collect-transport-dispose' paradigm embedded in Indonesia's Law No. 18 of 2008 and Government Regulation No. 81 of 2012 on household waste management, Dr Suwarso added. These policies do not support waste sorting at the source, resulting in over-reliance on landfills

and high government expenditure.

“After 15 years without revision, these regulations urgently need updating,” Dr Suwarso said.

Both Dr Suwarso and Prof Ramirez-Lovering reflected on the invaluable insights gained through the project, and its deep cross-border ties.

“We’ve learned so much—from methodologies and theories to professionalism and discipline from international researchers,” Dr Suwarso said.

“It’s been a privilege to work with Indonesian researchers and learn from diverse communities. Ultimately, this collaboration strengthens people-to-people and government-to-government ties between Australia and Indonesia,” Prof Ramirez-Lovering added.

Through CARP

Through CARP, Indonesian and Australian researchers collaborate directly with residents, community leaders, and local institutions to understand behaviour, identify practical barriers, and co-design approaches that make waste sorting and recycling part of daily life.

The research underscores an

important insight: infrastructure becomes effective when communities see its value and feel ownership of it. The living laboratory in Padamukti and Cibodas shows how evidence-based research can bridge the gap between physical facilities and meaningful, sustained community engagement, turning infrastructure into solutions that truly work for the people they serve.

The research team is now seeking supporters to replicate the model in other regions.

“Visitors to the Circular Economy TPS3R site have expressed strong enthusiasm for adopting zero waste at source principles to address their local waste challenges,” Dr Suwarso said.

The living laboratory is now a destination for study trips by government and academic institutions from around Indonesia. In December 2024, a large delegation from eastern Indonesia arrived in Padamukti and Cibodas. The group of 196 participants from Bulukumba Regency, South Sulawesi included village heads, members of Village Consultative Councils, and other leaders.

The Bulukumba tour was followed by visitors from other communities in Bandung and Depok, as well as Badung Regency in Bali. Students



Padamukti has become a kind of “living lab”—a place where locals learn, train, and experiment with waste systems that could be replicated in other areas.

from several universities—Universitas Indonesia, Universitas Padjadjaran, Institut Teknologi Bandung (ITB), Telkom University, Universitas Ahmad Yani Cimahi, and BSTAI Bhakti Persada (Bhakti Persada Islamic College)—also joined the stream of visitors eager to learn from the people of Padamukti and Cibodas.

Their visits were not merely ceremonial, nor was they random; these groups had travelled across the country to learn about community-based waste management practices and sustainable ecotourism from these two small villages that had now become a national example of best practice. ☉

Bridging the Divide between Sea and Land Conservation to Secure Southwest Papua's Environmental Future

Southwest Papua is known for its rich biodiversity and dramatic landscapes. Yet these ecosystems, and the communities that depend on them, are facing growing threats in a changing climate. Research by the World Resources Institute Indonesia, in collaboration with the National Research and Innovation Agency, University of Technology Sydney, and the University of Queensland, proposes an integrated conservation approach to support a sustainable future for the region.



RESEARCH LOCATION

- Southwest Papua, Papua



In early November 2023, dawn was just breaking on Doom Island, Sorong District, Southwest Papua Province, when Emon began preparing 40 litres of fuel for his boat. Together with his crew, he readied to cross the sea, travelling several kilometres from his hometown in search of a catch. This long journey has now become routine for Emon, as fish no longer remain in the waters around Sorong.

Emon's story is captured in a documentary titled 'Damaged sea: Sorong fishermen search for fish as far as Raja Ampat', uploaded on the Harian Kompas YouTube channel a year ago. In the documentary, Ilham Marassabesy, a lecturer at Universitas

Muhammadiyah Sorong's Faculty of Fisheries, explains how coastal ecosystem damage has shifted fishing grounds. "Fishermen who used to catch fish near the coral reefs now have to go much further out to sea," he said.

The environmental degradation to the coastal ecosystem in Sorong could be a warning sign for Southwest Papua Province, long known for its dense tropical rainforests and rich coastal ecosystems. Highland forests, rivers, and coral reefs form an interconnected landscape rich in ecological and cultural value (Fatem et al. 2020; Purwanto et al. 2021).

Rapid development, resource extraction, and tourism is accelerating the damage, resulting in biodiversity loss and disruption to the livelihoods of local communities dependent on nature (Mangubhai et al. 2012; Gaveau et al. 2021).

In this context, conservation efforts are increasingly urgent. This growing threat motivated researchers from the World Resources Institute (WRI

Indonesia)—Dr Ahmad Dhiaulhaq (Research and Data Integrity Manager) and Tomi Haryadi (Director for Food, Land and Water Programme)—along with teams from three other institutions, to examine what works locally to promote comprehensive conservation.

The research, titled Conserving Ridge to Reef: Integrated and Innovative Approach in Supporting Inclusive

RESEARCH TITLE

Conserving Ridge to Reef: Integrated and Innovative Approach to Enable Sustainable Financing in Supporting Inclusive Climate Change Projects in Indonesia

PARTNERS	
	Indonesian Organisations
1.National Research and Innovation Agency (BRIN)	
2.World Resources Institute Indonesia (WRI Indonesia)	
	Australian Organisations
1. University of Technology Sydney	
2. University of Queensland	
RESEARCHERS	

- | | | |
|-----------------------------|-----------------|----------------------------|
| • Tomi Haryadi | LEAD RESEARCHER | • Dewi Sari |
| • Dr. Ahmad Dhiaulhaq | LEAD RESEARCHER | • Cynthia Maharani |
| • Nicholas Stacher | | • Ehdra Masran |
| • Prof. Eve McDonald-Madden | | • Meirella Rumfabe |
| • Anna Gero | | • Paul Pasaribu |
| • Tamara Megaw | | • Briantama Asmara |
| • Prof. Dr. Syarif Hidayat | | • Muhammad Zayyanul Afwani |
| • Dr. Maxensius Tri Sambodo | | • Gemasakti Adzan |



Papuan women process sago in the forest, drawing on generations of knowledge to sustain food security and livelihoods.

Climate Change Projects in Indonesia was conducted from September 2023 to November 2024. Mr Haryadi explained that the study focuses on integrating ecosystem preservation across the region's diverse landscapes.

“We view terrestrial and marine areas as a unified whole in conservation management,” he said.

The research focuses on three key challenges.

First, terrestrial and marine conservation management have traditionally been conducted separately, so ecological impacts in both areas are not seen as interconnected. Yet changes in terrestrial biodiversity inevitably affect coastal and marine ecosystems.

Second is the importance of maintaining sustainable conservation funding.

“Without sustainable funding, conservation will only remain a conversation—or merely rhetoric,” Mr Haryadi said.

Third, the need to account for the scale of climate change impacts.

“These impacts must be measurable and form a crucial part of research recommendations,” he added.

Nature conservation in Southwest Papua is well-suited to the ridge-to-reef (R2R) conservation approach, Mr Haryadi said. The area boasts high biodiversity with integrated hill and coastal marine environments. Tourism and sustainable natural products have potential to sustain funding for conservation work, and are currently underutilised. And just like many other regions in Indonesia, Southwest Papua faces current and future pressures from climate change.

Initially, a feasibility study examined whether the R2R concept was relevant and appropriate to the context of Southwest Papua. Researchers then engaged comprehensively and collaboratively with stakeholders, in an effort to bridge the existing divide between terrestrial and coastal environmental management. Finally, researchers worked on devising an attractive funding scheme for donors to support sustainability.

The feasibility analysis used quantitative and qualitative methods, said Dr Ahmad Dhiaulhaq from WRI. However, to gain narrative depth, “the qualitative component needs to be enlarged,” he said. Data collection took place between August 2023 and July 2024 through structured interviews with 80 respondents, including 24 women. The team also conducted several focus group discussions (FGDs), policy analysis, and spatial analysis to understand the interconnections between terrestrial and marine ecosystems.

To confirm their findings, the team held a Validation Workshop in July 2024. Researchers presented the study results to respondents and stakeholders to obtain feedback and suggestions.

“The Validation Workshop was very beneficial,” said Mr Haryadi. “If there were errors or gaps in the data collected, the respondents present could validate it, and we as researchers could immediately make corrections.”

This session was enthusiastically received by respondents, as it is rare for them to have the opportunity to review final research results before publication.

“What often happens is researchers missed to give respondents the chance to validate the data produced,” Dr Dhiaulhaq said.

A Final Workshop in Jakarta held in September 2024 brought the research to stakeholders at the national level.

With the support of KONEKSI, WRI Indonesia was able to bring together experts from both Indonesia and Australia to collaborate closely on the project, including government. WRI researchers worked alongside colleagues from Indonesia's National Research and Innovation Agency (BRIN), as well as academics from the University of Technology Sydney (UTS) and the University of Queensland (UQ).

Each partner organisation brought a particular area of strength to the project. For example, BRIN experts concentrated on institutional governance matters; UTS specialised in Gender Equality, Disability, and Social Inclusion (GEDSI) issues; while UQ contributed expertise in research design and conservation.

The initial phase of the research began in January 2023, when the WRI Indonesia research team formulated a concept note outlining the ideas, themes, and expected outputs. After engaging partner organisations, the concept note was refined based on their feedback before being submitted to KONEKSI.

From UTS, the research team included GEDSI practitioners Anna Gero and Tamara Megaw. Professor Eve McDonald-Madden from UQ, an expert in decision research analysis and conservation, played a pivotal role in refining the research design, from setting objectives to ensuring scientific rigour. From BRIN, key contributors were Professor Dr Syarif Hidayat and Dr Maxensius Tri Sambodo.

"Both have been extensively involved in related research and have considerable experience working on Papua-related issues," Mr Haryadi said.

Following the establishment of the consortium, the research team held regular monthly online meetings, as well as smaller focused sessions to discuss specific issues. Data collection in the field was conducted by WRI Indonesia to facilitate access in Papua.

"Field data collection was not carried out by foreign researchers; however, they participated in the Final Workshop and meetings in Jakarta. Australian researchers also reviewed the field data and research reports," Mr Haryadi said.

Despite this well-coordinated approach, differences in academic backgrounds among team members occasionally led to varying perceptions and

interpretations of data, particularly on GEDSI. Initially, there was a proposal to integrate GEDSI considerations into every project outcome. However, it was ultimately agreed to focus on GEDSI in specific components where it was most relevant.

Dr Dhiaulhaq noted that one of the challenges was harmonising the diverse disciplinary perspectives within the team.

Mutual respect was the basis for the productive collaboration, Mr Haryadi said. Colleagues from WRI Indonesia, UQ, UTS, and BRIN understood that this research was applied in nature.

“Our goal is to produce research that is practical and applicable,” he said.

To ensure the research process running smoothly, the team made use of the Partnership Health Check—part of KONEKSI’s approach to fostering equitable research partnerships.

Through this forum, members were encouraged to pause, reflect, and adjust how they worked together as the partnership and project evolved.

“This forum provided an opportunity for us to learn from each other and improve,” Mr Haryadi explained.

Review and reflection was not limited to internal team members. Centring the needs and interests of vulnerable groups, such as women and persons with disabilities, was essential to the project, and their feedback was invited at multiple stages of the project. Dr Dhiaulhaq emphasised that these community groups have been involved as respondents from the outset.

One such group was the women’s community in Arborek, who play a key role in processing marine products into various saleable goods. They were regularly invited to both general and women’s only FGDs.

The team also interviewed indigenous communities, including the traditional leaders of the Moy and Malaumkarta tribes. These interviews revealed that indigenous peoples view the land and sea as an integrated whole, aligning with conservation and ridge to reef principles.

Speech-impaired and deaf communities were also interviewed, to understand their involvement in natural resource management and the accessibility of public spaces.

While this research project was completed in November 2024, the research team hopes the results will continue to benefit communities well into the future.

To support uptake, researchers presented their findings to various government institutions, including the Regional Research, Development, and Innovation Planning Agency; the Regional Development Planning Agency; the Environment and Forestry Service; the Tourism Office; and the Regional Public Service Agency.

“One of our recommendations is that the Ridge-to-Reef concept is highly appropriate to be implemented in Southwest Papua,” said Mr Haryadi. “The integration of the R2R concept into natural resource management in Southwest Papua is crucial, as it will greatly assist conservation efforts in the region.”

The researchers also experienced personal benefits. Dr Dhiaulhaq said the project enriched his portfolio and experience as a project leader.

“Cross-country collaboration such as this, although not my first time, still provides invaluable experience,” he said.

As a research institution based outside the university sector, WRI Indonesia found the experience of leading the project extremely valuable. The new

and robust collaborations with overseas universities and national research institutions could provide the basis for future environmental research, and have introduced fresh perspectives.

Mr Haryadi noted that these partnerships have exceptional value.

Mr Haryadi also highlighted that funding from KONEKSI increased the research team's confidence, as they succeeded in securing funding from among hundreds of other proposals.

WRI Indonesia plans to ensure the sustainability of the research. As an applied research organisation, they hope to make a tangible contribution to environmental conservation.

This spirit aligns with the words of the residents of Waifo Village in Raja Ampat, who are determined to continue protecting their natural surroundings.

“Because the forest is the mother, and the sea is the father. We protect the mother and father to safeguard the future. If the sea is destroyed, it means the father is destroyed. If the forest is destroyed, it means the mother is destroyed.” ☉

Harvesting Hope by Multiplying the Benefits of Salt Production

A world-first system created in the salt fields of the Madura Strait is bringing together renewable energy, desalination, salt harvesting, seaweed cultivation and fish production to benefit local farmers.



RESEARCH LOCATION

- Madura, East Java



The tide is coming in. It's time to open the floodgates.

Slowly, seawater from the Madura Strait flows into a holding pond, the first step in harvesting salt.

Usually, salt producers directly channel this seawater into shallow ponds, where it dries under the sun. However, at Haji Rohim's salt field in Lebung Village in Pamekasan, Madura, a few extra steps in the process create valuable resources for the community: seaweed, fish, electricity and clean drinking water.

In the holding pond, the seawater is first cleaned of dirt and

microorganisms by seaweed and milkfish, which are later harvested, then pumped into a freshwater processing machine, which outputs drinkable water and an intensely salty brine. The brine is then channelled into the next pond.

This is the power plant reservoir. In this pond, 3.05 metres wide and 1.9 metres deep, with the water level maintained at 1.83 metres. Electricity is harvested using a simple but effective technology: the temperature difference between the water at the top and the bottom of the pond is used to drive a turbine.

RESEARCH TITLE

Harvesting Hope: Renewable Energy, Clean Water and Quality Salt for Madura’s Saltwork Community through Seaweed Farming

PARTNERS



Indonesian Organisations

- 1.Ministry of Marine Affairs and Fisheries
- 2.Universitas Trunodjoyo Madura



Australian Organisations

1. University of Newcastle
2. Royal Melbourne Institute of Technology (RMIT University)

RESEARCHERS

- Prof. Caroline Chan

LEAD RESEARCHER
- Prof. Booi Kam
- Dr Zaki Mahassin
- Prof. Wahyudi Agustiono, Ph.D.
- Nizar Amir

The electricity produced by the turbine is stored in batteries, along with additional electricity from solar panels. That electricity—after being converted into alternating current—is used to run all the pumps, filtration machines, and salt pond lighting.

At the same time, the seawater in the reservoir pond continues to be heated by the sun. As a result of evaporation, the brine becomes more concentrated, starting to form salt crystals even before it makes it into the final drying pond.

Thanks to this salt cultivation system, called ‘coupled seaweed and solar salt farming’ (CSSSF), on each hectare per harvest this system can yield 100 tonnes of salt and two tonnes of seaweed, along with seven quintals of milkfish per harvest. Every eight hours, it can produce 5,000 litres of fresh water and 7 kWh of electricity.

Calculating the economics, a 6-hectare salt field—3.5 hectares for salt ponds, 2.5 hectares for seawater holding ponds—can generate a revenue of approximately IDR 467 million (AU\$ 43,960) per year.



Fishermen harvest seaweed in Desa Lembung, Pamekasan, as part of the Harvesting Hope project. By combining seaweed farming with solar-powered salt production, the project offers a smart, eco-friendly solution to improve coastal livelihoods.

"So, the capital for procuring the CSSSF of IDR 500 million has been recouped in year 1.1," said Associate Professor Wahyudi Agustiono, a researcher and lecturer at Universitas Trunodjoyo Madura (UTM).

A/Prof Agustiono, who is also a professor at the university, is a member of the Indonesian-Australian scientific team that built the CSSSF. Other team members include Professor Caroline Chan from The University of Newcastle, Australia, as project leader; Professor Booi Kam from RMIT University in Melbourne; Mr Nizar Amir from UTM; and Dr Zaki Mahassin, a researcher at the Ministry of Marine Affairs and Fisheries (KKP).

Bringing Together Existing Technology to Drive Innovation

Although the CSSSF in Lembung is a new system—the first of its kind in the world—A/Prof Agustiono said that they did not create new technology.

"What was done was by orchestrating existing technologies," he said.

The idea took shape when Prof Chan—A/Prof Agustiono's former PhD supervisor in Australia—invited him to collaborate on a proposal for the 2023 KONEKSI research grant round.

The grant had a focus on supporting collaborative research to address pressing global environmental issues, particularly climate change and the blue economy.

Following discussions between Prof Chan, A/Prof Agustiono, and Professor Kam, they agreed to centre the project around salt. Since none of the three were salt specialists, A/Prof Agustiono brought in his colleague Mr Amir, a PhD candidate from Malaysia who had in-depth knowledge of the salt and seaweed industries. To further strengthen the team, they also engaged Dr Mahassin, a recognised salt expert who now leads the Seawater Utilisation Team at Indonesia's Ministry of Marine Affairs and Fisheries (KKP).

From an assessment of the problems faced by salt farmers, the team found they were struggling to cope with warmer temperatures due to climate change. Salt farmers, who usually live on the coast, also have limited access to clean water and electricity and need empowerment programs that can increase income.

The team decided to tackle these complex problems through a multi-generation approach, where salt ponds would be harnessed to produce seaweed, fish, electricity, and fresh water—while increasing the yield and quality of salt.

"So, this is a real example of a problem leading to research. This is the most powerful practice at the core of research: if there is a problem, we can research it," A/Prof Agustiono said.

The team looked for the most appropriate technology for each expected output and figured out how to combine these into an integrated system. Electricity production, for example, uses Organic Rankine Cycle (ORC) technology and solar panels. Drinking water production uses three-stage filtration Sea Water Reverse Osmosis technology.

The idea was then shared with Prof Chan, who was born in North Surabaya. She consulted with her colleagues at the University of Newcastle to assess its feasibility.

"My colleagues said that the idea was sound, so we decided to move forward," she explained.

However, she requested that the proposal title be revised, from a focus

solely on salt to the broader theme of harvesting hope. While salt production seems like a local issue, A/Prof Agustiono said, the bigger ideas behind the project have relevance for other coastal communities facing climate challenges, and the concept of hope is universal.

Thus, the title of the initiative is Harvesting Hope: Renewable Energy, Clean Water, and Quality Salt for Madura's Saltwork Community through Seaweed Farming.

For A/Prof Agustino, one of the biggest challenges was the readiness of his institution to engage in international research. Having become a state university only in 2001, the project was the first international collaboration for UTM, and a significant learning opportunity. Limited administrative capacity meant delays to processing funds, as new processes and systems were tested.

However, Prof Chan—who brings decades of experience in international

Salt farmers, who usually live on the coast, also have limited access to clean water and electricity and need empowerment programs that can increase income.

research—understood the challenges her partners at UTM were facing, including administrative hurdles.

“UTM simply didn’t know how to proceed,” she said. “But I told A/Prof Agustiono that he’s a pioneer. What he’s doing now will pave the way for other colleagues who wish to apply for international grants.”

As for technical challenges, the researchers often had to modify their system by trial and error.

“For example, it would turn out that a tool had to be raised so many centimetres to avoid flooding. However, this would then affect its efficiency,” A/Prof Agustiono said.

Prof Chan said that challenges are an inevitable part of any research journey.

“I’ve led many projects, and it’s simply impossible to go through one without facing obstacles,” she said.

“But challenges shouldn’t be a reason to hold back—it’s through them that we grow.”

Trust, Respect and, Understanding

The strong connections between researchers across all institutions,

and farmers on the ground, were fundamental to the project’s success, according to A/Prof Agustiono.

Prof Chan agreed, emphasising the importance of taking time to build understanding.

“How can we truly collaborate if we don’t understand each other?” she said. “This kind of understanding doesn’t happen overnight.”

A/Prof Agustiono and Prof Chan have a long-standing history as research collaborators, with mutual trust and respect a critical basis for their effective communication and teamwork.

In 2020, they worked together on a project titled Cybersecurity in E-Commerce for MSMEs, funded by the Australian Government as part of the E-Commerce for Trade initiative. The project aimed to boost digital security awareness among small businesses.

Professor Chan agreed that strong connections within the team are essential—especially given their diverse scientific backgrounds.

“Ideally, the team should be *gado-gado*,” she said, using the Indonesian term for a mixed salad to highlight the team’s interdisciplinary makeup.

“Our outputs are also *gado-gado*—they may seem unrelated at first glance, but each brings value in a different way.”

She added that while single-discipline research still has its place—particularly in basic science—developing practical, impactful systems increasingly relies on collaboration across fields.

“Globally, we see that the most useful innovations often emerge from multidisciplinary efforts,” she said.

A/Prof Agustiono emphasised that the only members of the project team who were experts on the salt and seaweed industries were Mr Amir and Dr Mahassin.

“We are a team that complements each other,” he stressed.

Another key to the project’s success has been the team’s ability to collaborate across a highly asynchronous setup—navigating differences in time zones, locations, and busy schedules. The team is spread across three countries, with time differences of up to four hours.

As the team leader, Prof Chan understands the challenges of coordinating an international team and leads with both flexibility and empathy. Supporting this effort, Prof Kam often took the lead in setting up meetings and ensuring that action items were

tracked and progressed.

Meanwhile, A/Prof Agustiono played a pivotal role as the local coordinator and innovator, bridging international expertise with community needs in Madura.

A/Prof Agustiono praised the team’s agility and dedication, highlighting how members regularly adjusted their schedules—sometimes meeting outside regular hours or even during holidays. This shared flexibility has been crucial in sustaining the project’s momentum and cohesion.

The team’s dedication even extended to late night monitoring missions. When all of the seaweed in a holding pond died mysteriously, researchers investigated various options to find the cause, but came to a dead end.

Wanting to ensure this event didn’t derail their prototype, the team decided to stay up all night at the holding pond to monitor it.

“We found out that at midnight the sea water receded to a level that the seaweed could not tolerate,” A/Prof Agustiono said.

“So then we then had a new job—to open and close the floodgates in the middle of the night, in the middle of the pond.”

Challenges aside, A/Prof Agustiono said that the most important ingredient for the project's success was working with Haji Rohim and his farmers group, right from the proposal stage.

The farmers need this system and have the resources to operate it, A/Prof Agustiono said. "It's impossible to offer a system to those who don't need it."

Haji Rohim himself was very open to this project, perhaps because he is also a graduate. His open mind made it easier for A/Prof Agustiono and the team to explain the project, including the technology. While not overly complex, "the technology has never been seen [here] before," A/Prof Agustiono said.

Encouraged by the idea of producing salt all year round, farmers took the initiative to make the canals between the reservoir and the pond productive, whether channelling the brine to a salt greenhouse. The farmers also proposed to no longer depend on sea water by making bore wells. So, salt raw materials are available all the time.

Looking to the Future in Madura and Beyond

After finishing the CSSSF prototype, called Tumpang Terang Madura in

Indonesian, the team plans to apply for funding to train Haji Rohim's farmer group how to operate it into the future.

"So that later they can be independent and sustainable," A/Prof Agustiono said.

The training includes a step-by-step process, how to maintain the system, and how to optimise it based on previous best practices.

As part of the Harvesting Hope initiative, the new funding proposal goes beyond technical refinement. It will include comprehensive system testing as well as detailed documentation to support future scalability.

The goal is to ensure that outputs—such as potable water—are not only safe for consumption but also viable for commercialisation.

"[It will be] more than just a record of how the system performs," Prof Chan explained.

"This documentation will enable the prototype to be replicated and modified to suit the specific conditions of different coastal areas."



Farmers harvest salt in Desa Bunder, Pamekasan, on Tuesday (3 July 2018). At the start of this season, Madura salt prices at the farm level range from IDR 1.4 million to IDR 1.9 million per tonne. ANTARA PHOTO/SAIFUL BAHRI

The system has already caught the interest of farmers from elsewhere in Madura. At an industrial forum event that showcased the technology, farmers from Sumenep thought the system could help them better store their catches.

"The fishermen in this place often get a lot of fish, but they rot quickly, because they have coolers but they don't have electricity," A/Prof Agustiono said.

Given that Harvesting Hope initiative brings together renewable energy, desalination, salt harvesting, and seaweed cultivation in a single

integrated system, clear documentation is essential—not just for replication, but also for encouraging adoption by other communities facing similar environmental and economic challenges.

The entire system may not need to be fully duplicated—other communities may select one or two components to suit their needs.

"Like playing with Lego, it can be put together to get the most suitable arrangement. Or even to create new value as well," A/Prof Agustiono said. ©

ECHOES OF PARTNERSHIP

Stories From the Australia-Indonesia
Research Collaborations
Facing Shared Climate Challenges

CHAPTER

6

CONCLUSION

Strengthening Collaboration for A Better Future

In a small village in East Lombok, cattlemen must travel dozens of kilometres to find livestock feed during the dry season. In East Sumba, a mother lost all her livestock to an outbreak of African swine fever. In Central Java, tidal floods have submerged villages and wiped out farmland that serves as the backbone of the local economy. These events across the Indonesian archipelago highlight one undeniable truth: climate change poses a real and pressing threat to daily life.

Despite the hardships, these stories also inspire hope. Collaborative research by teams from Indonesia and Australia demonstrate that, with the right approaches, these challenges can be turned into opportunities. By analysing data, amplifying community voices –including those from often marginalised groups–and developing evidence-based solutions, KONEKSI has created a solid foundation for stronger, evidence-based and inclusive climate policies and action.

It is undeniable that climate change is a global challenge that no single nation can tackle alone. A collaborative

approach that combines scientific knowledge, local wisdom, modern technology, and inclusive policies is essential to creating sustainable solutions. These partnerships between Indonesian and Australian researchers are a prime example of how cross-country cooperation can bring positive outcomes for communities, the environment, and global development.

The Importance of Cross-Country Collaboration in Tackling Climate Challenges

Mutual respect and an understanding of each country's local context are essential lessons learned by researchers across many KONEKSI projects. These principles underpin the program's commitment to equitable partnerships, and result in tangible impacts.

For example, one project in Kalimantan examined customary land governance systems, leading to the development of more inclusive and relevant policies that are widely accepted by local communities, while supporting sustainable environmental conservation.

KONEKSI partnerships also facilitate valuable two-way learning

by providing opportunities for Indonesian researchers to share their expertise internationally. One such researcher from Universitas Andalas, Arrum Harahap, who was supported by KONEKSI, recently presented his work at the Community of Ecosystem Services Conference (ACES) in Austin, Texas. His research, conducted with Simone Maynard of Griffith University, examines climate change adaptation among indigenous women in Indonesia and Australia, focusing on the critical role of ecosystem services and the invaluable contribution of women to sustaining, adapting and scaling solutions. Mr Harahap's participation fostered valuable discussions and exchange with global experts.

Catalysing the power of technology for addressing climate impacts at the local, regional and global levels is yet another area where fruitful collaboration has the potential for wide-ranging benefits. For instance, the Tide-Eye technology, developed jointly between Indonesian and Australian partners, has become a model for real-time monitoring of tidal flooding – an issue in many cities and towns in Indonesia and beyond. Tide-Eye demonstrates that technological innovation not only assists governments in planning, but also strengthens community resilience,

Research involving universities and institutions from both countries has led to more effective, evidence-based and targeted policies.

enabling them to safeguard lives and assets against the increasingly frequent impacts of climate change.

Research involving universities and institutions from both countries has led to more effective, evidence-based and targeted policies. For example, the Future Proofing a Basic Social Service: Climate-Resilient Community-Based Rural Water Supply project has helped rural communities restore degraded water springs, ensuring long-term water security in the face of climate change.

Further insights from the partnership underline the importance of

empowering vulnerable groups and local communities. Edu-games in East Nusa Tenggara involve children, including those with disabilities, in understanding climate challenges through engaging educational activities, providing them with the information they need to be agents for change. Women's agricultural collectives in Yogyakarta support sustainable livelihoods and promote improved practices.

While much research focuses on creating new solutions, building on what we have is equally important. For example, local communities in Pekalongan, Alor, Marunda, and Poso

have shown remarkable resilience in confronting climate change. Research-based training programs have empowered women in Alor, East Nusa Tenggara, to better understand the impact of climate change on family health, including ways to combat malnutrition and stunting caused by crop failures. This has positioned them as key defenders of community well-being. Meanwhile, in Marunda, North Jakarta, local health workers have received training to deliver more responsive healthcare services to address diseases exacerbated by flooding.

Inclusion as A Cornerstone of Climate Policy

Vulnerable groups such as women, children, people with disabilities, and indigenous communities are often the most affected by climate change. Many existing climate policies fail to address their specific needs.

Sometimes policies with the best intentions can have unintended consequences if they are not informed by gender, disability and social inclusion principles. Research into Indonesia's energy transition reveals that net-zero emission policies could drive up commodity prices, disproportionately impacting female-

headed households and families with disabled members. As a result, this research stresses the need for policies that address social impacts alongside environmental goals.

Initiatives like Feminist Participatory Action Research (FPAR) in Poso, Central Sulawesi, are also empowering indigenous women to play a greater role in preserving ecosystems. This approach ensures that women's voices are not only heard but also integrated into decision-making processes. Through this process, gender equality is seen not just as a social objective but as an integral part of effective environmental sustainability.

In Ambon, the digitalisation of climate vulnerability maps is improving disaster response, particularly for vulnerable groups such as women and children.

These examples illustrate how research not only influences policies, but transforms everyday lives.

Inclusive policies ensure that solutions to the climate crisis are equitable and sustainable. By addressing the needs of vulnerable groups and ensuring all voices are heard and empowered, we can create a more resilient and fair future for all.



Future Climate Policy Partnership Agenda

KONEKSI collaborative knowledge partnerships open new opportunities for cross-country cooperation in research and innovation.

The findings of KONEKSI research projects have potential to inform locally-led development approaches elsewhere: for example, the restorative justice approach implemented in East Sumba could be a model for community-based natural resource management.

Similarly, the Tide-Eye technology developed in Semarang offers a promising example for adaptation in countries like the Philippines and Maldives, which face similar threats from rising sea levels.

Ensuring a just energy transition is a critical focus for individuals, communities and economies across the globe. KONEKSI-supported simulations on the impact of net-zero emission policies highlight the need for inclusive approaches that address the needs of vulnerable groups, and could improve understanding for

other middle income economies wanting to transform their energy systems without compromising social equity.

Conclusion

Although the 20 KONEKSI-supported research projects featured in this book explore a broad range of issues related to the environment and climate change, many common themes and messages have emerged.

Climate change is a global threat that demands cooperative solutions. Communities, policymakers and researchers are key partners in finding the way forward. By integrating scientific knowledge, local wisdom, modern technology, and inclusive policies with a strong evidence base, we can better manage the climate challenge.

Success stories, from kitchens in Poso to high-tech networked solutions in Semarang, show us the potential of innovation, collaboration and resilience. By transforming these valuable lessons into policies and practices, we can build a fairer and more sustainable future for all. ☺

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ECHOES OF PARTNERSHIP

As Indonesia and Australia confront pressing climate challenges, this book stands as a testament that the most effective solutions are forged through collaboration.

Delve into 20 transformative research stories from the KONEKSI program, a collaborative initiative in the knowledge and innovation sector supporting the Australia-Indonesia partnership, where scientific innovation is interwoven with local wisdom.

Discover how the Tide-Eye project, which leverages artificial intelligence (AI) and Internet of Things (IoT) technology, monitor tidal floods along the northern coast of Java. Meanwhile, a study on the Kajang indigenous community in South Sulawesi highlights how traditional knowledge and local wisdom can support sustainable environmental management and climate resilience.

This is more than a mere collection of research; it is a pathway towards a more resilient and equitable future. An invitation to learn, be inspired, and to act.

ECHOES OF PARTNERSHIP

AN INFOGRAPHIC BOOKLET

**The Australia-
Indonesia Partnership
for a Climate-
Resilient Future**



ECHOES OF PARTNERSHIP

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for a Climate-Resilient Future**

ECHOES OF PARTNERSHIP -
AN INFOGRAPHIC BOOKLET

The Australia-Indonesia Partnership
for a Climate-Resilient Future

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INTRODUCTION: BUILDING A RESILIENT FUTURE TOGETHER

Climate change is no longer a distant threat; it is a lived reality affecting lives across the globe, from the devastating tidal floods in Indonesia to the intense bushfires in Australia. These environmental shifts do more than damage landscapes; they threaten the livelihoods, health, and security of our communities—particularly those who are most vulnerable. Facing such complex challenges requires more than just local action; it demands cross-border collaboration and innovative thinking.

The KONEKSI — Australia-Indonesia Knowledge Partnership Platform — stands at the forefront of this mission, serving as a model for collaborative solutions that are both innovative and inclusive. This booklet summarizes the findings of 20 research projects that bridge the gap between high-level science, government policy, and the practical needs of the community. They are parts of KONEKSI's broader Environmental and Climate Change (ECC) research grants, which funded 38 projects.

Research projects in this booklet are also included in a book titled “Echoes of Partnership: Stories from the Australia-Indonesia Research Collaborations Facing Shared Climate Challenges”, which highlights the stories and collaborative journeys behind each project.

The research projects are organized into four key thematic pillars:

1. **Community Adaptation and Resilience:** Strengthening the ability of local communities to adapt to climate changes.
2. **Disaster Mitigation and Risk Management:** Utilizing technology and traditional wisdom to mitigate and manage disaster risks.
3. **Health and Wellbeing in a Changing Climate:** Addressing climate change impacts on human health
4. **Environmental Sustainability and Innovation:** Driving the transition toward a more sustainable future.



At the heart of every project is a commitment to inclusivity. KONEKSI ensures that vulnerable groups—including women, children, indigenous peoples, and people with disabilities—are at the very center of the solutions we design. Whether through AI-powered flood monitoring systems like Tide-Eye, the integration of indigenous knowledge in forest fire mitigation, or the use of creative edu-games to empower the next generation, these projects demonstrate that everyone has a role to play in climate action.

We hope this infographic booklet serves as a source of inspiration for policymakers, researchers, and the public. By combining collaboration, innovation, and a focus on equity, we can build a future that is not only more resilient and sustainable but also fairer for all.

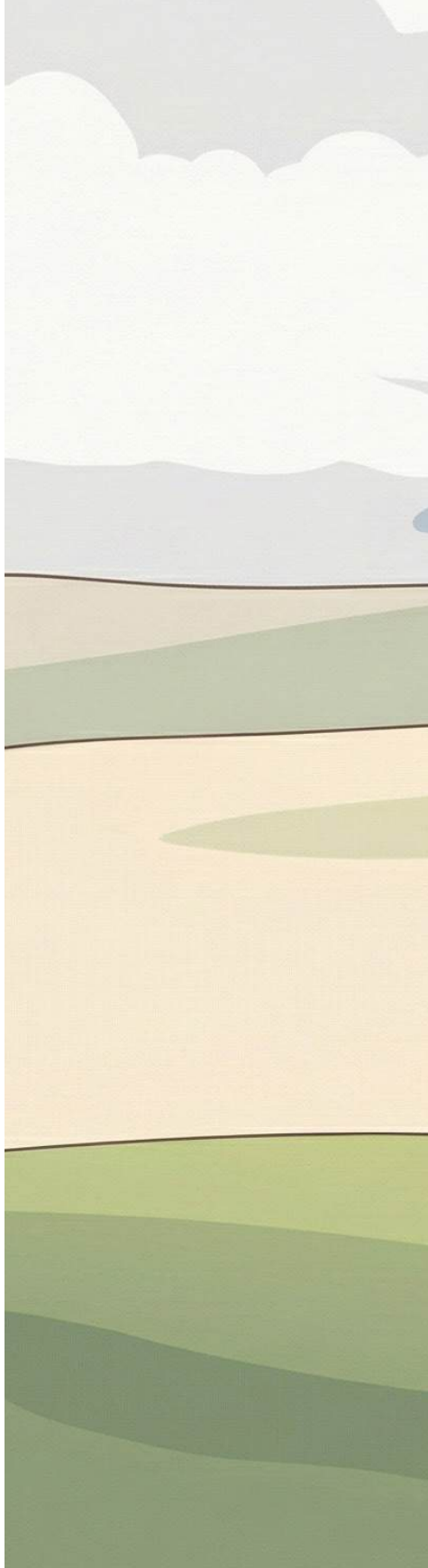
**ECHOES
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2

**COMMUNITY
ADAPTATION
AND RESILIENCE**

(Illustration) Head of tribe, Luta Ndakuanau, stands on the meadow in a Pambotajara village on March, 2013 in Sumba Island, East Nusa Tenggara, Indonesia.
(Photo by Ulet Ifansasti/Getty Images)





THE IMPACTS OF CLIMATE CHANGE ON CHILDREN AND ADOLESCENTS

Children and adolescents often perceive climate change as an unavoidable fate. Thus, PUSKAPA UI & the ANU highlight the importance of community-based approaches to raise young people's awareness of the impacts of climate change.

Research Objectives



To understand children's and adolescents' perspectives on climate change



To examine the links between climate policies & the challenges faced by marginalised young people



To promote justice in climate policy

Research Locations: Jakarta, Pekalongan, and Pontianak

Temperature increases (1993–2023) negatively affected children and adolescents.



1993 (Average temperature)



2023 (Average temperature)



Key Outcomes

Pekalongan: Tidal flooding cuts children's access to gardens

Pontianak: Haze from forest & land fires disrupts school activities

Jakarta: Extreme heat causes skin rashes and itching among children

Recommendations

Expand government focus on climate impacts in everyday life

Strengthen youth engagement in community-based climate actions

Address structural inequalities related to climate change

Provide an adaptive and long-term social protection scheme for marginalised communities

Key Social Impacts



Young people lack confidence in decision-making



Children & adolescents are insufficiently involved in climate issues



Their critical voices are often overlooked

Notes:

- PKH (Family Hope Programme)

Source: Research "Moving Towards Just Climate Governance: Understanding Climate Change from the Standpoint of Marginalized Children and Young People in Indonesia"

Participating Organisations



Indonesian Organisation

- Centre on Child Protection and Wellbeing (PUSKAPA Universitas Indonesia)



Australian Organisations

- Indonesia Project of the Australian National University



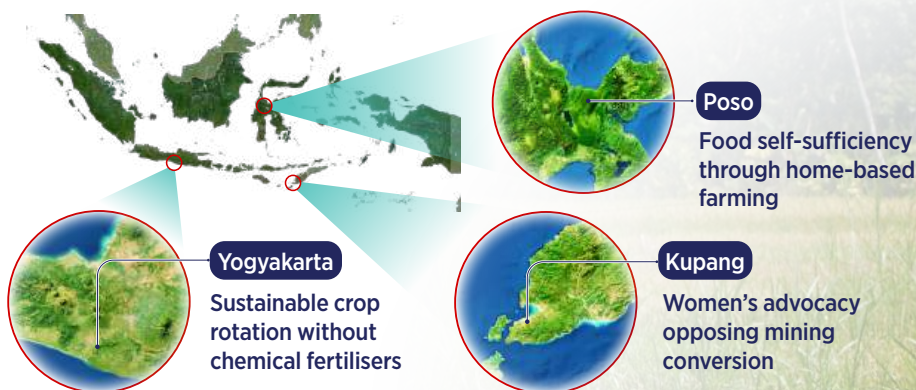
THE ROLE OF WOMEN'S ADVOCACY IN CLIMATE ADAPTATION

FPAR for Climate Change Research

A participatory research method that engages grassroots women to understand systemic injustices and advocate for gender and social justice in climate issues.

This research highlights the critical role of women in environmental adaptation. Using the FPAR approach, researchers mapped and strengthened women-led advocacy networks to advance climate and gender justice

Research and FPAR Implementation Locations



The Role of Women's Advocacy Networks in Climate Adaptation:



Raising Awareness: Climate adaptation through trusted community spaces (Institut Mosintuwu)



Strengthening Communities: Establish sustainable women farmers' groups (Solidaritas Perempuan Kinasih)



Promoting Recognition: Women farmers' groups in Yogyakarta formally recognised & certified by the Provincial Government



Responsive Policy Action: JPIT in Kupang actively responds to mining regulations & their climate impacts

(Photo by: Arterra/Universal Images Group via Getty Images)



Challenges in FPAR

- Limited participation of women
- Insufficient social & adaptation data
- Restricted access to adaptation programmes
- Overly technocratic & gender-neutral policies
- Persistent patriarchal norms

Key Outcomes

- Implement inclusive climate policies
- Expand data on climate change impacts
- Improve access to adaptation programmes & social protection
- Strengthen gender-responsive capacity building
- Enhance collaboration between the state & communities

Notes:

- FPAR (Feminist Participatory Action Research)
- JPIT (Jaringan Perempuan Indonesia Timur)

Source: Research “Inclusive Climate Adaptation: The Roles of Women’s Climate Advocacy Network”

Participating Organisations



Indonesian Organisation

- Universitas Negeri Semarang (UNNES)
- Universitas Gadjah Mada (UGM)
- Institut Mosintuwu
- Sri Institute
- Solidaritas Perempuan Kinasih
- Jaringan Perempuan Indonesia Timur (JPIT)



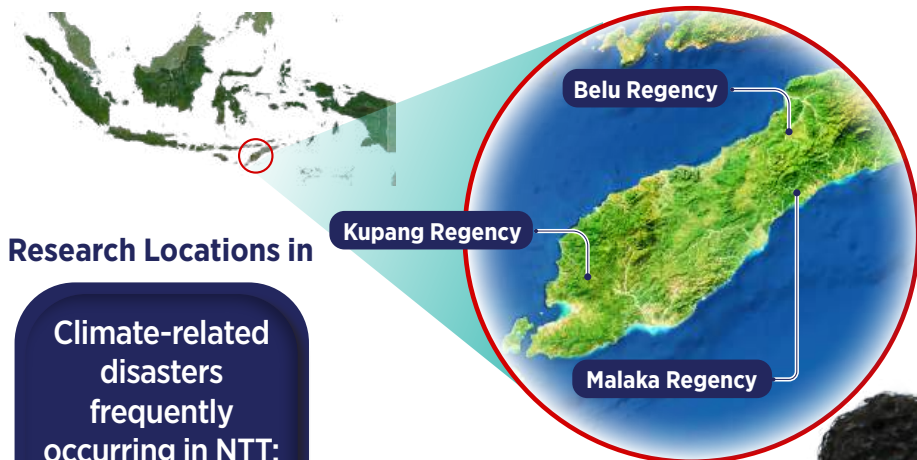
Australian Organisations

- Australian National University (ANU)
- University of Western Australia



TACKLING CLIMATE CHANGE THROUGH GAMES

Indonesian and Australian researchers worked with children and adolescents to create educational climate change games (edu-games), highlighting the role of youth in climate solutions.



Climate-related disasters frequently occurring in NTT: Floods, droughts, storms, and tidal flood

Children are highly vulnerable to climate change & natural disasters



Their health, nutrition, & education are at risk

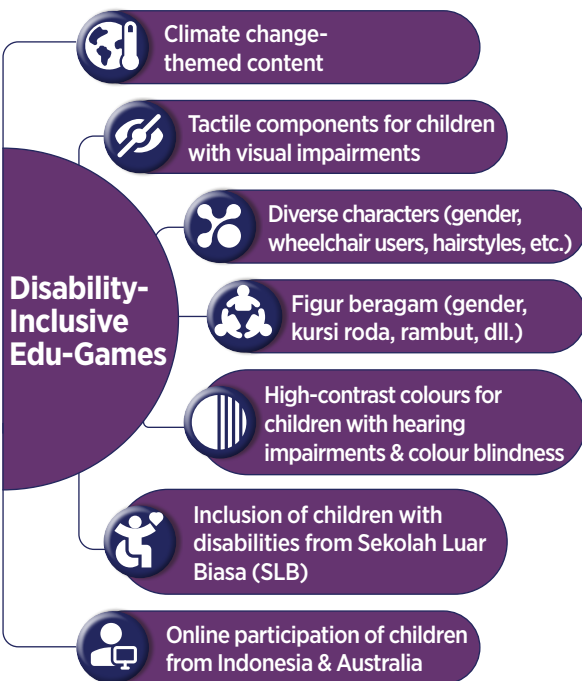


The risk of violence increases during disasters



3 out of 4 children have limited knowledge of climate change





Key Outcomes

Edu-games help children understand environmental & climate issues

Generaksi's educational materials and games have been distributed across 8 provinces in Indonesia.

Recommendations

Integrate edu-games into learning to strengthen climate education & disaster preparedness

Promote collaboration between teachers, schools, & government to enhance student awareness of climate change and disasters

Source: Research "Enabling Children as Agents of Change through Inclusive Edu-Games on Climate Change and Disaster Resilience"

Participating Organisations



Indonesian Organisation

- PREDIKT Tangguh Indonesia
- Universitas Nusa Cendana
- Universitas Multimedia Nusantara
- ChildFund Indonesia
- Masyarakat Penanggulangan Bencana Indonesia



Australian Organisations

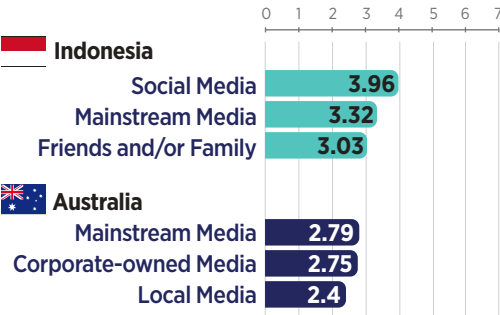
- Charles Darwin University
- The University of Western Australia
- Harkaway Primary School



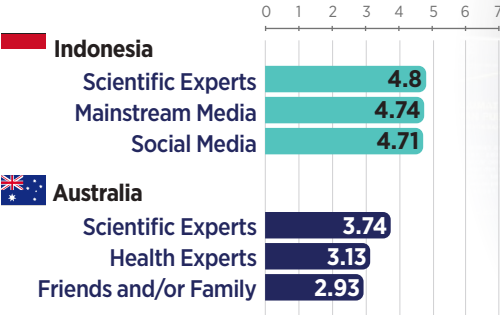
MEDIA AND CLIMATE CHANGE: A PROBLEM OR A SOLUTION?

Rural communities are highly vulnerable to climate impacts yet have limited access to information. This research has developed an AI-based fact-checking tool in Indonesian & English that provides credible, real-time climate information.

3 Most Common Climate Information Sources



3 Most Trusted Climate Information Sources



*Average trust score from scale 1 to 7, 1 = not at all trustworthy, 7 = very trustworthy



Research Locations

Indonesia

Australia



MECHANICAL AND INDUSTRIAL ENGINEERING



Many Indonesians believe climate change is driven by natural cycles

	 Indonesia	 Australia
Human activities	50%	63.2%
Natural processes/ cycles	40%	28%
Divine intervention	8.6%	0.4%
Fate	1.2%	1%
Does not exist (does not believe in climate change)	0.4%	5.2%
Other	0.1%	2.1%

Samples

 1,234 respondents across 7 states

 1,048 respondents across 33 provinces



Fewer Indonesians than Australians believe climate change is caused by **human activities**.



More Indonesians than Australians believe climate change is driven by **natural cycles**.



Limited information in villages shapes how people understand climate causes.

Research impacts:

Tackling climate misinformation

Supporting data-driven decision making

Strengthening community resilience & participation

Providing real-time insight

Improving the accuracy of fact-checking

Recommendations

Strengthen climate change reporting & education, including on social media

Link news to the real-world impacts of climate change

Involve rural communities to improve climate policy literacy

Source: Research “Building Resilience in At-Risk Rural Communities through Improving Media Communication on Climate Change Policies”

Participating Organisations



Indonesian Organisation

- Universitas Gadjah Mada



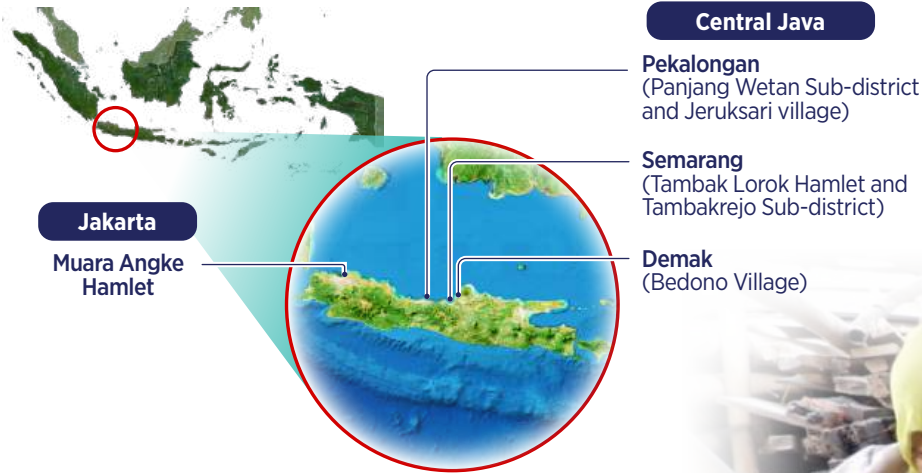
Organisasi Australia

- Deakin University
- University of Tasmania (UTAS)

STRENGTHENING THE RESILIENCE OF WOMEN AND CHILDREN TO FLOOD RISKS

Sea-level rise and tidal flooding along the north coast of Java have triggered an economic crisis, forcing women and children into unprotected work. The research team was seeking practical solutions while promoting cross-sector collaboration.

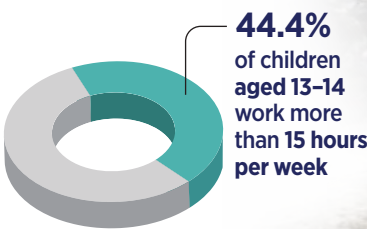
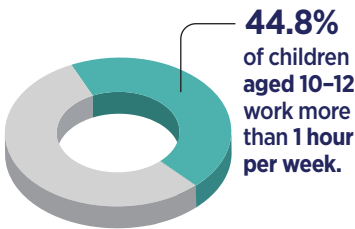
Research Locations in Affected Areas



Climate Impacts on Children and Women

Result of a survey of 315 women & 85 children, July 2023 - June 2024 in the affected areas:

1. Child Labour in Exploitative Conditions



(Photo by SOPA Images/Getty Images)



2. Women Experience Physical and Psychological Distress



Nearly **40%** of women report psychological disorders



46% of women report headaches/stomach aches



Nearly **60%** of women struggle & feel exhausted at work



40% of women have migrated from their home villages

Recommendations

Revise the Disaster Management Law & develop a dedicated climate change law

Align mandates & budgets to support the relocation of affected residents

Improve the skills of women & children for safer, better work opportunities

Enforce labour regulations, especially in sectors with high environmental risk

Source: Research “Compelled Labour and Climate Change: Keeping a Focus on Women and Children”

Participating Organisations



Indonesian Organisations

- Universitas Diponegoro
- Pusat Riset Hukum (PRH) BRIN
- Badan Riset dan Inovasi Nasional
- Urban Initiative for Climate Change (IKUPI)
- Centre for Regional Research and Information (Pattiro)



Australian Organisation

- Griffith University



LEARNING FROM LOCAL RESILIENCE

Disasters, climate change, and poverty reinforce each other, pushing vulnerable households deeper into poverty. In Indonesia, many communities rely on post-disaster coping strategies that weaken long-term resilience. Adaptive Social Protection (ASP) offers a more proactive and resilient approach.

Location



ASP => An integrated approach that combines social assistance, social insurance, livelihoods, disaster risk management, and climate adaptation to help communities anticipate, cope with, and recover from shocks. This approach is adopted in Indonesia's national development strategic planning as part of the social transformation agenda, as articulated in:

RPJPN 2025–2045

RPJMN 2025–2029



Challenges



Inadequate cross-sectoral coordination (social protection, DRM, climate)



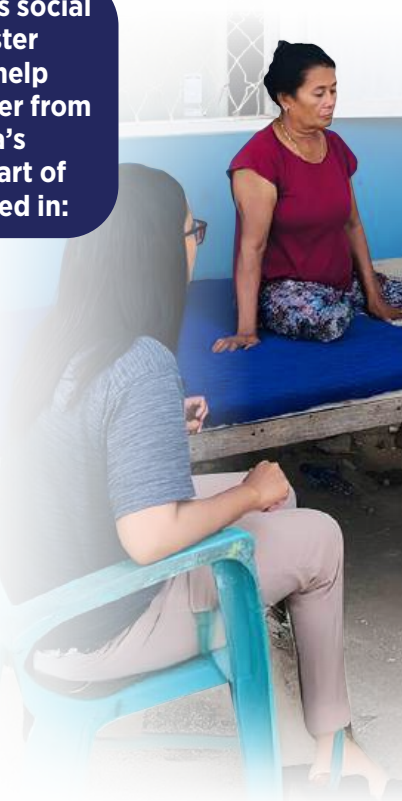
Fragmented & outdated poverty & disaster data



Limited local government capacity & financing flexibility



Informal support systems are shrinking under widespread poverty



Sikepangmas:
Example of community-based ASP in East Sumba. It complements formal social protection programmes by strengthening early action and local preparedness through:



Early warning for food insecurity



Disaster risk monitoring



Local government leadership

The strategic role of multi-stakeholder collaboration in building resilient communities:

Government

- Strengthen ASP policy integration across sectors
- Improve data integration (socio-economic registry & hazards data)
- Ensure contingency financing & scalability mechanisms

Communities

- Recognise and strengthen local wisdom & informal safety nets
- Support community networks & trust-based systems

NGOs & Partners

- Align programmes with government ASP frameworks
- Support capacity building & innovation

Source: Research “Towards Future Proof Society: Adaptive Social Protection Against Climate Change”.

Participating Organisations



Indonesian Organisations

- Resilience Development Initiative
- Universitas Pendidikan Indonesia
- Universitas Kristen Wira Wacana
- The PRAKARSA
- Habitat for Humanity Indonesia
- Institute of Resource Governance and Social Change



Australian Organisation

- Charles Darwin University

Notes: **RPJMN** (National Medium-Term Development Plan),
RPJPN (National Long-Term Development Plan),
Sikepangmas (Community Food Security Action Information System).

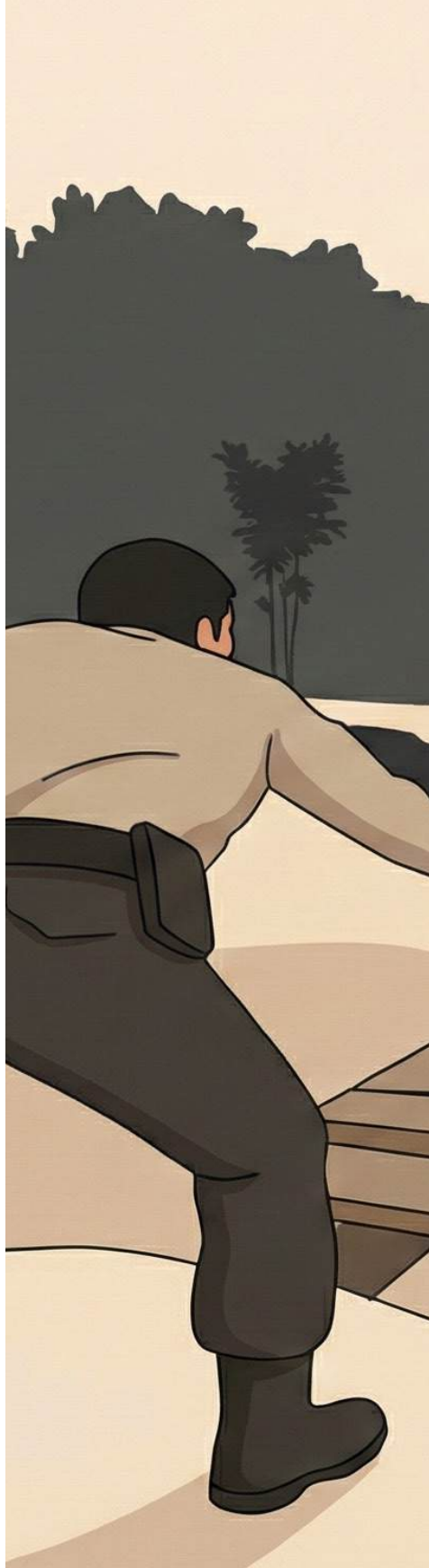
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3

DISASTER MITIGATION AND RISK MANAGEMENT

(Illustration) A police officer attempts to extinguish a fire burning on a plot of land in Palangkaraya, Central Kalimantan, on 14 September 2019.
(Photo by Ulet Ifansasti/Getty Images)





TIDE-EYE, THE MONITOR OF THE NORTHERN COAST OF CENTRAL JAVA

Tide-Eye addresses tidal flooding along the northern coast of Central Java by integrating AI, IoT, and drone technology to enable real-time flood monitoring.

Tide-Eye targets 3 cities frequently affected by tidal flooding



Pekalongan



Semarang



Demak

Intelligent Tidal Flood Mitigation System



AI, radar, and cameras monitor sea water levels and issue early warning alerts.



Drones & AI map affected areas for rapid action via the BBWS dashboard

Workflow



REAL-TIME DATA COLLECTION

Water Radar
Sensors + Smart
Cameras + Aerial
Drones

SMART DATA TRANSMISSION & PROCESSING

Cloud Server +
AI/ML : Water
Level Detection,
Mapping, Risk
Prediction

EARLY WARNING SYSTEM

Web Dashboard
+ Mobile App
+ Automated
Alerts

MITIGATION ACTIONS

Remote
Activation of
Water Pumps
+ Timely
Evacuation

POSITIVE IMPACTS

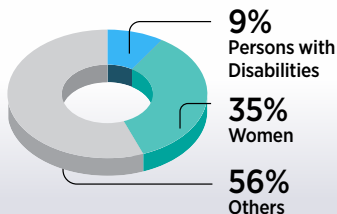
Accuracy &
Efficiency +
Loss Reduction
+ Resilience +
Inclusivity



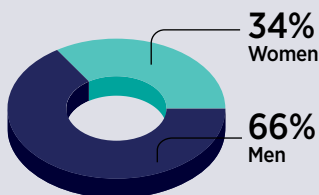
Tide-Eye, an Inclusive Project

Women, persons with disabilities, & vulnerable groups are involved, from project planning to the implementation

Women and persons with disabilities accounted for **44%** of 23 participants



BBWS staff composition: **34%** women, **66%** men.



**Aligned with
SDG Principles:**

06
CLEAN WATER
AND SANITATION



11
SUSTAINABLE
CITIES &
COMMUNITIES



13
CLIMATE ACTION



17
PARTNERSHIPS
TO ACHIEVE
THE GOAL



Impacts

Technology-based solutions for tidal flood mitigation

Strengthen inclusive policies & local partnerships

Enhance Indonesia-Australia collaboration on climate change issues

Recommendations

Ensure gender & disability representation in all aspects

Develop more accessible applications for people with visual impairments

Source: Research “Tide Eye - AI/IoT-Powered Airborne System for Monitoring Water Level and Tidal Floods in North Coast of Central Java”

Participating Organisations



Indonesian Organisations

- Telkom University
- Balai Besar Wilayah Sungai Pemali Juana (BBWS Pemali Juana), The Ministry of Public Works and Housing
- PT. Hilmy Anugerah Consulting Engineer Ltd. (PTHA)



Australian Organisation

- University of Wollongong (UOW)

Notes: **BBWS** (River Basin Authority) | **AI** (Artificial Intelligence) | **IoT** (Internet of Things)



INDIGENOUS COMMUNITIES DON'T DOWNPLAY FIRE

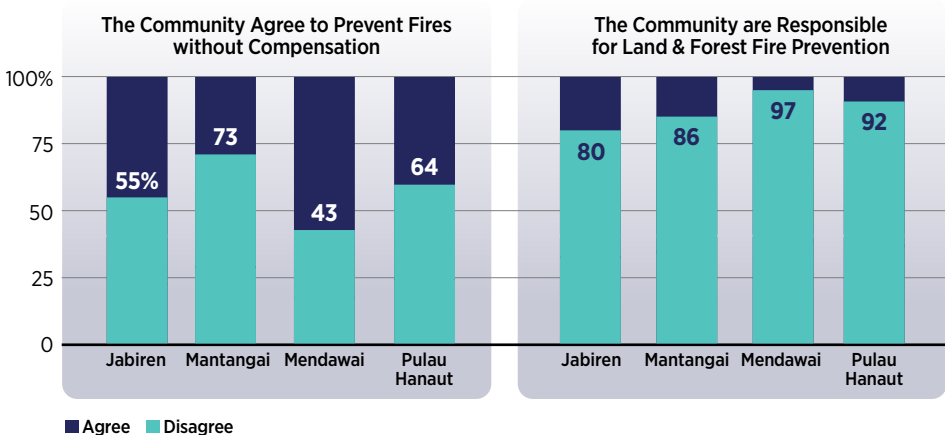
This research highlights the role of Indigenous communities in forest fire management and demonstrates that local knowledge can be a critical part of the solution.

4 Districts in Central Kalimantan are at Risk of Forest and Land Fires



Research Findings

Indigenous Dayak communities across 4 districts are willing to prevent forest & land fires voluntarily, even when it is not formally their responsibility



Forest fire mitigation strategies must be contextualised and locally adapted.

LAND & FOREST FIRE MITIGATION	CHALLENGES	IMPACTS
Enforcement of Law No. 6/2023 banning land clearing by burning	Aggressive patrols & arrests intimidate residents, leading to village abandonment	Reduced trust and cooperation between government & communities
Promotion of non-burning, non-chemical farming	Programmes misaligned with community needs & Gov. Regulation No. 52/2008 on controlled cultural burning	Continued land burning & weak enforcement
Establish RSA & MPA groups in every village for fire prevention, monitoring, & mitigation	Low wages for RSA members (IDR 100,000/day), no job security, limited equipment	Suboptimal performance of RSA & MPA due to funding and resource constraints

Recommendations



Strengthen disaster preparedness through community-government town watching initiatives



Increase mitigation budgets & private sector partnerships



Integrate local knowledge, women, & vulnerable groups

Source: Research “Fire Play: Documenting and Understanding Indigenous Fire Governance”

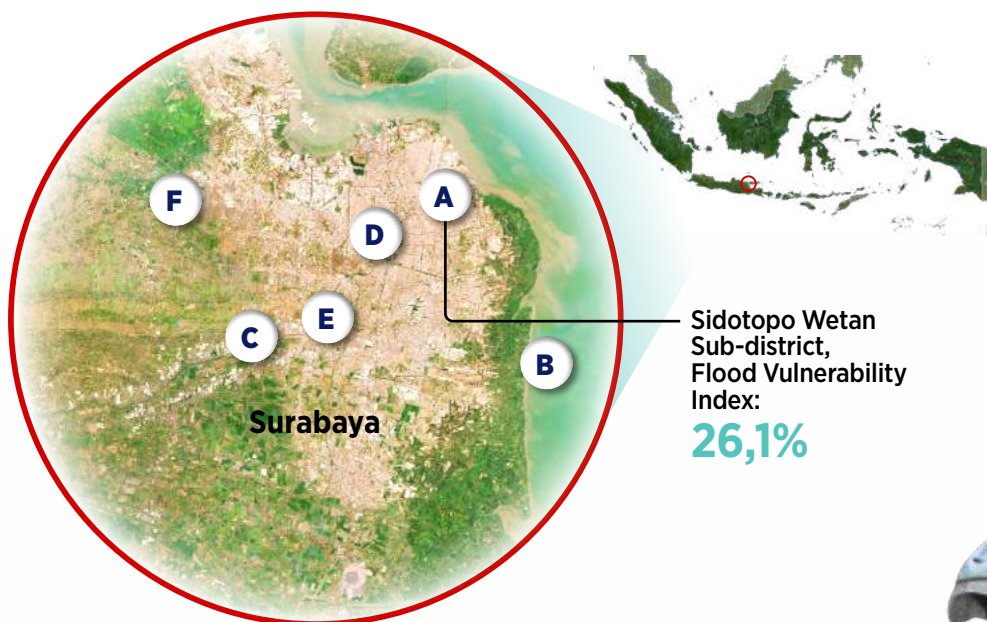
Participating Organisations

 Indonesian Organisations	 Australian Organisation
• Universitas Indonesia • Yayasan Puter Indonesia • Pusat Riset Kewilayahan, Badan Riset & Inovasi Nasional	• The University of Melbourne

Notes: **RSA** (Fire Response Unit) | **MPA** (Fire-Care Community)

PREPARING VULNERABLE GROUPS FOR FLOOD RISKS

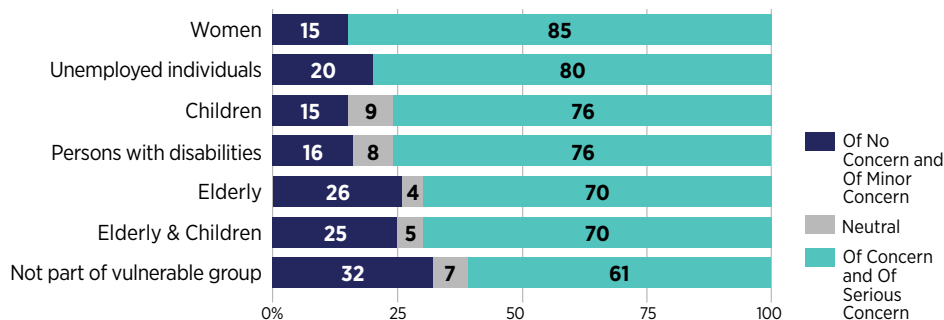
Climate change has made flooding in Surabaya more extreme and unpredictable. This research proposes strategies to strengthen resilience among vulnerable groups and children in flood-prone areas.



The flood vulnerable index table of 6- sub districts in Surabaya is as follows:



Flood concern levels among households with vulnerable members:



Conclusion: Households with vulnerable members show the highest levels of concern regarding flooding.

CHALLENGES

POLITICAL & ECONOMIC

1. Limited research on disasters
2. Insufficient flood mitigation funding

HR & SOCIO-CULTURAL

1. Limited government & community capacity
2. Low community participation

INFRASTRUCTURE & ENVIRONMENT

1. Poor drainage systems
2. Narrow & poorly maintained waterways

RECOMMENDATIONS

1. Cross-sector collaboration
2. Increase & diversify local budgets

1. Flood preparedness training
2. Empower KSH to support vulnerable groups

1. Improve drainage infrastructure
2. Engage communities in waterway maintenance

Source: Research “Strengthening the Flood Resilience Capabilities of Vulnerable Groups”

Participating Organisations



Indonesian Organisations

- Institut Teknologi Sepuluh Nopember
- Surabaya City Government



Australian Organisations

- Queensland University of Technology
- University of Technology Sydney

Notes: **KSH** (Surabaya Resilient Cadres) | **HR** (Human Resources)
Photo Credit: ANTARA FOTO/Didik Suhartono

RESTORATIVE JUSTICE FOR THE EARTH AND HUMANITY

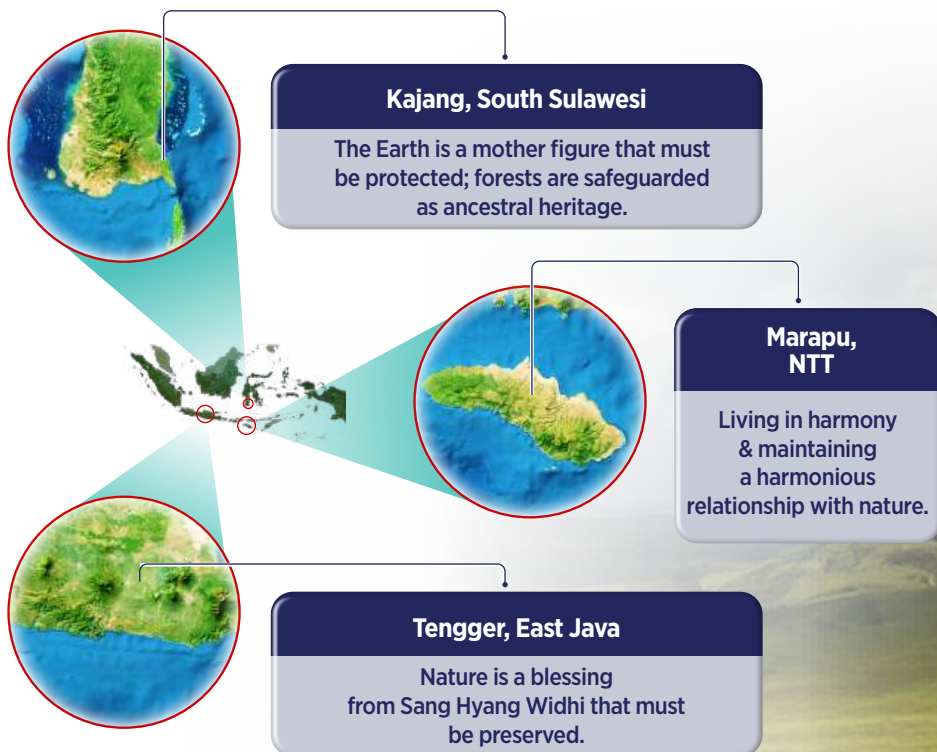
Indigenous communities live in harmony with nature but remain vulnerable to climate change. This research examines how communities in Kajang, Tengger, and Marapu respond to climate challenges through a restorative justice approach.

Restorative Justice for Climate
refers to restoring damaged relationships between people, communities, and nature caused by climate change



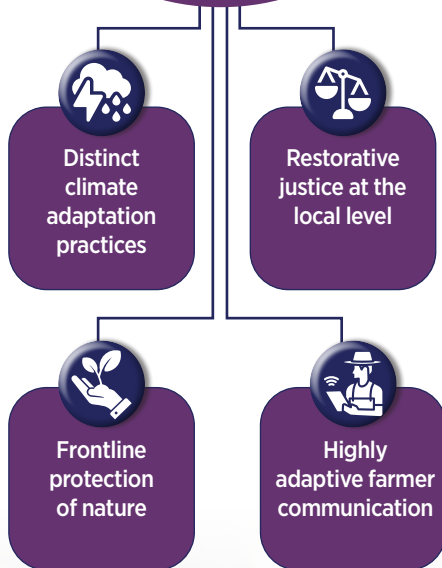
INDIGENOUS COMMUNITIES AS GUARDIANS OF THE EARTH

Despite differences in character recognition, Indigenous communities share spiritual & ecological values in safeguarding the Earth.



(Photo by Ulet Ifansasti/Getty Images)

INDIGENOUS COMMUNITY CONTRIBUTIONS



Recommendations

- 1. Infrastructure & Technology:**
 - Develop inclusive disaster response guidelines
 - Early warning systems
 - Disability-friendly evacuation shelters
- 2. Organisational Strengthening:**
 - Strengthen capacity of disaster responders
 - Improve disability awareness services
- 3. Inclusive Policies:**
 - Sirens accessible for people with hearing impairments
 - Safe spaces for people with visual impairments
 - Emergency exit access for wheelchair users

Source: Research “Exploring the Practice of Restorative Justice Framework to Build Resilience and Address Climate Change Harms in Indonesia”

Participating Organisations



Indonesian Organisation

- Universitas Brawijaya



Australian Organisations

- Australian Catholic University
- Australia Indonesia Disability Research and Advocacy Network

Notes:
NTT (East Nusa Tenggara)



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4

HEALTH AND WELLBEING IN A CHANGING CLIMATE

(Illustration) Researchers explain the technical use of the primary healthcare dashboard to help mitigate climate change risks.





ANTICIPATING THE IMPACTS OF CLIMATE CHANGE ON PUBLIC HEALTH

This research finds that primary healthcare services need to be strengthened through the use of climate-resilient health service dashboards.

Hazard Index Analysis

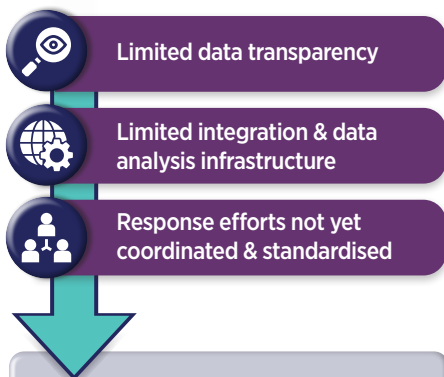


	Banda Aceh (Aceh)	Mataram (NTB)	Ambon (Maluku)
Quadrant 1	64 villages	42 villages	45 villages
Quadrant 2	26 villages	8 villages	5 villages
Total	90 villages	50 villages	50 villages

Quadrant 1: High hazard, low adaptive capacity
Quadrant 2: Potential hazard, high adaptive capacity

Overall Risk Profile:
High Risk: 92.11%
Very High Risk: 7.89%

Primary healthcare services have not been optimal in addressing climate change impacts due to:



The **CORE-STEP** dashboard strengthens primary healthcare/ Puskesmas to be more resilient, inclusive, & sustainable in responding to climate impacts.



CORE-STEP DASHBOARD IMPACTS:



Recommendations

Integrate cross-agency data

Use the **CORE-STEP** Dashboard for policy planning & budgeting

Enhance the capacity of healthcare workers

Strengthen regional partnerships in climate-related programmes

Source: Research “**CORE-STEP: Advancing Innovative Knowledge-Based Solutions for Inclusive and Climate Ready Primary Health Care Systems**”

Participating Organisations



Indonesian Organisations

- Universitas Syiah Kuala
- Universitas Mataram
- Universitas Pattimura
- Kementerian Kesehatan
- ICLEI Indonesia – Local Governments for Sustainability
- Cerdas Antisipasi Risiko bencana (CARIII)
- Yayasan Lingkar Pemberdayaan Perempuan dan Anak (LAPPAN) Maluku



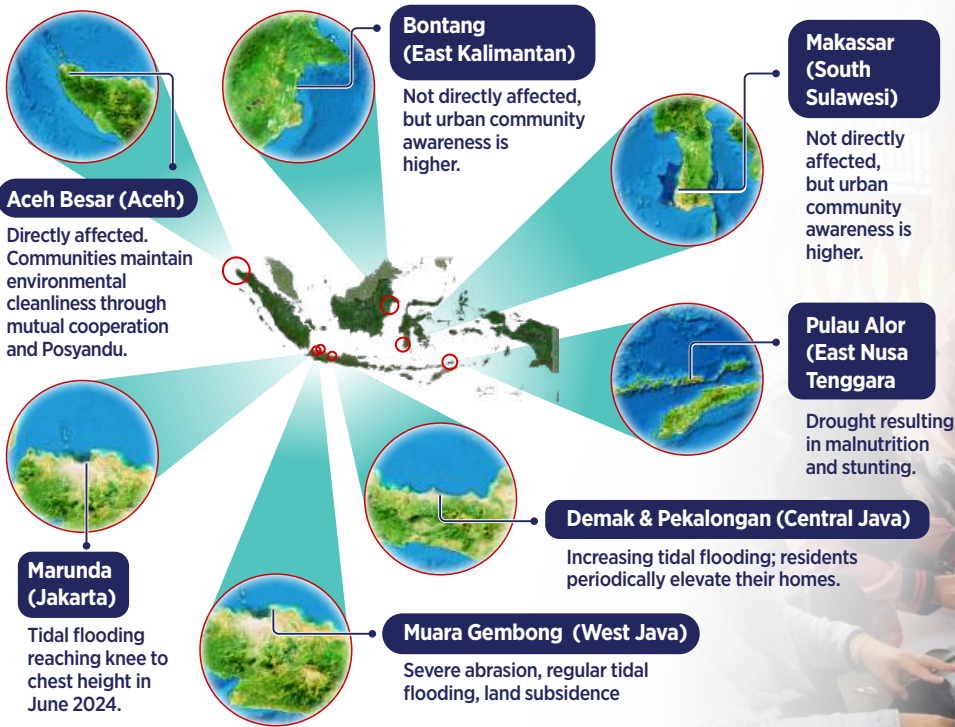
Australian Organisation

- Griffith University

HIGHLIGHTING OVERLOOKED HEALTH AND CLIMATE CHANGE IMPACTS

Women in many regions face climate change impacts on their health and their families. The research recommends integrating climate issues into health policies to build informed and resilient communities.

Climate Crisis Impacts at Research Sites



Women’s Knowledge of Climate Change Impacts

Respondents:
130
Women

Extreme increases in air temperature	100%
Changes in weather cycles	99.2%
Melting polar ice	95.4%
Increased air pollution	94.6%
Rising sea surface temperatures & coral bleaching	93.8%
Changes in planting seasons	88.3%
Rising sea levels	86.2%
Stronger & more frequent storms	81.4%
Increased insect pests	80.8%
Decline in fish stocks	76.2%

Impacts of Climate Change on Women



Spinal disorders from carrying water over long distance



Malnutrition from unequal household food distribution



Increased domestic violence during food & economic crises



Limited capacity to adapt & make decisions



Limited access to health information & services



Risk of miscarriage

Recommendations

Develop climate change-health guidelines for Puskesmas

Involve women in climate change mitigation policies

Integrate climate issues into healthcare curricula

Establish long-term partnerships for women's empowerment

Source: Research
"Empowering Women in Mitigating Climate Change Impacts on Health"

Health Impacts of Climate Changes on Women

Respiratory diseases	98.6%
Sunburn	98.4%
Heatstroke	96.2%
Dehydration	89.2%
Skin diseases	81.5%
Allergies	75.0%
Dengue fever	74.4%
Poisoning (bacterial, viral, protozoal contamination)	73.6%
Emotional disorders	70.9%
Anxiety	63%

Participating Organisations



Indonesian Organisation

- Universitas Indonesia



Australian Organisations

- Monash University
- The University of Melbourne

DECADES OF TIDAL FLOOD IMPACTS ON HEALTH AND FOOD SECURITY

For decades, tidal flooding along Central Java’s northern coast has damaged homes, livelihoods, and health. This research maps food and health vulnerabilities and the adaptive solutions.



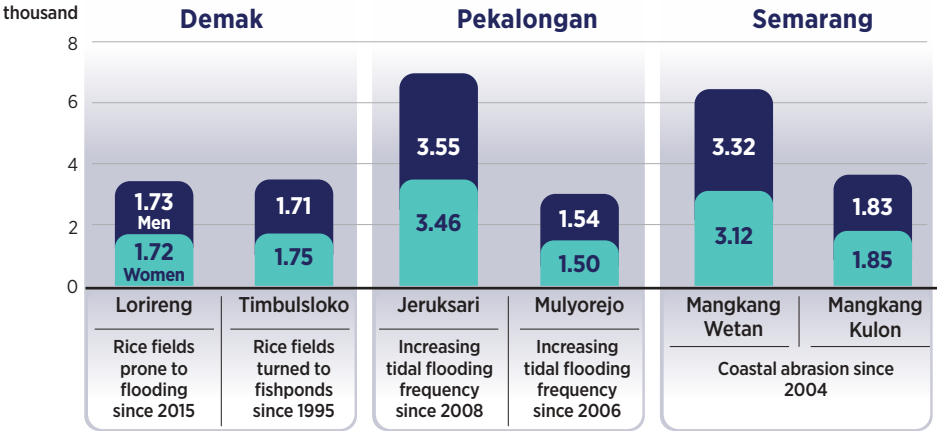
Six Villages Affected by Tidal Flooding

Pekalongan:
• Jeruksari
• Mulyorejo

Demak:
• Lorireng
• Timbulsloko

Semarang:
• Mangkang Wetan
• Mangkang Kulon

13,000 Women Affected by Climate Change in 6 Villages



Impacts of Tidal Flooding along the Northern Coast of Central Java



Tidal flooding has hit Demak, Pekalongan, Semarang for 10-20 years



Rice fields lost, converted into fishponds



Roads submerged; residents rely on wooden bridges & boats

Food Security Challenges and Current Responses

Regions	Challenges		Responses	
	Food Security	Clean Water	Government Programmes	Community Initiatives
Semarang	Farmers sell crops & purchase rice from other regions.	Drinking water from PAMSIMAS, artesian wells, refill stations.	PKH programme, rice ATM, food barns.	Free meals for the elderly.
Demak	Residents struggle to farm; farmers become fishermen/labourers.	Unclean water causes skin diseases.	Farmer group programmes, urban farming, PKH, BLT.	Elevating houses to anticipate flooding.
Pekalongan	Staple food prices rise; residents rely on instant food.	Low-quality bottled water; no PAMSIMAS access; declining nutrition & health.	Health programmes addressing stunting (81 cases), mental health disorders (37 cases), skin diseases.	Women's empowerment through fish milk production.

Recommendations

Skills training to boost food security and incomes.

National-local coordination on climate policy & food security.

Improving sanitation infrastructure to prevent disease during tidal floods.

Inclusive programmes for women, older adults and persons with a disability.

Integrated food security policies in flood-prone areas.

Notes: PKH (Family Hope Programme), BLT (Cash Transfer Assistance), PAMSIMAS (Community-Based Drinking Water Supply and Sanitation Provision)

Source: Research “Exploring Links Between Food Security and Health to Inform Policy and Service Priorities for Communities Living in High Flood Risk Areas of the Northern Coast of Central Java”

Participating Organisations



Indonesian Organisations

- Universitas Brawijaya
- Universitas Sebelas Maret (UNS)
- Percik Institute
- The Habibie Centre



Australian Organisation

- The George Institute for Global Health

**ECHOES
OF PARTNERSHIP
AN INFOGRAPHIC BOOKLET**

The Australia-Indonesia Partnership
for a Climate-Resilient Future

5

ENVIRONMENTAL SUSTAINABILITY AND INNOVATION

(Illustration) Farmers in Sungai Sintang, Sintang
Regency, West Kalimantan, celebrate a harvest
shaped by collective labour and local stewardship.





ASSISTING GRASSROOTS COMMUNITIES TO ADAPT TO CLIMATE CHANGE

Climate change significantly affects rural livelihoods. This research reveals grassroots adaptation, particularly among women and children, in sustaining resilience.

Climate Vulnerability Index of 6 Regencies

Six Selected Regencies based on Livelihood Characteristics:

South Pesisir (West Sumatra)

 Wetland agriculture

 0.45

Central Lombok (West Nusa Tenggara)

 Cow Farming

 0.52

East Lombok (West Nusa Tenggara)

 Cow Farming

 0.43

East Flores (East Nusa Tenggara)

 Dryland agriculture

 0.53

Kupang (East Nusa Tenggara)

 Buffalo farming

 0.63

South Lampung (Lampung)

 Coastal/fishing livelihoods

 0.51

Climate Vulnerability Index (CVI) uses 3 components: exposure, sensitivity, & adaptive capacity

 Livelihood Characteristics  Climate Vulnerability Index

Vulnerability Categories:
 Moderate  High



Regional Conditions

East Flores	Kupang	South Lampung	South Pesisir	Central Lombok. East Lombok
• High drought risk • Prone to hydrometeorological disasters	• Declining buffalo population • Prone to natural disasters	• Extreme weather • Highly prone to natural disasters	• Unpredictable weather threatens food production • Red Zone for the agricultural sector • Increasing frequency of hydrometeorological disasters	• Extreme weather • Increasing frequency of hydro-meteorological disasters • High drought risk • Declining livestock population

Climate Change Impacts on Grassroots Communities

70–80% of respondents experience temperature changes & extreme weather.

Shifting planting seasons raise crop failure risk.

Greater work distance raises violence risks for women.

Intensifying dry & raining seasons increase hydrometeorological disasters frequency.

Extreme weather lowers fisher productivity.

Recommendations

Engage villages, farmer groups, customary institutions in climate policy.

Develop climate-friendly farming & livestock techniques.

Social protection for women & children.

Strengthen local capacity through training & collaboration.

Enhance national–local cooperation on inclusive climate adaptation & disaster mitigation.

Research: Source “Understanding Climate Impact on the Grassroot Communities and Rural Livelihood in Indonesia: Catalysing Changes toward Adaptation and Resilience”

Participating Organisations



Indonesian Organisations

- Universitas Mataram
- Institut Teknologi Sepuluh Nopember
- Konsorsium untuk Studi dan Pengembangan Partisipasi (KONSEPSI)
- Bengkel Advokasi Pemberdayaan dan Pengembangan Kampung (Bengkel APPEK)
- Yayasan Pengkajian Pengembangan Sosial (YPPS)
- Lembaga Transformasi Nusa Tenggara Barat (NTB)
- Lembaga Pengkajian dan Pemberdayaan Masyarakat (LP2M)
- Yayasan Konservasi Way Seputih (YKWS)



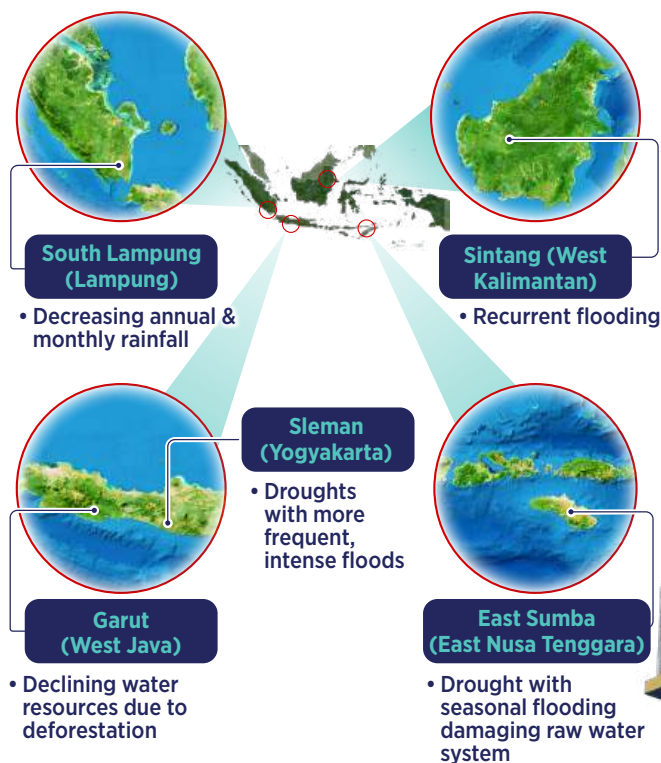
Australian Organisation

- Charles Darwin University

THE FUTURE OF RURAL WATER SUPPLY AMID CLIMATE CHANGE

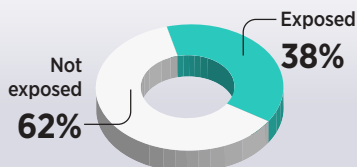
Rural water systems are not yet prepared for climate impacts. This research recommends climate resilience planning in community-based drinking water management integrated into government monitoring.

5 Research Locations Affected by Climate Change

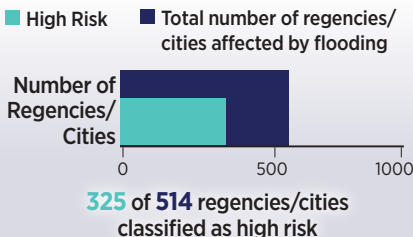


Challenges and Impacts of the Water Crisis in Indonesia

**>100 Million People
Exposed to Flood Risk, 2021**



**High-Risk Regencies/Cities
Affected by Flooding, 2021**



The government has launched PAMSIMAS to improve rural access to clean water & sanitation



Community-based rural drinking water & sanitation programme has been implemented since 2006



Benefits 25.6 million people in 37,000 villages (37 provinces), as of December 2022



This research found 12,000-14,000 (34-46%) PAMSIMAS water systems are not climate resilient



During prolonged dry seasons, residents shift to alternative water sources, such as rivers, that have higher risk of contamination

Note:
PAMSIMAS
(Community-Based Drinking Water Supply and Sanitation Provision), PPP (Public Private Partnership)

Recommendations

Establish a district multi-stakeholder platform for climate issues

Establish emergency reserve funds

Provide technical training on maintenance, climate resilience, emergency response

Protect catchment areas through land-use enforcement

Diversify funding (PPP, climate adaptation grants, microfinance)

Source: Research “Future Proofing a Basic Social Service: Climate-Resilient Community-Based Rural Water Supply”

Participating Organisations



Indonesian Organisations

- Universitas Indonesia
- Universitas Ibn Khaldun Bogor
- Universitas Gadjah Mada



Australian Organisation

- University of Technology Sydney

SUSTAINABLE FORESTS NEED WOMEN

This research highlights the vital role of women in social forestry and the need for tangible implementation of government gender equality policies

Social Forestry Programme:

1970's: The concept of community forestry was introduced, designed by Perum Perhutani

1990s: Early implementation of the Social Forestry Programme.

2007: Formal policy implementation began; e.g.: Banyusoco Village, Yogyakarta.

There are 6 schemes, dominated by Village Forest (HD) and Community Forest (HKm), → 80% of all permits issued under the Social Forestry Programme.

National Target:
12.7 million hectares

Realisation (July 2023): 5.5 million hectares

HD vs HKm

Aspects	HD	HKm
Objective	Transfer of forest management from the state to local communities to ensure forest sustainability & public welfare.	
Management Rights	35 years, extendable for another 35 years	
Business Model	KUPS → Sales and profit-sharing	
Community Awareness	72% of residents are unaware of their involvement due to limited information	Communities are generally aware of their participation in Social Forestry Programme
Land Origin	Mostly inherited land (e.g. Sungai Garong 96.55%)	Mostly allocated through farmer groups (e.g. Banyusoco 93.33%)

Social Forestry Areas Selected as Research Sites

HD:

Sungai Garong Village, West Kalimantan

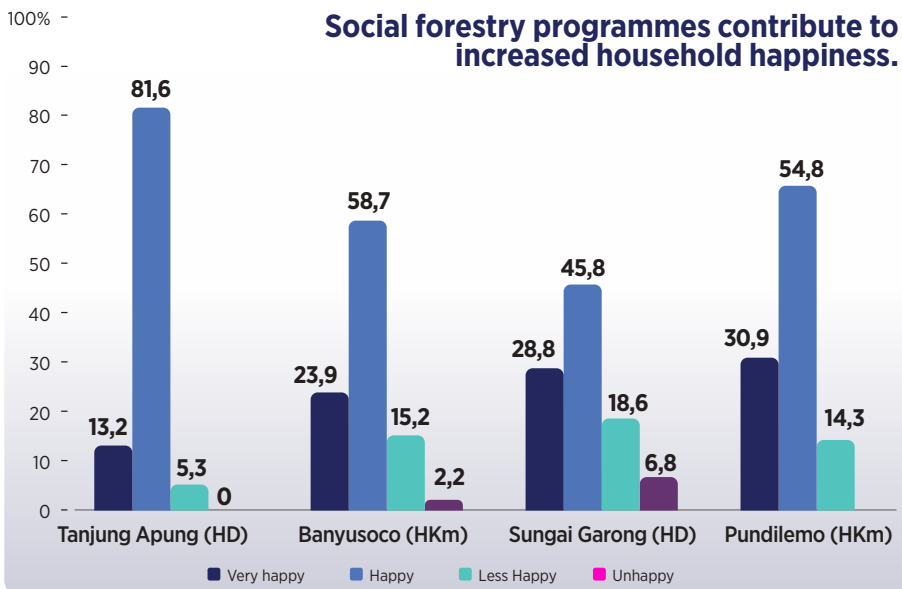
Tanjung Agung Village, South Sumatra



HKm:

Pundilemo Village, South Sulawesi

Banyusoco Village, Yogyakarta



Women & Social Forestry

-  Only 67% of communities are actively involved, predominantly men
-  Women are often perceived merely as companions
-  Not decision-makers in KUPS
-  Strong knowledge of medicinal & food crops
-  Roles mainly involve collecting forest products (spices, coffee, cocoa)

Note: KUPS (Kelompok Usaha Perhutanan Sosial or Social Forestry Business Unit)

Source: Research “Evaluating the Contribution of Social Forestry Management Rights towards Climate Proof Livelihoods of Women and Men in Indonesia”

Recommendations

Involve 25–30% women & vulnerable groups in social forestry management

Improve access to information on women’s rights in social forestry

Promote gender equality across all social forestry programmes

Participating Organisations

Indonesian Organisations

- Perkumpulan untuk Peningkatan Usaha Kecil (PUPUK)
- The Asia Foundation
- Badan Riset dan Inovasi Nasional
- Universitas Airlangga

Australian Organisation

- The University of Melbourne

MODELLING THE FUTURE OF NET ZERO EMISSION FOR INCLUSIVE ENERGY TRANSITION

Despite its good intentions, the global energy transition toward net zero risks leaving vulnerable groups behind. This research highlights both the pitfalls and inclusive solutions needed to ensure a fair transition for all.

Research Location: Jakarta



Socio-economic Impacts of the Energy Transition



Energy transition may increase electricity & commodity prices



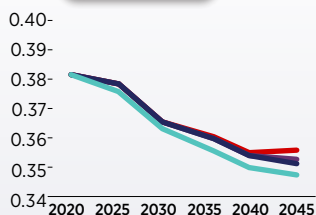
Vulnerable groups are more exposed to price increases



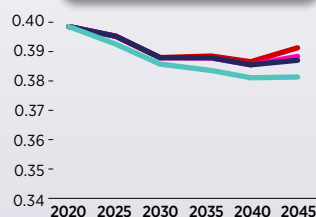
Without inclusive policies, risks of poverty and inequality rise

Impact of NZE on the 2020–2045 Gini Ratio

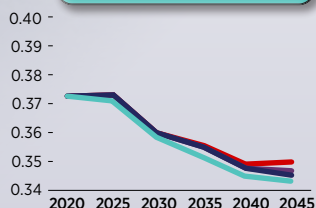
a Overall average



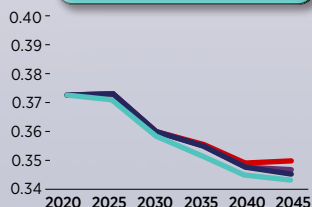
b Female-headed households



c Households with persons with disabilities



d Households with elderly & children



■ NZE 2050 ■ NZE 2060
■ NZE 2080 ■ Reference



Ambitious net zero targets may widen inequality. The Gini ratio measures income inequality (0 = perfect equality, 1 = perfect inequality).



Efforts to achieve NZE by 2050 are projected to result in higher inequality by 2045, with a Gini ratio of 0.355, compared to 0.347.



Gini ratios under the NZE 2050 scenario show an upward trend from 2040 to 2045, while households headed by persons with disabilities & women record the lowest declines.

Recommendations

Use carbon tax revenues for social protection of vulnerable groups

Without adequate intervention, the energy transition may hinder Indonesia's 2045 targets to reduce poverty & inequality.

Note: NZE (NZE: Net Zero Emission)

Source: Research "Initiative for an Open, Inclusive, and Integrated Climate Change Model for Indonesia"

Participating Organisations



Indonesian Organisations

- Universitas Indonesia
- Institute for Essential Services Reform
- The SMERU Research Institute



Australian Organisation

- Australian National University

CIRCULAR ECONOMY POTENTIAL IN INDONESIA'S MOST POLLUTED RIVER

Citarum at a Glance:



One of the most polluted rivers in the world



15,000+ tonnes of waste per day across the river basin



Pollution sources include household and industrial waste

Major Challenges in Citarum



Padamukti lacks adequate waste management system



Waste frequently leaks into the Citarik River



Regulations focus only on "collect-transport-dispose"



Stronger regulation enforcement, funding coordination, community participation are needed



The division of roles in waste management needs to be clarified

The Citarum River is known as one of the most polluted rivers in the world. This research proposes community-based circular economy solutions through CARP to restore the Citarum ecosystem & improve community wellbeing.



CARP Objectives:



Revitalise 2.3 km of the Citarik River in Padamukti and Cibodas Villages, West Java



Promote sustainable local economic development



Improve waste management



Support climate adaptation



Improve water & sanitation services



CARP proposes upgrading *TPS3R in Padamukti into TPS-3R++, comprising:

-  **New TPS-3R, as early waste sorting**
-  **Existing waste bank, used for organic waste processing using BSF larvae**
-  **Fish ponds, managed using BSF larvae feed**
-  **Precious Plastics Bandung, as partner for advanced plastic processing**

TPS-3R++ Development Stages:



Stage 1 (Current):
TPS3R arrangement & management



Stage 2:
Additional construction & demonstration materials



Stage 3:
Expansion of plastic processing capacity

CARP Recommendations

New governance principles:

1. Waste processing at source
2. Data- and location-based policies
3. Integrated socio-technical approaches

Encourage government funding & private investment

Public education

Optimise BSF through partnerships with food & beverage businesses

Replace incineration with sustainable methods

Notes: **CARP** (Citurum Action Research Program), **TPS3R** (Reduce, Reuse, Recycle Waste Management Facility), **BSF** (Black Soldier Fly).

Source: Research “Indonesia-Australia Citurum Action Research Program (CARP)-Circular Economy Transitions for Resilient Climate and Environmental Futures”

Participating Organisations



Indonesian Organisations

- Universitas Indonesia
- Yaksa Pelestari Bumi Berkelanjutan



Australian Organisations

- Monash University
- The Commonwealth Scientific and Industrial Research Organisation (CSIRO)



BRIDGING LAND-SEA CONSERVATION FOR THE FUTURE OF SOUTHWEST PAPUA

Biodiversity in Southwest Papua is threatened by climate change. This research recommends integrated conservation to ensure ecosystem & community sustainability.

Conserving R2R Programme:



Research Locations in Southwest Papua



Objectives:

Integrated resource and conservation management, with community-based climate resilience.



Principles:

Upstream activities affect downstream ecosystems such as mangroves & coral reefs.



Southwest Papua:

A global centre of marine biodiversity

A source of livelihood & identity for Indigenous communities

Interconnected forest-sea ecosystems requiring integrated conservation



Deforestation, pollution, and degradation of marine ecosystem



Fragmented land-sea planning with minimal Indigenous participation



Conservation funding difficult for local communities to



Limited involvement of vulnerable groups in resource management

Challenges in Southwest Papua

The **Conserving Ridge-to-Reef (R2R)** approach offers an integrated solution to protect Southwest Papua's environment & strengthen communities to be more resilient.

Benefits of the R2R Conservation Approach

Conserving forests to coral reefs

Protecting biodiversity & climate resilience

Safeguarding local livelihoods

Recommendations

Establish an R2R coordination body under local government

Integrate GEDSI across all stages

Improve access to sustainable financing

Align the R2R approach with customary values

Engage local leaders & Indigenous communities

Source: **Research “Conserving Ridge to Reef: Integrated and Innovative Approach to Enable Sustainable Financing in Supporting Inclusive Climate Change Projects in Indonesia”**

Participating Organisations



Indonesian Organisations

- World Resources Institute Indonesia (WRI Indonesia)
- National Research and Innovation Agency



Australian Organisations

- University of Technology Sydney
- University of Queensland

Note: GEDSI: Gender Equality, Disability, and Social Inclusion



HARVESTING HOPE FROM SUSTAINABLE SALT PRODUCTION

Coastal communities often face challenges related to clean water, energy, and livelihoods. In Pamekasan, Madura, coastal communities have developed the Coupled Seaweed and Solar Salt Farming (CSSSF) system, integrating salt, solar energy, clean water, seaweed, and fish to strengthen a sustainable local economy.



Research Sites in East Java



Objective:

Integrating seaweed farming & solar-powered salt production.



Potential:

Meeting annual energy needs of **4,989 kWh**





CSSSF is a hybrid renewable energy system delivering tangible benefits to coastal communities., such as:

Electricity from renewable energy

Cleaner water

High-quality salt & seaweed, increasing farmer income

Stronger local economic resilience

Recommendations

Training and documentation of the CSSSF system

Needs-based replication across regions

Similar programmes developed with a focus on clean water, electricity, or marine farming

Source: **Research “Harvesting Hope: Renewable Energy, Clean Water and Quality Salt for Madura’s Saltwork Community through Seaweed Farming”**

Participating Organisations



Indonesian Organisations

- Universitas Trunodjoyo Madura
- Kementerian Kelautan dan Perikanan



Australian Organisations

- The University of Newcastle
- Royal Melbourne Institute of Technology (RMIT University)







ECHOES OF PARTNERSHIP

As Indonesia and Australia confront pressing climate challenges, this booklet stands as a testament that the most effective solutions are forged through collaboration. Delve into 20 transformative research projects from the KONEKSI program, a collaborative initiative in the knowledge and innovation sector supporting the Australia-Indonesia partnership, where scientific innovation is interwoven with local wisdom.

Discover how the Tide-Eye project, which leverages artificial intelligence (AI) and Internet of Things (IoT) technology, monitors tidal floods along the northern coast of Java. Meanwhile, a study on the Kajang indigenous community in South Sulawesi highlights how traditional knowledge and local wisdom can support sustainable environmental management and climate resilience.

This booklet is beyond a collection of research; it is a pathway towards a more resilient and equitable future. An invitation to learn, be inspired, and to act.