FINAL REPORT

Conserving Ridge to Reef in Southwest Papua

WRI INDONESIA · BRIN Badan Riset dan Inovasi Nasional · The University of Queensland Australia · UTS · KONEKSI Knowledge Partnership Platform Australia - Indonesia

AUTHORS

WRI Indonesia:

DR. AHMAD DHIAULHAQ | Research and Data Integrity Manager

Contact: ahmad.dhiaulhaq@wri.org

NICHOLAS STACHER | Former Senior Manager, Intact Rainforest Partnership

Contact: nicholas.quintans.stacher@gmail.com

TOMI HARYADI | Director for Food, Land and Water Programme

Contact: tomi.haryadi@wri.org

DEWI SARI | Nature-Based Solution Manager

Contact: dewi.sari@wri.org

CYNTHIA MAHARANI | Former GEDSI Lead

Contact: cdmaharani@gmail.com

EHDRA MASRAN | Former Ridge to Reef Research Consultant

MEIRELLA RUMFABE | Stakeholder Engagement Analyst for Southwest Papua

Contact: meirella.rumfabe@wri.org

PAUL PASARIBU | Policy Research Consultant

Contact: paul.pasaribu@wri.org

BRIANTAMA ASMARA | Research and GIS Analyst

Contact: briantama.asmara@wri.org

MUHAMMAD ZAYYANUL AFWANI | GIS Research Analyst

Contact: muhammad.afwani@wri.org

GEMASAKTI ADZAN | Geospatial Research Lead

Contact: gemasakti.adzan@wri.org

National Research and Innovation Agency (BRIN):

DR. MAXENSIUS TRI SAMBODO | Senior Researcher

PROF. DR. SYARIF HIDAYAT | Senior Researcher

University of Technology Sydney (UTS):

ANNA GERO | Research Director at Institute for Sustainable Futures

TAMARA MEGAW | Senior Research Consultant

University of Queensland (UQ):

PROF. EVE MCDONALD-MADDEN | Professor

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HIGHLIGHTS

- Southwest Papua's rich and diverse ecosystems, spanning upland forests to coral reefs, are critical for biodiversity and local communities but face increasing threats from development and resources extraction.
- The Ridge to Reef (R2R) approach offers a framework to connect terrestrial and marine ecosystems, promoting integrated resource management for ecological and social resilience.
- This study assesses and proposes innovative governance structures and sustainable financing strategies to support long-term conservation and climate resilience efforts in Southwest Papua.
- This study found that the R2R approach aligns well with local cultural values and practices, enhancing its feasibility in Southwest Papua.
- This study recommends the establishment of an R2R Development Collaboration Agency, designed to coordinate conservation efforts through a legally backed framework.
- Comprehensive R2R management requires a balanced and complimentary blend of financial mechanisms.
- Incorporating gender, disability and social inclusion (GEDSI) is crucial to ensure equity in the proposed R2R governance and sustainable financing.

Context

Southwest Papua, Indonesia, is a region of exceptional ecological and cultural importance, where upland forests, rivers, and coral reefs create a unique and interdependent landscape (Fatem et al. 2020; Purwanto et al. 2021). This diverse natural environment sustains a rich variety of species and provides essential resources to local communities, particularly Indigenous groups whose livelihoods and cultural identities are closely tied to these ecosystems.

However, rapid development, resource extraction, and tourism increasingly threaten the health and sustainability of these ecosystems. Expanding infrastructure, plantations, logging and mining activities are leading to significant environmental degradation, which directly impacts both biodiversity and local communities that rely on natural resources for their livelihoods (Mangubhai et al. 2012; Gaveau et al. 2021). As these pressures intensify, conservation efforts become more urgent.

In addition to environmental challenges, fragmented governance and limited sustainable funding hinder effective conservation strategies. Traditional management approaches struggle to address the complex, interconnected threats facing Southwest Papua's ecosystems. The Ridge to Reef (R2R) approach offers a sustainable framework to link terrestrial and marine conservation efforts, build climate resilience, and uphold the rights and well-being of local communities.

About this report

This report investigates the feasibility of implementing an R2R approach to conservation in Southwest Papua. Further, it assesses and proposes innovative governance structures and sustainable financing strategies to support long-term conservation and climate resilience efforts. By integrating land and marine conservation, the R2R model offers a holistic framework for sustainable resource management, making it a compelling strategy for addressing the ecological challenges in this region.

Developed through a collaborative research effort by WRI Indonesia, Indonesia's National Research and Innovation Agency (BRIN), the University of Technology Sydney (UTS), and University of Queensland (UQ), this report synthesizes findings from stakeholder interviews, focus group discussions, policy analyses, and spatial assessments to provide a comprehensive view of Southwest Papua's social, economic, and environmental context. In doing so, it highlights key enabling factors and challenges for R2R implementation, with a particular attention on gender, disability and social inclusion (GEDSI), governance framework, and sustainable financing.

Feasibility of R2R management

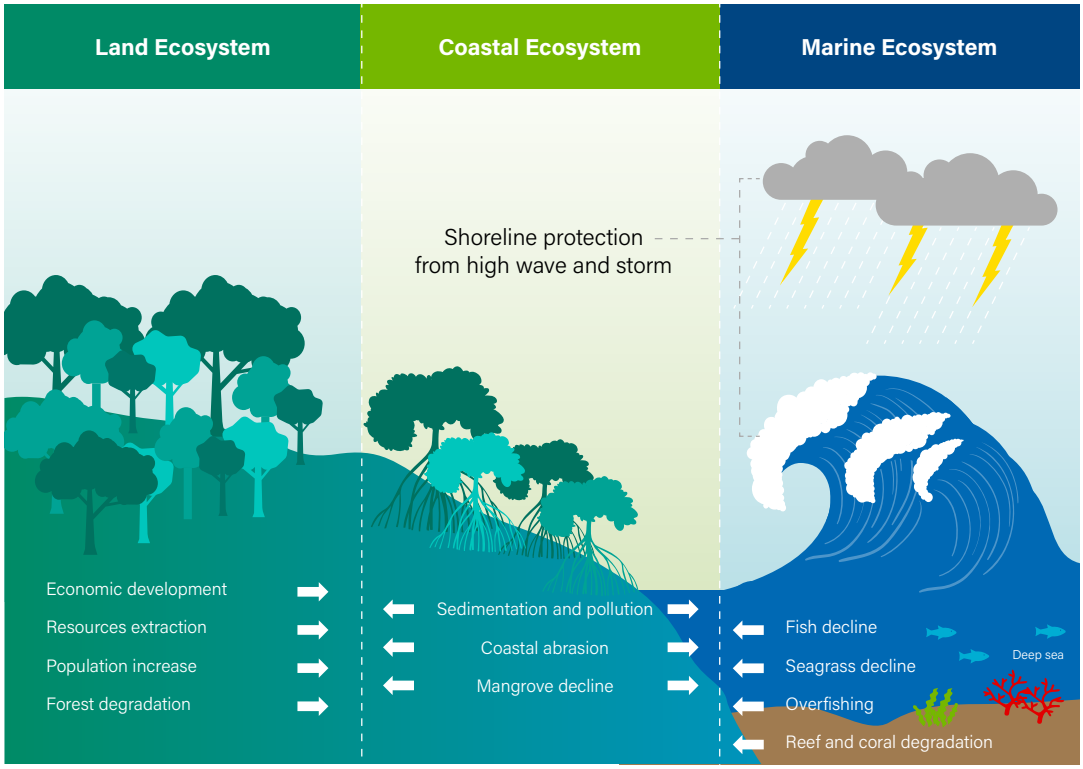
This study found that the R2R approach aligns well with local cultural values and practices, enhancing its feasibility in Southwest Papua. Indigenous beliefs emphasize the interconnectedness of ecosystems, viewing land and sea as unseparated. Traditional practices, such as *egek* and *sasi* (Adiastuti et al. 2019; McLeod et al. 2009), further reinforce sustainable resource management in both land and sea and make the R2R approach compatible with community values.

Supportive government policies and legal frameworks enhance the potential for R2R implementation. Customary laws and local regulations, like the Sorong Regency Regulation that protects indigenous land rights, empower communities to manage resources, facilitating R2R governance and local authority over conservation efforts.

The interconnected ecosystems of Southwest Papua create ecological imperatives that necessitate an integrated R2R approach. This region's unique environment — from upland forests to coral reefs — requires coordinated management to mitigate upstream impacts, such as deforestation and pollution, which directly threaten marine and coastal habitats essential for biodiversity and local livelihoods (Figure 1 and 4).

However, effective R2R management may face challenges related to fragmented governance and limited funding. Sectoral conflicts and insufficient sustainable financing may undermine the ability to implement an integrated R2R approach, making it essential to establish a cohesive governance and financing framework to support long-term conservation.

FIGURE 1 | Interdependence between terrestrial and marine ecosystems, where land-based activities in the upstream watershed area significantly influenced the downstream



Source: Authors' analysis.

Findings on gender, disability and social inclusion

Gender and social disparities still limit access to resources, particularly for women and people with disabilities. Traditional inheritance practices that prioritize male offsprings limit women's access to land ownership and economic benefits, while people with disabilities are often indirectly excluded from resource management and decision-making processes, creating significant access disparities.

Patriarchal norms limit women's roles in resource management. Although indigenous women possess valuable knowledge about resource management, entrenched gender norms restrict their formal involvement in decision-making, reducing their influence in conservation and land management.

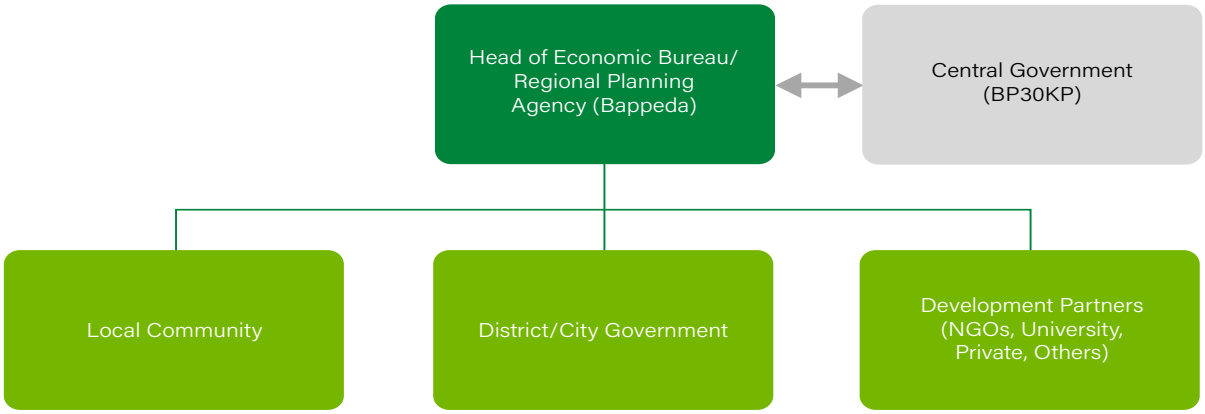
Emerging empowerment initiatives by several non-governmental organizations are making strides in increasing women's participation, though challenges remain. Local organizations have started to advocate for women's roles in resource management, yet these efforts are insufficient to overcome long-standing marginalization, indicating a need for more comprehensive empowerment strategies.

Findings on governance framework

To enhance governance and foster integrated management across sectors, a transformation of the current institutional structure toward a joint governance model is essential. This transition from sectoral (ridge and reef) to integrated (ridge to reef) management necessitates a gradual approach to build trust and interagency coordination required for effective collaboration.

A key recommendation from this study is the establishment of a Ridge-to-Reef Development Collaboration Agency (Badan Kolaborasi Pembangunan R2R Provinsi Papua Barat Daya/BKPR2R-PPBD), designed to unify efforts through a legally backed framework (Figure 2). This agency would operate under the provincial government, leveraging Special Regional Regulations (Perdasus) to ensure its strategies align with the unique ecological, cultural, and governance needs of Southwest Papua. Such regulatory alignment is feasible due to the region's Special Autonomy status, as affirmed in Papua's Special Autonomy Law.

FIGURE 2 | The structure of proposed BKPR2R-PPBD



Source: Authors.

The proposed agency will serve as a central hub, bringing together financial resources, human resources, and infrastructure to streamline planning and implementation across ridge-to-reef programs. This agency would address issues such as uncoordinated planning by aligning efforts with Regional Medium- and Long-Term Development Plans (RPJMD/RPJPD). This coordination will enhance efficiency and ensure that development is both targeted and responsive to regional needs.

The BKPR2R model also aligns with national policy initiatives aimed at accelerating development in Papua. Specifically, it complements the objectives of Presidential Regulation No. 121/2022, which created the Steering Committee for the Acceleration of Special Autonomy Development for Papua (BP3OKP), a non-structural institution designed to synchronize and coordinate special autonomy development in Papua. By aligning with these national efforts, BKPR2R can serve as a replicable model for integrated governance in other provinces, demonstrating an adaptive and sustainable approach to regional governance that aligns needs with national objectives.

Findings on sustainable finance

Current financing mechanisms in Southwest Papua still focus on marine and coastal protection but provide a solid foundation for broader efforts. The success of models like the Blue Abadi Fund (BAF) and BLUD-UPTD in Raja Ampat shows the potential of expanding sustainable finance to address gaps in R2R management. Building on these frameworks offers a strengths-based path to engage local stakeholders and prioritize new conservation funding to land-based activities.

Local communities face significant barriers to accessing global sustainable finance, limiting the impact of conservation efforts. Indigenous Peoples and Local Communities (IPLCs) are essential stewards of biodiversity, but challenges accessing and managing funds persist. Better preparing these stakeholders for fund management and aligning funders to on-the-ground capabilities can help improve conservation effectiveness and community benefits.

Environmental markets present additional opportunities but should complement — not replace — core funding. Carbon credits offer potential funding, but price volatility and low cost limit their reliability. Southwest Papua can strengthen its appeal in the global environmental marketplace by pursuing high integrity standards that ensure deep IPLC participation and transparency.

Results-based payment schemes can provide significant value in conserving Southwest Papua's intact forests. These forests provide outstanding value for climate action and biodiversity yet lack targeted climate financing due to their low deforestation rates. Developing a results-based payment scheme to reward Southwest Papua's conservation efforts can also support sustainable development.

Comprehensive R2R management requires a balanced and complimentary blend of financial mechanisms. Blending grants, investments, and cyclical funding sources, such as seasonal tourism revenue, can create a sustainable financial base. Lessons from other Indonesian conservation projects underscore the value of combining funding types to support long-term management and resilience.

A decision analysis framework could support local stakeholders in implementing sustainable finance solutions for R2R management. By helping stakeholders identify funding needs, manage trade-offs, and evaluate options, this framework could enable more effective decision-making in sustainable finance and governance for R2R conservation. By ensuring local knowledge and perspectives are embedded into this framework, Southwest Papua stakeholders could have an avenue to codesign financing and governance arrangements for R2R at the grassroots level.

Recommendations

Based on the findings above, we offer the following recommendations to support the effective implementation of the R2R approach in Southwest Papua, addressing governance, sustainable financing, and social inclusion to create a robust conservation framework that benefits both ecosystems and communities.

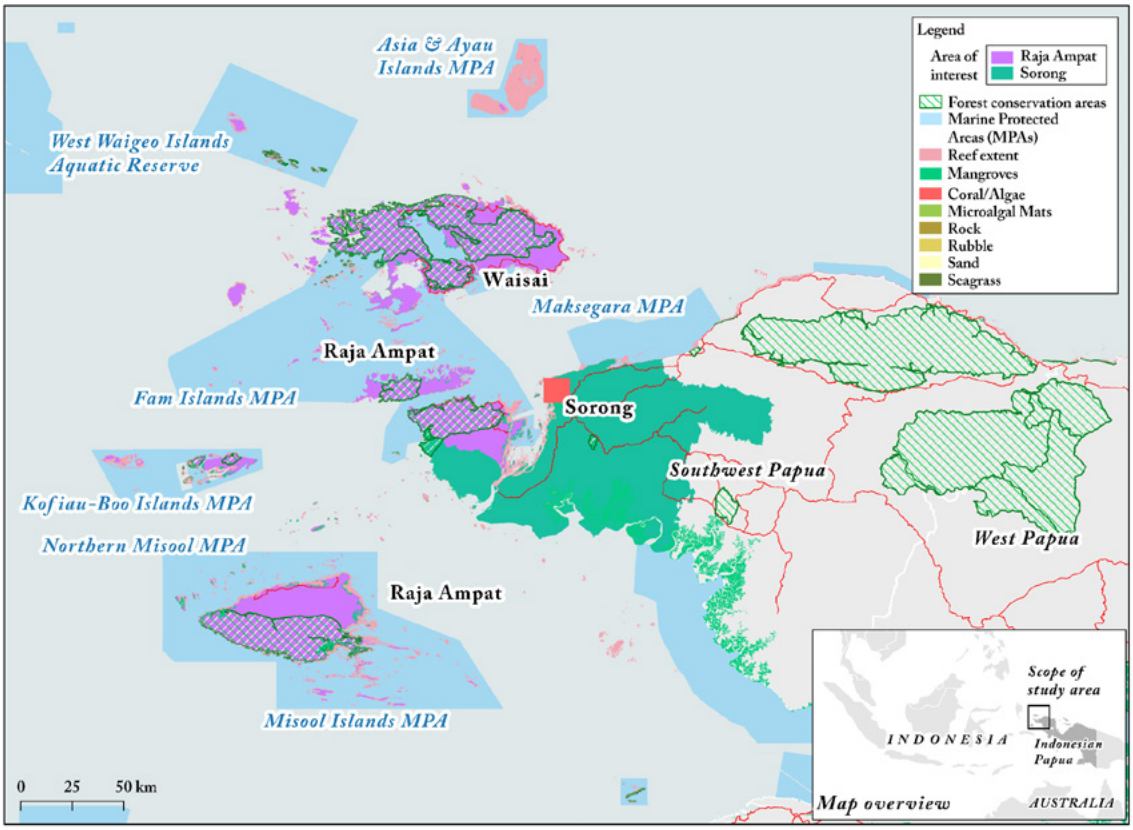
- **Current and incoming government and policymakers should consider reintegrating the R2R approach into natural resource management in Southwest Papua.** Integrated governance is essential for effective R2R implementation in Southwest Papua. Establishing a dedicated governance body like BKPR2R-PPBD will coordinate conservation efforts across land and marine environments, aligning sectoral priorities. Actively involving Indigenous communities and local stakeholders in decision making will enhance strategic planning and promote cohesive resource management.
- **To gradually begin joined-up coordination and integration for the implementation of R2R in Southwest Papua.** The transition from sectoral (ridge and reef) to integrated (ridge to reef) management necessitates a gradual approach to build trust and interagency coordination required for effective collaboration.
- **Developing sustainable financing is crucial to create a stable funding base for R2R initiatives.** A blended financing model will ensure long-term financial stability. International partnerships can provide additional funding and expertise, while community-driven economic initiatives like ecotourism will align local economic benefits with conservation goals.
- **R2R governance and sustainable funding mechanisms should promote equity and inclusion, prioritizing local leadership.** Gender equality, disability and social inclusion (GEDSI) must be embedded in all stages of R2R efforts. Ensuring equitable access to resources and decision-making, GEDSI-focused capacity-building will empower marginalized groups to participate fully in conservation. Policies with clear accountability will promote the active involvement of women, indigenous communities, and people with disabilities in conservation processes.
- **Leveraging indigenous knowledge and practices will enhance sustainable conservation in Southwest Papua.** Integrating traditional knowledge into conservation strategies and protecting indigenous land rights will foster local ownership and align R2R initiatives with cultural values. Collaboration with indigenous leaders will ensure that conservation practices respect and incorporate local customs.

Introduction

Indonesia's Papua Island is globally recognized for its vast forests and rich coastal ecosystems. The region offers a unique ecological and cultural landscape with immense conservation value, including mangrove forests, coral reef habitats, and seagrass beds, and some of the Pacific's last remaining old-growth tropical forests. Many parts of the island remain covered in pristine forest, partly due to low accessibility and their official designation as conservation areas (Fatem et al. 2020). In 2019, 83 percent of Papua was still covered with old-growth forests, playing a critical role in global biodiversity and climate regulation (Gaveau 2021). These ecosystems also sustain indigenous populations who have lived in the region for millennia. Conserving Papua's ecosystems is critical not only for nature and its people but also for climate stability, as even a modest reduction of Papua's forest cover from 83.4 percent to 70 percent could release 3.5 metric gigatons of carbon — enough to cancel Indonesia's Nationally Determined Contribution (NDC) targets for 2030 (Mumbunan et al. 2021).

This study focuses on Southwest Papua, a new Indonesian province established in November 2022, particularly in Raja Ampat and Sorong regencies (Figure 3). These two regencies are home to a diverse population of 194,464 people, including Indigenous Moi tribes (Statistics Indonesia 2023), who contribute to and benefit from the region's unique ecosystem. Southwest Papua's marine areas are part of the Bird's Head Seascape, lauded as the "epicenter of marine biodiversity", and hold one of the world's highest concentration of fish, coral, and crustacean species, with over 70 endemic species (Mangubhai et al. 2012; Purwanto et al. 2021). Its rich marine ecosystems provide food and income for over 760,000 local people (Conservation International, n.d.), particularly in Raja Ampat, where marine protected areas foster tourism and diving opportunities.

FIGURE 3 | Map of Raja Ampat and Sorong regencies



Source: Authors, adapted from Geospatial Information Agency (BIG), Ministry of Environment and Forestry, Ministry of Marine Affairs and Fisheries, and Allen Coral Atlas.

Despite its ecological importance, rapid infrastructure development and resource extraction in Southwest Papua are causing environmental degradation, posing threats to local ecosystems and their dependent local communities (Figure 1 and 4). Governance challenges, including the lack of integration between terrestrial and marine planning, and the limited participation of indigenous groups in decision-making, have hindered biodiversity conservation and stakeholder collaboration. This situation is exacerbated by the lack of sustainable financing necessary to support long-term conservation efforts (Browne et al. 2022). However, the recent establishment of Southwest Papua province provides a unique opportunity to create cross-sector synergy through integrated approaches.

The Ridge to Reef (R2R) approach offers a framework for integrating land and sea ecosystems, promoting integrated natural resource management and socio-economic development (Delevaux et al. 2018). Among various conceptual framings for the R2R approach, the perspective of viewing R2R as an approach to mitigate environmental degradation, foster environmental restoration, and enhance climate-disaster resilience has emerged as the most prevalent and widely adopted (Andales-Escano 2015; Kereseka 2021). Implemented in various countries (Table 1), the approach highlights how upstream activities like forest conversion, logging, mining and infrastructure development impact critical downstream habitats such as mangroves, seagrasses, and coral reefs (Wenger et al. 2020).

R2R implementation requires innovative governance models that integrate diverse stakeholders' perspectives and interests and sustainable financing to succeed. For example, an R2R initiative implemented by the Global Environmental Facilities in Fiji leveraged the traditional *i-Taukei* knowledge of communities on Cicia island to ensure the sustainability of land farming and reef fisheries, highlighting the bidirectional connection of land and sea (Fache and Pauwels 2022). The integration of gender equality, disability and social inclusion (GEDSI) into R2R projects is currently not a common practice, and GEDSI considerations remain limited or tokenistic throughout project design, implementation, and monitoring and evaluation phases. This project provides focus on sustainable and innovative governance mechanisms and takes a strong GEDSI focus throughout the approach.

TABLE 1 | R2R approach implemented in various countries

Country	Australia	Fiji	Philippines	Tuvalu
Location	The Great Barrier Reef and its catchments	Lau Islands	Mindanao Island	9 islands of Tuvalu
Name of initiative	Reef Guardian Stewardship Program	Lau Seascape	Mindanao Nurturing Our Waters (MindaNOW)	Implementing R2R approach to protect biodiversity and ecosystem functions in Tuvalu
Objectives	To increase awareness among coastal communities and industries about potential impacts of their actions on the reef, fostering engagement in sustainable practices for current and future generations.	To build a coalition of stakeholders and partners to apply integrated natural resource management.	To promote disaster risk reduction and management (DRMM), peacebuilding, and development acceleration.	To preserve ecosystem services, sustain livelihoods, and enhance resilience in Tuvalu.
Main implementing institution	Great Barrier Reef Marine Park Authority	Conservation International	The Mindanao Development Authority (MinDA)	Ministry of Foreign Affairs, Trade, Tourism, Environment and Labour (MFATTEL); UNDP/GEF
Outcomes	- 310 schools engage in activities to educate about reef health - 16 local Reef Guardian Councils established - 17 commercial fishing operations in recognized as Reef Guardians - Farmers recognized for sustainable farming leadership	- 17 village-based resource profiles developed - 13 integrated district management plans established - sustainable land management mapping completed	- Improved coordination between agencies for disaster response - Environmental cooperation helps maintain peace in Mindanao	- Protected areas expanded by 136 km^2 - Degraded ecosystems rehabilitated - Integrated water resource management (IWRM) developed - Integrated coastal management (ICM) developed - Governance and institutional capacity improved - Data and information systems enhanced

Sources: Andales-Escano 2015; Fache and Pauwels 2022; Loganimocel and Meo 2023; Oestereich n.d.; UNDP n.d.; ICRI 2015.

Purpose of this study

World Resources Institute (WRI) Indonesia, in collaboration with Indonesia's National Research and Innovation Agency (BRIN), the University of Technology Sydney (UTS), and the University of Queensland (UQ), launched a research project titled "Conserving Ridge to Reef: Integrated and Innovative Approach to Enable Sustainable Financing in Supporting Inclusive Climate Change Projects in Indonesia" in Southwest Papua. Running from September 2023 to December 2024, the research aims to develop and propose an integrated governance framework and sustainable financing pathways to support inclusive R2R management in Southwest Papua.

The research has two main objectives: to design an integrated R2R governance and financing system for positive ecological, economic, and socially inclusive outcomes in Southwest Papua; and to propose pathways for an integrated governance framework and sustainable financing mechanism that can support both environmental conservation and community resilience. The central research question is: *How might an integrated R2R governance and sustainable finance system achieve positive ecological, economic and socially inclusive outcomes for Southwest Papua?* Supporting sub-research questions include:

1. What key factors influence R2R feasibility, and how can indigenous knowledge and traditional practices be integrated for its success?
2. How can integrated governance mechanisms be designed to address current gaps and ensure the inclusive participation of marginalized groups, including indigenous peoples and women?
3. What sustainable financing strategies can be developed to support long-term R2R governance and conservation initiatives?

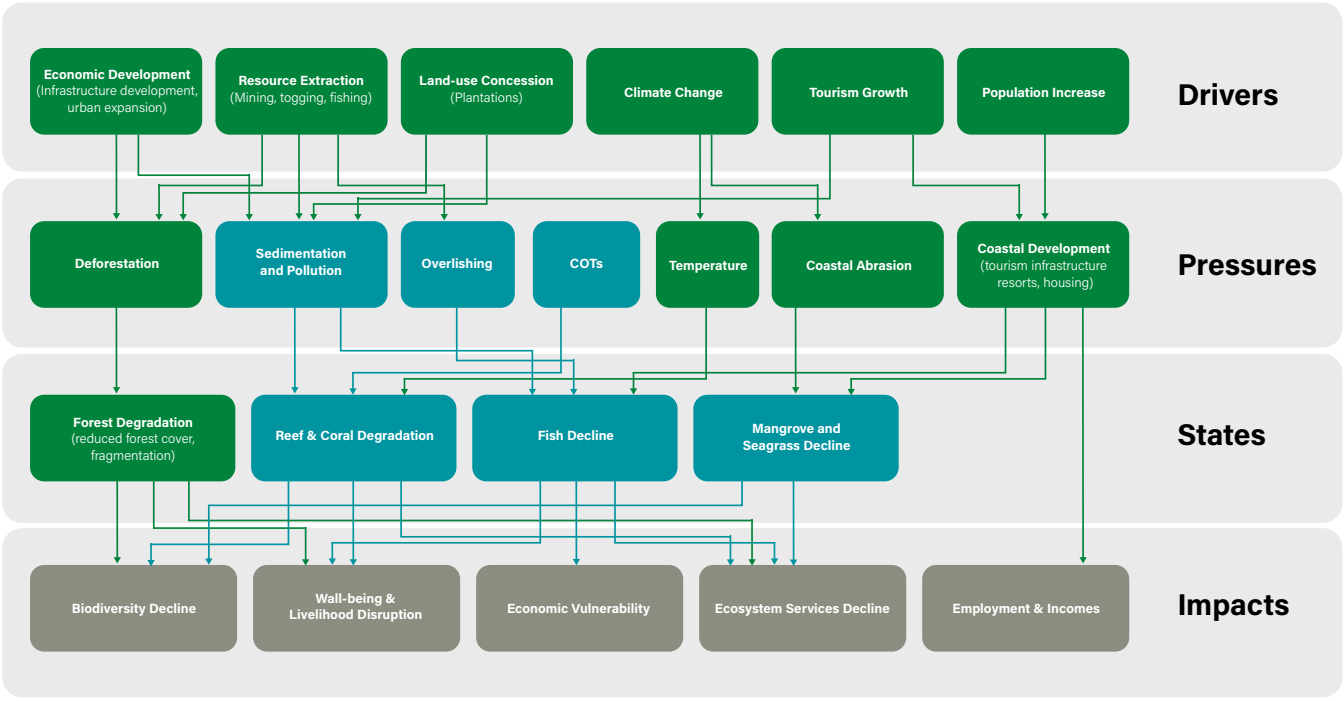
By addressing these questions, the research aims to contribute to the development of a comprehensive governance and sustainable financing framework for Southwest Papua, potentially serving as a model for other regions in Indonesia and globally.

Situation Analysis

Drivers, pressures, and socio-ecological impacts in Sorong and Raja Ampat

Figure 4 shows that land-based activities such as economic development, resource extraction, and land use concessions for logging, mining, infrastructure development, and plantation expansion are some of the key drivers impacting social-ecological dynamics in Sorong and Raja Ampat. Land-based activities like agriculture and mining in upstream areas affect downstream ecosystems, contributing to sedimentation and nutrient discharge, which impact marine health. Although these industries support economic resilience, reducing deforestation and mitigating industrial impacts are essential for conserving natural forests, biodiversity, and water quality. Coastal development further threatens mangrove ecosystems, which play a critical role in water regulation and disaster mitigation. These activities exert pressures on both terrestrial and marine ecosystems, which manifests through land degradation, deforestation, sedimentation, and water pollution. Although they provide economic gains, they also contribute to long-term environmental decline. From 2001 to 2019, deforestation rates increased across all districts in the Papua region, with the highest rates observed in Teluk Bintuni (33,443 hectares), Sorong regency (33,433 ha), and Fakfak regency (31,776 ha). Much of this deforestation occurred within land-based concessions for palm oil plantations, forestry, and mining (Koalisi Indonesia Memantau 2021; Auriga 2022).

FIGURE 4 | A driver-pressure-state-impact (DPSI) analysis based on literature review, interviews, and spatial data analysis. The R2R approach helps us understand the interconnections between terrestrial (in green) and marine ecosystems (in blue)



Source: Authors' analysis.

Compounding the issue is increasing population and urban expansion, which intensify housing and waste management challenges. The city of Sorong has seen significant growth, partly spurred by the oil and gas and tourism industries. It has emerged as a key urban center and gateway to Raja Ampat, now ranking as the third-largest urban area on the island of New Guinea (Statistics Indonesia 2018). With housing expansion and rising waste generation, poor waste management and sanitary systems exacerbate environmental issues in the region.

The rapidly expanding marine tourism industry in Raja Ampat is another key driver that puts significant pressure on coastal and marine ecosystems (Purwanto et al. 2021; Tranter et al. 2022). Beyond the increasing number of tourist visits, the rising demand for tourism infrastructure, such as resorts and homestays, drives extensive coastal development. This development comes with environmental consequences, especially given the region's poor sanitation and sewage system. These trends increase pressure on coastal and marine ecosystems, particularly coral reefs, mangroves, and fish populations. As noted by a conservation NGO activist:

> The source of ecological degradation in marine areas originates more from land [...] Our research indicates that the impact of sewage, runoff, and poor sanitation systems in terrestrial areas is already at a high level, which impacts coastal areas (YKAN, Sorong, March 2024).

From the R2R perspective, these drivers and pressures illustrate the interconnectedness between terrestrial and coastal and marine ecosystems. Unsustainable upstream land-use practices lead to degradation downstream, affecting coral reefs and coastal waters.

FIGURE 5 | Waste final processing site (TPA) in Sorong

Source: Authors

Gender equality, disability and social inclusion context

Official data on the Indigenous Communities of Sorong and Raja Ampat regencies — or *orang asli Papua* (OAP) — remains incomplete, but it is estimated that they make up less than a third of the population (ANTARA 2023). There is significant diversity among the local tribes, but these areas are primarily inhabited by the Indigenous Moi people, including their seven sub-tribes. Law No. 2/2021 on Special Autonomy for Papua establishes a legal framework that recognizes Indigenous Papuans, their customary rights, and their essential role in regional development. Additionally, Sorong Regional Regulation (Perda) No. 10/2017 specifically recognizes and protects the rights of the *Masyarakat Hukum Adat Moi* (Moi Indigenous Law Community), aiming at ensuring the Moi People receive the respect, legal support, and protection against discrimination they deserve.

Despite this legal recognition, land conflicts often arise due to government or private-sector projects in extractive industries, infrastructure, or other development initiatives, largely due to inadequate regulatory protections for indigenous communities (Taluke et al. 2022). The transfer of control of natural resources from indigenous communities to business actors and the government excludes most of the community from their land and sources of livelihood. The 2020 Omnibus Law, designed to simplify business permits, has raised concerns about its potential to facilitate land acquisitions without proper consultation with indigenous communities. This law has raised significant concerns over land rights in Papua, which can also disproportionately impact women and people with disabilities,

whose land rights and decision-making power are less often less secure, making them more vulnerable to displacement. In Papua's patrilineal and patriarchal culture, men retain land ownership while women hold limited rights to land usage and management. As environmental degradation worsens, women face greater impacts due to restricted access to and control over essential resources, making them more vulnerable (Manoby et al. 2023).

Women's participation in decision-making in Southwest Papua is a sensitive issue due to the influence of the customary law system upheld by various ethnic groups in the region. Although historically, women were once isolated by traditional customs, perspectives have begun to shift, and women are increasingly recognized as having more equal rights, especially in community decision-making processes. Efforts to support gender equality, such as education, skills training, and supportive policies, are making a difference, but structural and cultural barriers persist. Nevertheless, women have become more active in public decision-making, particularly in the context of land and resource management, often demonstrating leadership in customary communities.

In recent years, Sorong has made strides in improving the inclusion of people with disabilities within local government agendas, supported by NGOs and formal groups encouraging their active participation. In contrast, participation remains low in Raja Ampat, with limited support from both local communities and the government. Poor infrastructure, inadequate communication support, and inadequate educational resources further limit opportunities for individuals with disabilities in Raja Ampat, with limited government initiatives to foster independence and social inclusion. Many people with disabilities face challenges related to education, which are often overlooked by families, communities, and government authorities. This research underscores the need for improved educational infrastructure, tailored communication support, and a greater focus on inclusivity to address the inequalities faced by both women and people with disabilities in the region. Efforts to bridge these gaps are critical for ensuring more equitable participation in community development initiatives.

BOX 1 | Integration of GEDSI in R2R initiatives: A literature review

A review of GEDSI in R2R projects across the Asia Pacific region highlights that while some R2R projects recognize women's roles in community and governance, meaningful inclusion remains limited. Examples include the Vanuatu project addressing women's food security roles (ACIAR 2023) and efforts in the Philippines and Nauru to address women's health and livelihood challenges. Capacity-building is evident in a few projects, such as waste recycling training in Indonesia (WWF et al. 2015) and shell harvesting involvement in the Solomon Islands (Kereseka 2014). However, GEDSI efforts often focus only on women's participation in data collection, with limited impact on their broader needs.

Notably, disability inclusion is largely overlooked, with only one project in Tuvalu addressing this aspect (Oestereich 2024). Indigenous knowledge integration is seen in Fiji, Maldives, and the Solomon Islands (WWF et al. 2015; Kereseka 2014). For effective GEDSI inclusion, R2R projects require consistent, integrated approaches with pathways to assess impact on diverse groups, moving beyond tokenistic measures to genuinely amplify the voices of women, people with disabilities, and marginalized communities.

Governance context

Formerly part of West Papua province, Southwest Papua embraces the provincial vision for sustainable development as embodied in the Special Regional Regulation (Perdasus) No. 10/2019. This vision emphasizes development that meets current needs without compromising the ability of future generations, respecting the unique local conditions and characteristics. It aims to ensure the sustainability of natural resources, support the livelihoods and well-being of the Indigenous Papuans (OAP) and the broader Indonesian population, and to enhance their quality of life. The regulation reflects the government's dedication to conservation by enshrining protections for vital ecosystems, including integrating traditional conservation practices like *egek* and *sasi* (Adiastuti et al. 2019; McLeod et al. 2009), and upholding indigenous and community rights within natural resource governance. However, while these frameworks promote sustainable objectives, the practical implementation has occasionally faced inconsistencies, with some land acquisition practices perceived as lacking full community consent, raising concerns about equitable governance.

The establishment of marine protected areas (MPAs) in Raja Ampat and Sorong districts, which span over 2.1 million hectares, is a key intervention measure in protecting marine biodiversity and regulate fishing activities (Ministry of Marine Affairs and Fisheries 2024). This is in line with the Indonesian government's commitment to establishing 30 million hectares of MPAs that are managed effectively by 2030 (30x2030 target). International recognition — such as Raja Ampat's UNESCO Global Geopark status —along with robust support and funding from national and international NGOs, reinforces conservation efforts. The presence of conservation specialists within NGOs and universities, along with partnerships with initiatives like Bird's Head Seascape, enhances the region's capacity for sustainable natural resource management, even as work remains to ensure that all governance actions align fully with sustainable and inclusive principles.

However, Southwest Papua province faces significant challenges in governance and coordination partly due to its recent establishment. Key policies and regulations, such as the Zoning Plan for Coastal Areas and Small Islands (RZWP3K) are still under development, affecting coastal management efforts. Additionally, the province's government structure remains incomplete, resulting in weak coordination and integration, especially in integrating coastal planning with the Regional Spatial Planning (Rencana Tata Ruang Wilayah/RTRW). Sectoral egos and fragmented governance hinder a holistic R2R approach, leading to "conflicts" over land and sea use, as various sectors prioritize their own interests without considering their effects to other sectors and broader environmental sustainability. These issues are further weakened by limited infrastructure, particularly on remote islands, making it difficult to monitor natural resource exploitation effectively.

Compounding these challenges is the lack of community involvement in decision-making processes, where public consultations tend to focus on disseminating government policies rather than fostering meaningful dialogue. This disconnect between policy and practice is further reflected in the disjoin between the Long-Term Development Plan (RPJP) and the Regional Medium Term Development Plan (RPJMD), creating gaps in conservation strategies. Additionally, limited human resources, policy-maker capacities, and law enforcement hinder the operationalization of sustainable development regulations across the region.

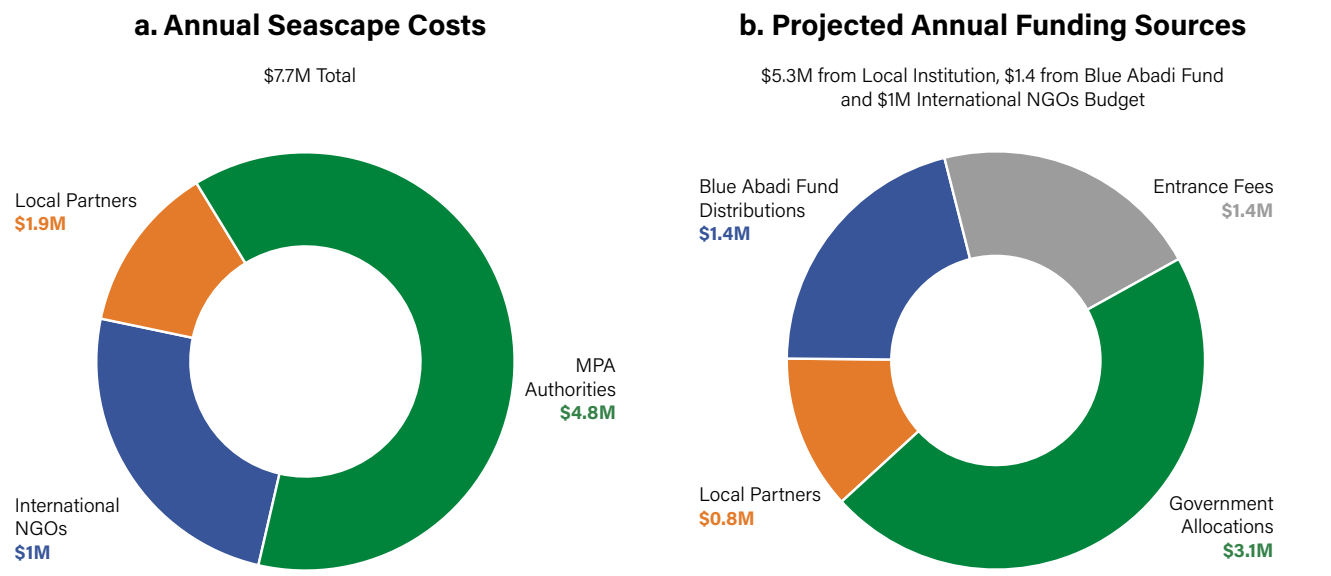
Despite these challenges, Southwest Papua has considerable opportunities to enhance natural resource governance. The region's new provincial status, combined with global interests on conservation, provides a unique opportunity to establish innovative sustainability policies that align with Indonesia's 30x2030 conservation goals. Additionally, the tourism sector holds potential for growth, which could be leveraged to fund conservation efforts. International collaborations and public-private partnerships can bring technological advancements and funding to improve resource monitoring and management. Empowering local communities through capacity-building and fostering stronger partnerships between government, NGOs, and universities can create a more inclusive and effective governance framework. Nevertheless, addressing threats such as uncontrolled development, environmental degradation, and climate change will require urgent and coordinated action to safeguard Southwest Papua's natural and cultural heritage.

Sustainable finance context

Papua's unique terrestrial and marine ecosystems are vulnerable due to limited sustainable livelihood and business opportunities, especially for rural IPLCs who are largely dependent on natural resources like forests and fisheries. Having few sustainable livelihood options can force them to turn to environmentally harmful activities as a means of income. Indonesian Papua's healthy and intact environment is juxtaposed with these social and economic pressures, given that the region has the lowest Human Development Index (HDI) in Indonesia with limited development opportunities beyond natural resource exploitation (Mumbunan et al. 2021).

Furthermore, although Southwest Papua's intact rainforests and marine ecosystems are critical for global climate action and biodiversity, the province receives limited international funding for its conservation efforts, especially to halt deforestation. While the Bird's Head Seascape has secured US$7.7 million in funding from government budgets, tourism (via a marine park entrance fees managed by the Regional Public Service Agency Technical Implementing Unit or Badan Layanan Umum Daerah Unit Pelaksana Teknis Daerah/BLUD-UPTD), grants from philanthropic donors (such as the Blue Abadi Fund and other donations through international NGOs), corporate social responsibility (CSR) programs, and fines for illegal fishing (Figure 6), there is a lack of equivalent mechanism to promote sustainable financing and equitable land use in terrestrial areas. This gap risks undermining long-term conservation efforts and local livelihoods, highlighting the need for an integrated R2R sustainable financing approach that supports both land and marine conservation in Southwest Papua.

FIGURE 6 | The annual cost to protect the Bird's Head Seascape Marine Protected Area (a) and projected annual funding from multiple sources (b)

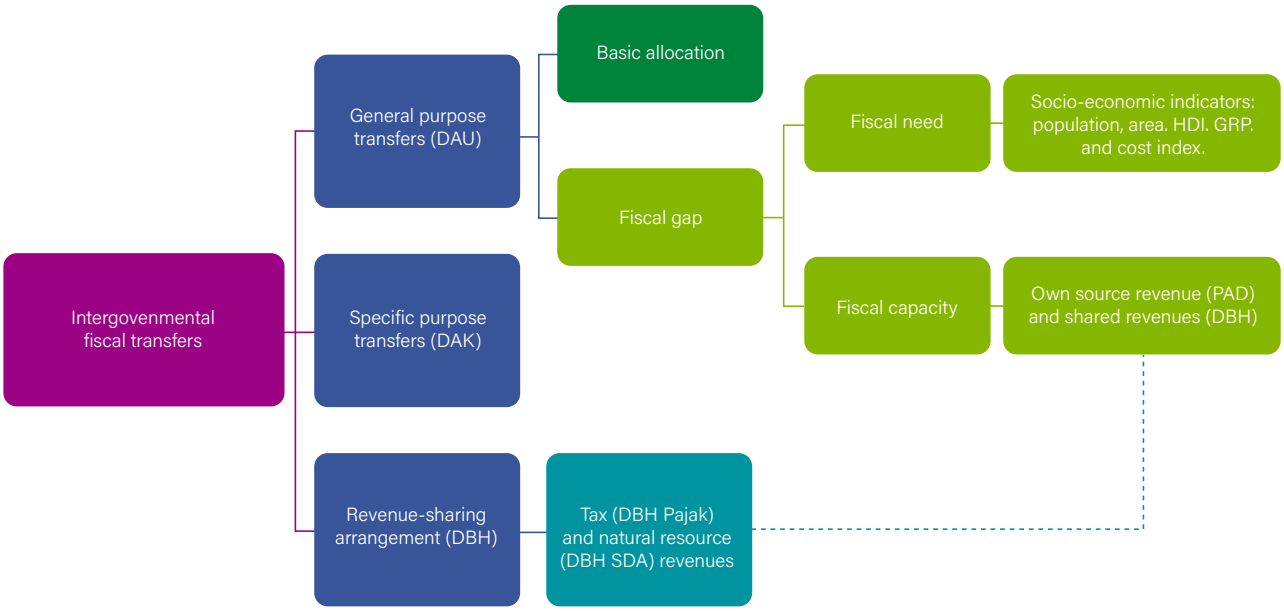


Sources: Konservasi Indonesia 2023; Browne et al. 2022.

Existing funding mechanisms supporting conservation in Southwest Papua include:

1. **Government budget allocations:** Government budget allocations to cover the $3.1 million annual cost of protecting the Bird's Head Seascape are generally derived from intergovernmental fiscal transfers through the South West Papua provincial government (Figure 7), including funds from the General Allocation Fund (Dana Alokasi Umum/ DAU), Specific Allocation Fund (Dana Alokasi Khusus/ DAK), Revenue Sharing Fund (DBH), Grant Fund (Hibah), and Special Autonomy Fund (Otsus).

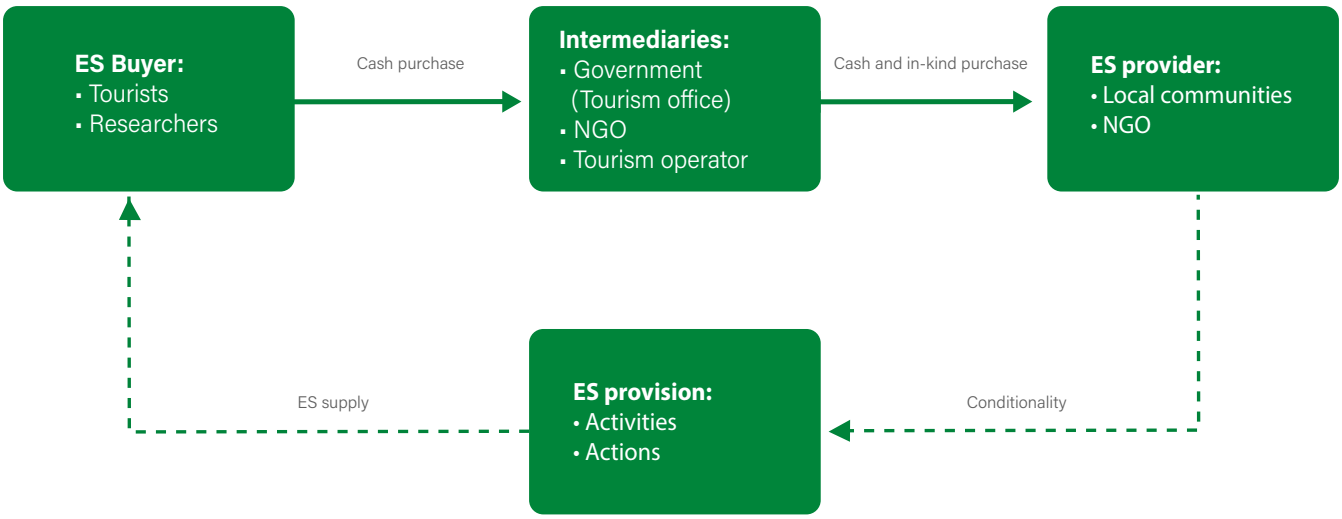
FIGURE 7 | Ecological fiscal transfers at the provincial level in Indonesia



Source: Mumbunan et al. 2012.

2. **Payment for ecosystem services:** In 2007, the Raja Ampat regency government introduced an entry fee system under the Raja Ampat Marine Park Authority's Public Service Agency (BLUD UPTD) framework as a "payment for ecosystem services" finance scheme (*Tarif Layanan Pemeliharaan Jasa Lingkungan/TLPJL*), in which tourists and researchers contribute to marine conservation in Raja Ampat and community support in exchange for access (Figure 8). The fee, required annually, is set at Rp 700,000 for international visitors and Rp 425,000 for Indonesian visitors in 2024. Residents of Raja Ampat are exempt from this fee. Managed by the Raja Ampat Marine Park Authority's Public Service Agency (BLUD UPTD), 30 percent of the revenue was thus directed to the regency's general fund, while the remainder was split evenly between conservation efforts (such as MPA enforcement and reef monitoring), community welfare projects, and the operational costs of the management team itself (Atmodjo et al. 2017).

FIGURE 8 | Overview of Raja Ampat's entrance fee through the PES framework



Source: Atmodjo et al. 2017.

3. **Grants through the Blue Abadi Fund:** The previous West Papua administration, together with the Bird's Head Seascape Coalition, pursued partnerships with private sector entities, public bodies, and philanthropic groups to finance a $38 million trust fund. Named the Blue Abadi Fund (BAF), it was targeted to continuously support marine conservation and indigenous coastal communities in the Bird's Head Seascape. It aims to generate approximately $1.4 million annually and is also projected to stimulate an additional $5.3 million each year from locally generated sustainable revenue streams. In the period 2016-2021, the fund had raised more than 23.45 million in funds and had distributed more than $4 million over the course of two funding cycles, supporting a broad spectrum of activities such as the management, surveillance, and evaluation of Marine Protected Areas (MPAs), alongside initiatives geared toward sustainable development (BAF 2022). As of March 2021, 39 grants were awarded to a total of 27 organizations, including the Raja Ampat BLUD UPTD, which helped mitigate financial gaps not covered by existing user fees or caused by the downturn in tourism during COVID-19 pandemic.

4. **Debt-for-nature swaps:** A debt-for-nature swap is a financial arrangement in which a portion of a developing country's external debt is canceled in exchange for the country's commitment to investing in conservation work. In July 2024, a $35 million debt-for-nature swaps between Indonesia and the United States was finalized with the aim to conserve coral reefs in eastern Indonesia — including the Southwest Papua Birds Head Seascape — over the nine years. The funding is offset by Indonesia's canceled sovereign debt payable to the US (Ambari 2024). The Global Fund for Coral Reefs (GFCR), an international public-private finance body, provided financial and technical support for the debt swap, while conservation organizations Yayasan Konservasi Alam Nusantara (YKAN) and Konservasi Indonesia (KI) oversee fieldwork using grant funding established under the swap. Activities enabled by the debt-for-nature swap include capacity-building of coral-dependent communities to access the grant to develop livelihoods that support the protection of some 800,000 hectares of coral reefs (Ambari 2024).

The desirability for a wider sustainable finance approach is reflected by stakeholders in Southwest Papua, with Tranter et al. (2022) finding that activities carried out in Raja Ampat to address the challenges of the COVID-19 pandemic — which reduced tourism-related revenue — had led to strong examples of collaboration between communities and governments finding alternative ways of maintaining conservation efforts. This includes ensuring the network of community-managed protected areas involving local traditions (such as *egek* and *sasi*) support community resilience, cooperation in management activities where communities patrolled their surrounding areas, allowing government agencies to patrol more remote areas, and an improved focus on managing tourism numbers to reduce environmental degradation (Tranter et al. 2022).

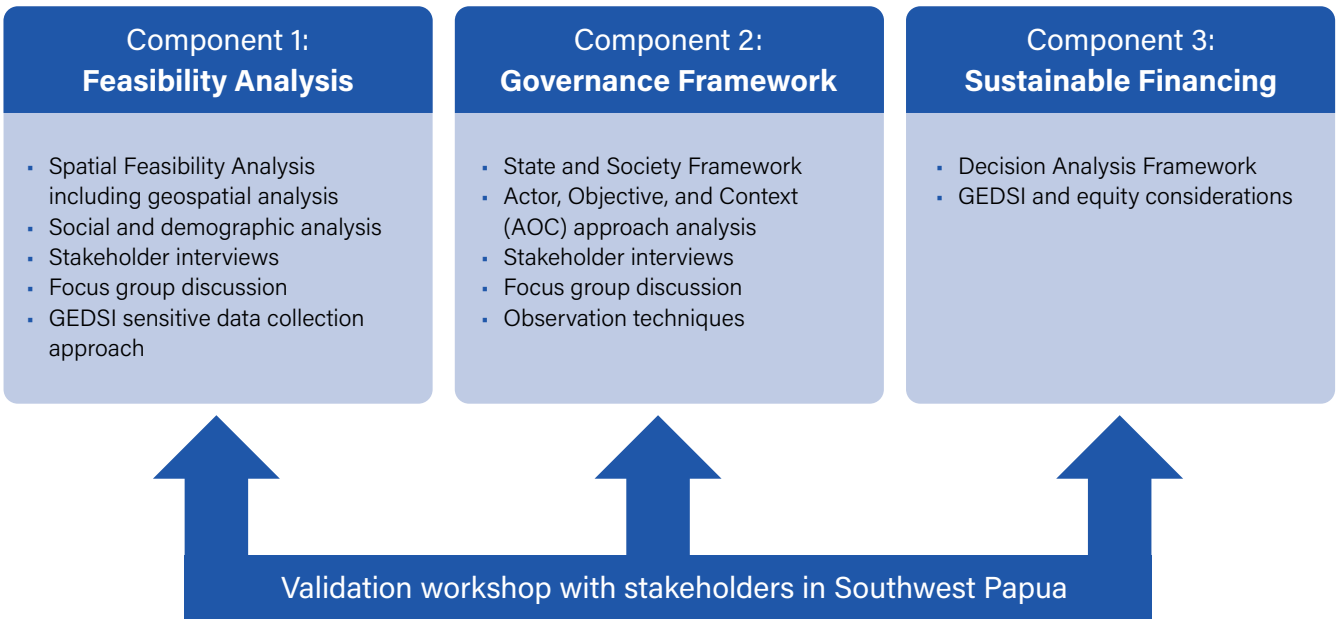
Sustainable finance mechanisms in Southwest Papua underscore the province's potential to balance economic development with environmental preservation. Enhanced and diversified funding strategies are essential to secure the resilience of these ecosystems and promote sustainable livelihoods for IPLCs, ensuring long-term conservation impacts across both terrestrial and marine landscapes.

Methodology

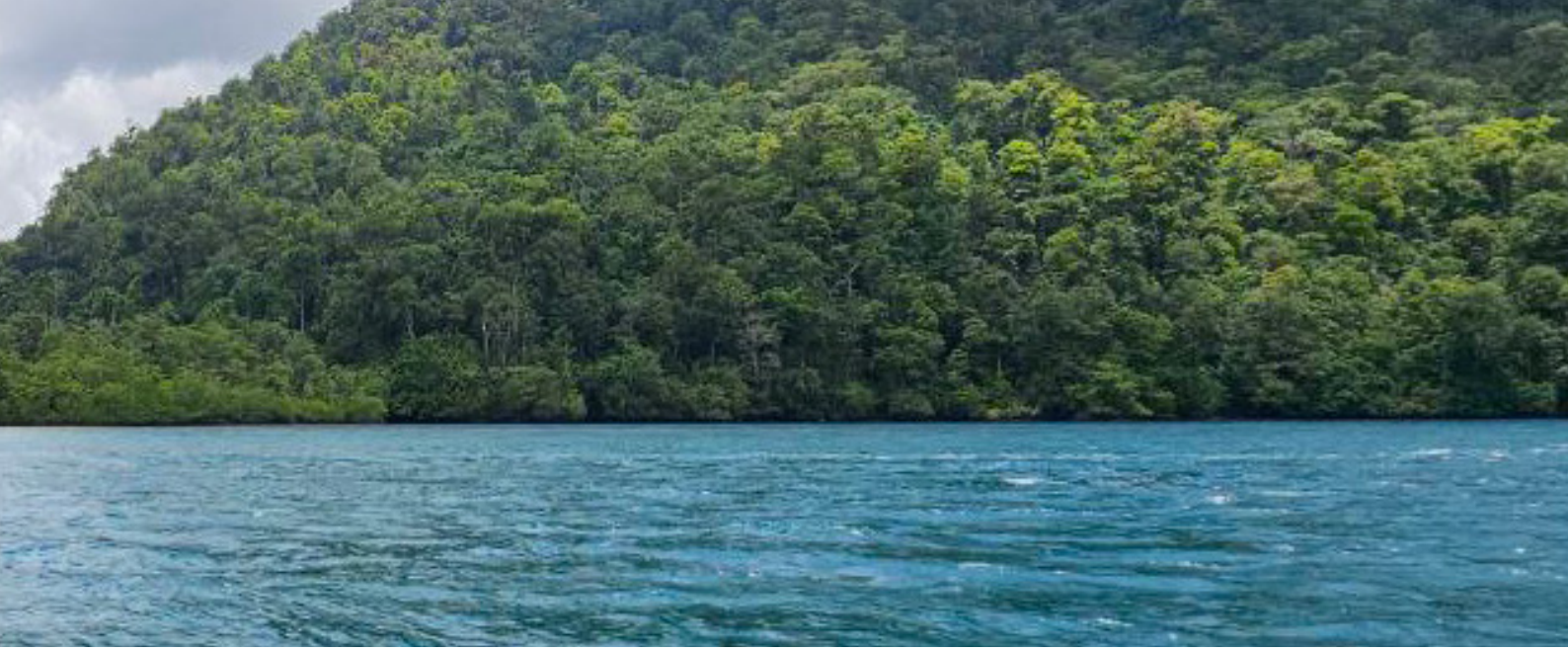
Given the breadth of this research, which covers environmental, spatial, financial, social, governance and GEDSI assessments, a mixed-methods approach enabled a comprehensive understanding of the complexities of natural resource management and its intersection with social inclusion and community rights in the region.

Data collection for this study was carried out from August 2023 to July 2024, employing mixed qualitative and qualitative research methods to comprehensively capture the dynamics of natural resource management in Southwest Papua. The approaches and methods used in the three components of research project are summarized in the following:

FIGURE 9 | Research methods in the R2R study



Source: Authors



1. **Semi-structured interviews:** A total of 80 semi-structured interviews were conducted with a diverse group of stakeholders, including 56 men and 24 women. Stakeholder groups included NGOs, as well as government, community, local business, and private sector organizations. These interviews aimed to capture a range of perspectives on current R2R management practices, impacts of climate change, noting different perspectives across gender and disabilities (we conducted three interviews with people with disabilities and/or representative organizations), the role of indigenous knowledge in natural resource governance, and alternative development narratives.

2. **Focus group discussions (FGDs)**: Seven FGDs were held with mixed-gender and all-women groups to explore the impacts of climate change, the varied social and ecological outcomes of policy implementation, and perspectives on GEDSI.

3. **Policy analysis:** A review of legal frameworks and policies related to natural resource management was conducted, focusing on provisions for community rights, benefit-sharing, and stakeholder participation/consultation. The analysis included identifying prevailing narratives surrounding development and conservation on land and sea, with specific attention to policy implications for GEDSI.

4. **Document and literature review:** An in-depth review of academic literature and relevant documents was undertaken to understand the concept of R2R and its implementation in diverse contexts as well as socio-political history, institutional and governance frameworks, and current realities of the study area.

5. **Spatial analysis: A** comprehensive spatial analysis was conducted to assess the interconnected ecosystems from ridge to reef. The study focused on identifying dynamic changes in four key ecosystems — forest, mangrove, coral reef, and seagrass — driven by human activities.

6. **Observation:** Field observations were conducted across multiple locations in Raja Ampat regency (e.g., Kampung Arborek, Friwen, Waifoi, Saonek, Waisai) and Sorong (e.g., Malaumkarta village, Suatolo) to document how local actors respond to social and ecological changes, including climate change, and their interactions with government agencies, business organizations, and other entities.

7. **Validation workshop:** A validation workshop was organized to present preliminary findings to key stakeholders in Southwest Papua. The workshop involved participation from 16 individuals across stakeholder groups, including representatives of the local government (eight people), NGOs (four people), and the local community (four people). It also facilitated feedback on the study results and provided an opportunity to refine the findings based on stakeholders' suggestions.

FIGURE 10 | Validation workshop in Sorong

Source: Authors documentation, with permission from participants.

Results

Feasibility of R2R management

Based on interviews, the feasibility of implementing the R2R conservation approach in Southwest Papua appears promising, provided that certain enabling conditions and challenges are addressed. This feasibility hinges on enabling factors such as established cultural practices in natural resource management, local government commitment, awareness of environmental impacts and importance of ecosystem connectivity, as well as potential funding from *dana otsus* (government budgets), international donors, and strategic partnerships. These factors collectively enhance the potential for implementing R2R.

Cultural compatibility

The R2R approach aligns well with indigenous beliefs and practices in Southwest Papua, which emphasize the interconnectedness of land and sea. Local indigenous communities view the "forest as mother" and "sea as father", underscoring a holistic perspective on ecosystems and the importance of conserving both.

A resident of Waifoi village in Raja Ampat said:

> "The forest is mother, and the sea is father. We look after mother and father to protect the future. If the sea is destroyed, it means that the father is also destroyed. If the forest is destroyed, it means mother is also destroyed" (Interview, Raja Ampat, October 2023).

This cultural alignment with R2R strengthens its feasibility and provides a foundation for integrating traditional knowledge into conservation practices.

Customary traditions, particularly those governing sustainable practices like *egek* and *sasi*, reinforce sustainable management across land and marine ecosystems. The Moi tribe's culture emphasizes the responsible management of resources, seeing land as a "mother", symbolizing a nurturing force that sustains life, much like a mother caring for her children. Through *egek* and *sasi*, indigenous communities ensure that both terrestrial and marine resources are used sustainably, creating a seamless alignment with the R2R approach.

Legal and governance support

The strength of *adat* (customary laws), supported by legal frameworks, further supports the feasibility of R2R implementation. The Moi tribe, for instance, recognizes the rights to manage their ancestral lands under Sorong Regency Regulation No. 10/2017, which protects the rights of indigenous people to manage their ancestral lands. This regulation officially acknowledges the Moi's rights to customary land, forests, and coastal areas, enhancing local authority over resource management. Article 12 of the regulation recognizes their territorial claims over land and marine areas, while Article 15 secures their rights to use, develop, and control these resources based on hereditary ownership. These policies strengthen indigenous governance structures, aligning with R2R principles by empowering communities to manage their landscapes from ridge to reef.

Government commitment at the provincial and regional levels is another critical factor in R2R feasibility. Interviewees indicated that conservation efforts could gain momentum with a provincial vision of sustainable development and interests in integrating R2R principles into policy. A supportive government can streamline coordination across the forestry, marine management, and agricultural sectors, which are essential areas in ridge-to-reef conservation.

Ecological imperatives for R2R management

Southwest Papua's interconnected ecosystems, from primary forests to coral reefs, necessitate an integrated R2R approach to improve climate resilience and sustain community livelihoods. Our study found that land-based activities significantly threaten the downstream ecosystem. For instance, deforestation for agriculture, plantation and mining in upstream areas, combined with industrial and midstream tourism activities, lead to water pollution and the degradation of coastal ecosystems, such as mangroves. Given that mangroves play a crucial role in regulating upstream water before it flows into the ocean, if ecosystem services fall even slightly, the potential for natural disasters increase.

Marine ecosystems, especially seagrass beds and coral reefs, face extreme pressures from these land-based threats. In some areas of Raja Ampat, such as in Dampir Strait, coral reefs were exposed to high sea surface temperatures, suspended solids, and the Crown of Thorns Seastar (COTS) outbreak, which leads to coral bleaching (Erdmann and Jones 2018). If this condition continues for an extended period, it could lead to massive coral destruction. The health of these habitats is crucial as they provide nursery areas for fish and maintain biodiversity. Seagrass and coral reefs are distributed along the shallow water zone surrounding Southwest Papua, some of them are located inside MPAs. Although local authorities continue to regularly monitor MPAs, they still find evidence

of illegal activities like overfishing and illegal fishing. Strengthening regulations and monitoring around MPAs is essential to protect these marine resources.

Key challenges to R2R implementation

Despite these favorable conditions, several challenges could impede R2R implementation. Governance issues, particularly "sectoral ego", present significant obstacles. Competing interests among different government departments create fragmentation. For instance, forestry, agriculture, and marine governance often operate independently, leading to conflicting policies and priorities. Effective R2R implementation would require a coordinated approach across these sectors, including harmonizing objectives and activities across sectors. Several sources suggested that the Regional Development Planning Agency (Bappeda) had the potential to coordinate across local government departments. Bappeda's role would be crucial in managing resources, avoiding sectoral conflicts, and ensuring unified planning across land and marine jurisdictions. However, R2R implementation may face challenges as it would require coordination among multiple stakeholders from government and non-government entities.

Another challenge is funding limitations and donor alignment. R2R initiatives require substantial and long-term funding, but many donors prefer to fund specific sectors rather than integrated conservation approaches. Substantial support from both international donors and government budgets, like the special autonomy fund, could help address these limitations, provided that strategic coordination can ensure the funds are allocated effectively. This funding source, combined with external support from NGOs and donors, can enable local governments to sustain conservation efforts over the long term.

Findings regarding GEDSI

This section outlines findings from empirical and secondary research on GEDSI within the context of inclusive R2R implementation in Southwest Papua. Applying the Gender at Work analytical framework (Rao et al. 2017) as adapted in KONEKSI's GEDSI strategy, this analysis examines how traditional conservation practices, women's roles, education, and land tenure complexities shape gender norms and inequalities. The findings are organized by the framework's four themes: access to resources and opportunities, formal rules and policies, informal norms and practices, and individual consciousness and capabilities.

Access to resources and opportunities

Access to natural resources in Southwest Papua still shows disparities in gender, disability and social inclusion. At the individual level, despite their critical roles in subsistence production and conservation, women from indigenous communities still face constraints in accessing and owning land, as traditional inheritance systems often prioritize male heirs. This situation has limited women's full access to economic benefits from natural resources. Additionally, people with disabilities are indirectly excluded from resource management and decision-making processes, limiting their economic opportunities.

This gendered limitation is compounded by weak legal protection and the absence of gender-sensitive policymaking, further exacerbating women's economic vulnerability, especially during large-scale land acquisitions. Structural inequities in access to resources persist due to centralization and privatization tendencies in policy frameworks. Permits favoring large-scale investment and businesses, as well as looser environmental standards in the Omnibus Law, prioritize economic gains over equitable access, often displacing local and indigenous communities and limiting their traditional rights.

Advocacy and capacity-building initiatives by organizations such as Female Diver Association of Raja Ampat (Molobin Raja Ampat/MORA), Yayasan Konservasi Alam Nusantara (YKAN), and Yayasan Konservasi Indonesia (KI), Kawan Pesisir, and projects such as Coral Reef Rehabilitation and Management Program-Coral Triangle Initiative (Coremap CTI) have led to improved women participation in recent years, including in supporting women's sustainable resource management efforts. However, these programs are still insufficient in the wider challenge to overcome deeply rooted marginalization and limited policy implementation.

Formal rules and policies

In terms of legal framework, formal policies such as the Papua Special Autonomy Law mandate gender representation, including a 30 percent quota of women in local governance roles. Additionally, the Indigenous Women and Children Protection Empowerment Institute (LP3A2) was established to further promote women's roles in governance and resource management. However, implementation gaps persist. These laws and regulations often fall short due to bureaucratic hurdles and the region's limited administrative capacity. Moreover, the Omnibus Law's provisions may undermine these protections, emphasizing investment over local autonomy and environmental safeguards.

Despite these advances, patriarchal values embedded in land tenure laws continue to restrict women's ownership rights. Customary rights remain male-dominated, and while some progress has been made (e.g., Sorong's recognition of ancestral land rights), legal frameworks lack comprehensive gender integration, limiting women's formal involvement in land governance. Also, there remains minimal emphasis on incorporating GEDSI perspectives in policymaking and implementation, with limited monitoring mechanisms ensuring marginalized groups benefit from natural resource management.

Informal norms and practices

Deep-rooted patriarchal norms across Southwest Papua still hinder women's equitable participation in resource governance. While women contribute significantly through informal influence via social networks and kinship, their visibility and authority in resource governance are constrained by entrenched gender norms. In some communities, only men partake in decision-making bodies, relegating women to peripheral roles. This exclusion limits women's influence in advocating for fairer distribution of resource benefits. Traditional rights often exclude women, reinforcing gender hierarchies and limiting women's and marginalized groups' control on resources.

People with disabilities, meanwhile, continue to be marginalized because of social stigma and lack of inclusivity, further isolating them from decision-making processes. The limited data on disabilities in the region perpetuates exclusion, as policies lack the evidence base needed to address specific needs for people with disabilities.

Consciousness and capabilities

In terms of knowledge and awareness, women in Southwest Papua demonstrate extensive knowledge in resource management, managing food security and preserving traditional ecological knowledge through rights like *hak pakai* (right to use) and *hak makan* (right to eat). These skills include sustainable farming, medicinal knowledge, and food garden management.

However, the political consciousness and awareness among marginalized groups, particularly women and people with disabilities, are hindered by limited educational opportunities, including disparities between urban and rural areas, restricted access to leadership roles, and cultural norms that discourage their involvement in resource management. Although some indigenous groups such as the Moi tribe allow some roles for women, broader empowerment efforts and institutional support (e.g., more access to information) are still limited.

Our key sources emphasized the need for capacity building programs to equip women and marginalized groups with the knowledge and skills to engage meaningfully in decision-making. Such initiatives are sporadic and often lack sustained support, preventing women and other marginalized groups from effectively challenging the status quo in natural resource governance.

To ensure effective governance from R2R in Southwest Papua, this report recommends prioritizing social inclusion by expanding local representation and participation in decision-making processes. This can be achieved by integrating diverse voices, particularly those of women, indigenous peoples, and other marginalized groups, into conservation initiatives and governance structures. Building the capacity of local governments is also needed to enable them to facilitate decision-making processes that are informed by community consultation and inclusive wisdom. Policy advocacy at the national level, such as engaging with the Ministry of Women's Empowerment and Children's Protection and the Indonesian Human Rights Commission is also needed. This should involve the active empowerment of marginalized communities, ensuring that their knowledge, experiences, and needs shape policy development and implementation.

There is also an urgent need for advocacy to promote equitable conservation characterized by the fair distribution of benefits while respecting local wisdom and traditional practices. Additionally, a comprehensive financing strategy aligned with GEDSI principles is required to enable resource allocation to local communities and civil society organizations (CSOs). This will enhance their ability to contribute effectively to the inclusive development of Southwest Papua, aligning with the objectives of the Special Autonomy Law. An inclusive R2R approach should incorporate GEDSI in all project stages, with meaningful involvement and the non-tokenistic engagement of women, indigenous peoples, and diverse social groups. Clear pathways for impact assessment will ensure accountability and transparency, fostering sustainable and just governance across terrestrial and marine ecosystems.

Achieving gender equity in Southwest Papua will require a multidimensional strategy. Legal reforms must be aligned with culturally sensitive interventions that acknowledge the distinct roles and contributions of women in resource management. In addition, building women's individual capacities through education and training, fostering more inclusive norms, and expanding their access to resources are essential for promoting sustainable and equitable development. Lastly, a more inclusive approach to governance and integrating women's voices and indigenous perspectives is necessary to transform entrenched gender relations and create a more just and sustainable society in Southwest Papua.

Findings on governance framework

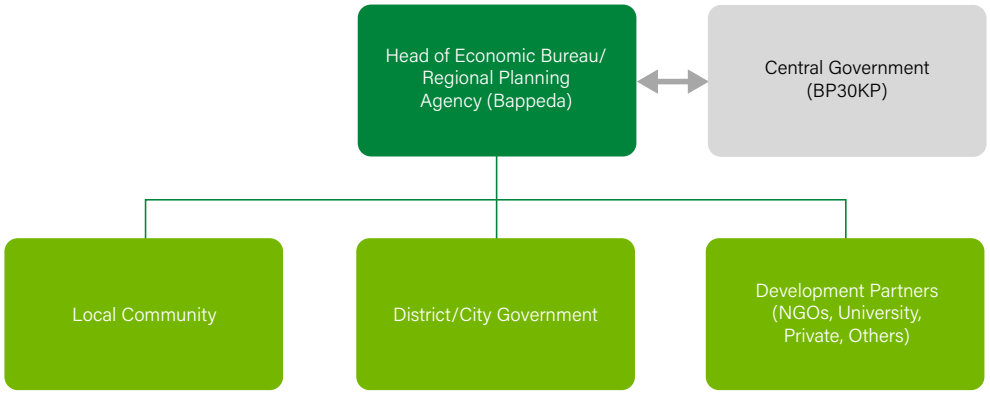
To enhance governance and sustainable financing for R2R conservation in Southwest Papua, a structured, inclusive framework is essential. Shared-governance arrangements in conservation can bring financial and socio-economic benefits for local communities, including revenue-sharing, financial resilience, improved food security, equitable resource management, and robust monitoring and law enforcement (Cumming et al. 2021; Phua et al. 2021). However, transforming from the current model (ridge and reef) to a joint management (ridge to reef) framework requires gradual steps to build trust and coordination among stakeholders, as a staged approach allows for sustainable, collective progress

A key recommendation is to establish a Ridge to Reef Development Collaboration Agency for Southwest Papua Province (Badan Kolaborasi Pembangunan Ridge to Reef Provinsi Papua Barat Daya/BKPR2R-PPBD) with potential legal support from Special Regional Regulations (Perdasus). Leveraging Papua's Special Autonomy Law (Law No. 21/2001 and its 2021 amendment), this agency could adapt policies to respect indigenous rights, resource management, and local governance structures. The authority to form and ratify Perdasus, based on Government Regulation No. 7/2021 concerning Special Autonomy for Papua, requires approval from the Papuan People's Representative Council (DPRP) the Papuan People's Assembly (MRP), and the cultural representation institutions of the Papuan Indigenous People. The Perdasus can be drafted to cover issues such as the rights of indigenous peoples, management of natural resources, education and health, protection of the rights of Indigenous Papuans (OAP), and a local government system that is appropriate to the unique conditions of Papua. Thus, the formation of a Perdasus related to natural resource management, especially for R2R protection, which is in line with the local wisdom of the Papuan people, could be very promising.

The proposed agency would centralize R2R governance, integrating resources, human capital, and infrastructure under a holistic, integrative, thematic, and spatial (HITS) framework as championed by Bappenas. Considering the larger ecosystem scope of administrative jurisdiction (between districts), the proposed agency for R2R conservation should ideally operate under provincial government oversight. With the governor in an *ex officio* role, operational control can be managed by the regional secretary within the economic bureau of the provincial government. This structure would enable the R2R initiative to be formally integrated into the Regional Medium- and Long-Term Development Plan (RPJMD/RPJPD) and followed up in the work plans of regional agencies or work units. Serving as a central R2R hub, the agency would "orchestrate" financial resources, programs, activities, human resources, and infrastructure, thereby improving focus and minimizing common issues like low budget absorption and unfocused planning.

The BKPR2R model aligns with national policy initiatives aimed at accelerating development in Papua. Specifically, it complements the objectives of Presidential Regulation No. 121/2022, which created the Steering Committee for the Acceleration of Special Autonomy Development for Papua (BP3OKP), a non-structural institution designed to synchronize and coordinate special autonomy development in Papua. Chaired by Indonesia's Vice President, BP3POKP includes the Minister of Home Affairs, the Minister of National Development Planning (Bappenas), the Minister of Finance, and representatives from each province in Tanah Papua. The President appointed members representing the provinces in Tanah Papua through 2023 Presidential Decree No. 15/M. By aligning with these national efforts, BKPR2R can serve as a replicable model for integrated governance in other provinces, demonstrating an adaptive and sustainable approach to regional governance that aligns needs with national objectives.

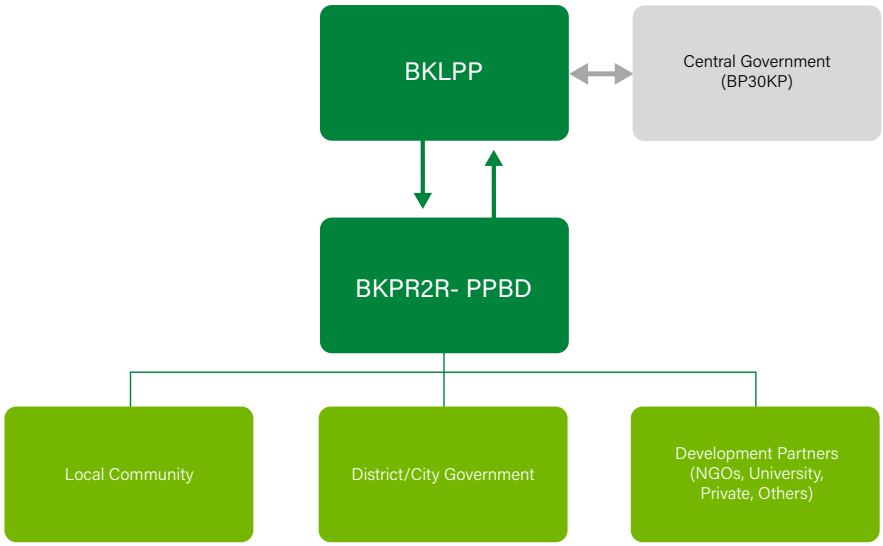
FIGURE 11 | Structure of the proposed BKPR2R-PPBD



Source: Authors

How is BP3OKP connected to the DPRP and MRP? These three institutions play an important role in implementing Special Autonomy in Papua. BP3OKP acts as director and supervisor of development, the DPRP as the regional legislative body that drafts regulations, and the MRP as a guardian of the rights of indigenous peoples. The connection between the three is very important to ensure that the implementation of Special Autonomy in Papua is effective and still takes into account the interests of Indigenous Papuans. BP3OKP aims to ensure that the development program complies with the Special Autonomy policies that have been established by the DPRP and MRP, as well as the regional government. BP3OKP, as the steering agency, works closely with the DPRP to ensure that the policies prepared by the DPRP are in line with the Papuan development goals desired by the central and regional governments. BP3OKP also supervises the implementation of this policy to ensure optimal results are achieved. BP3OKP, in supervising and directing development, must consider MRP approval, especially for policies related to the protection of customary and cultural rights. On this basis, BP3OKP will become an "umbrella" that orchestrates various R2R activities in Papua, and BKPR2R-PPBD will be one part of it. If the BKPR2R-PPBD institution can be developed for other provinces, then this will become part of the Cross-Governmental Collaboration Agency of Tanah Papua Province (Badan Kolaborasi Lintas Pemerintah Provinsi Tanah Papua/ BKLPP), with the structure as follows:

FIGURE 12 | BKPR2R-PPBD's relation to BKLPP in Tanah Papua



Source: Authors

By reflecting on the existing practices of R2R governance, we argued that strengthening social organizations and promoting technological support are essential. Integrated governance that harmonizes jurisdictional authority and the roles of state and non-state actors can be achieved through a zoning system aligned with community-based natural resource management. In Southwest Papua, Indigenous clans or tribes can be a basis of a zoning system, because they control how to manage the property rights. This will also provide space for local wisdom to play a greater role in environmental preservation. A clan-based zone system will also make it easier to resolve potential conflicts over land and resource use. Local wisdom often proves more effective than formal law in resolving economic, social and environmental issues, especially at the local level.

Religious organizations play a crucial role in fostering social solidarity to protect the environment. Churches, for instance, hold a unique position due to their strong influence within indigenous communities and their ability to inspire higher compliance rates. Its role includes education, advocacy, conflict mediation, and community organizing to protect the environment. However, challenges such as limited resources and external pressures call for stronger collaboration with the government, NGOs and international institutions to ensure sustainable environmental outcomes.

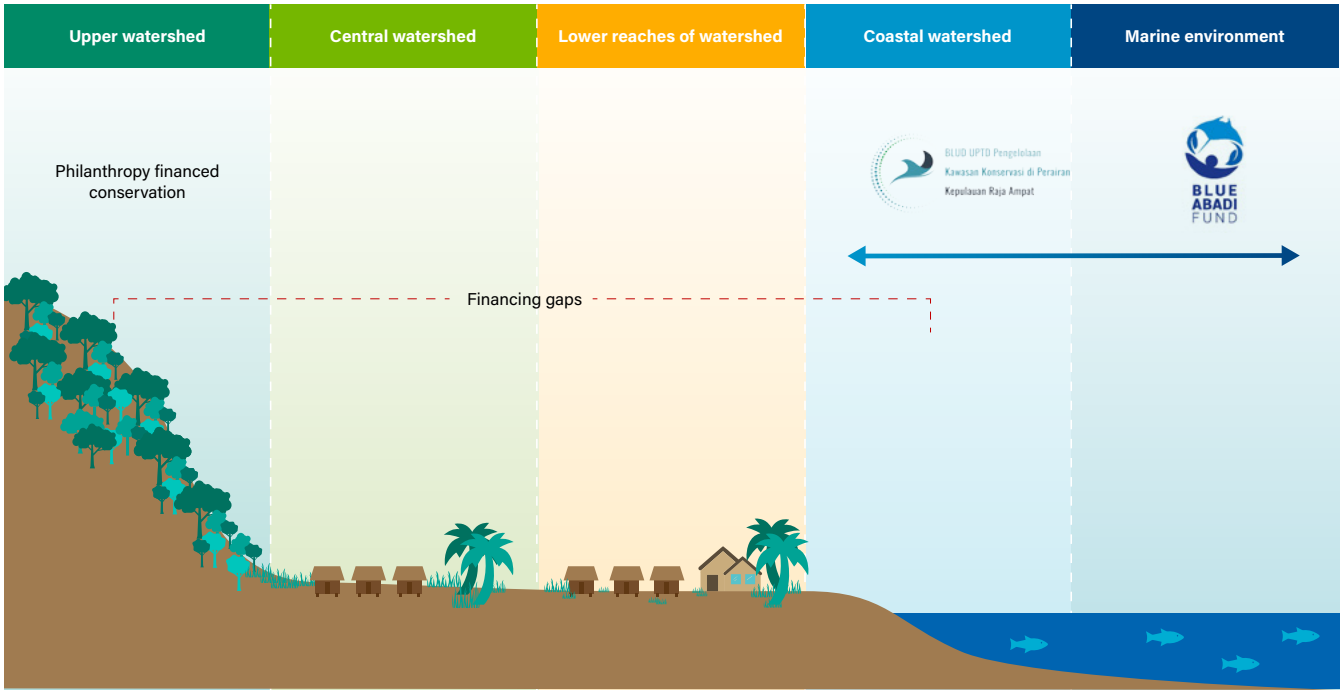
Technological support is necessary to improve sustainable livelihood and monitoring system in R2R governance. Tools like Geographic Information System (GIS) and the Sea Guard Information System (SIJALA) enable real-time monitoring and management and would be very good if its coverage was expanded to the ridge corridor. This technology will help the community not only in carrying out low-cost supervision but will also be an important part of efforts to strengthen the integrity of the monitoring system. Such advancements increase donor confidence by providing clear, measurable outcomes from their investments.

Findings on sustainable finance

Scope of current finance mechanisms in Southwest Papua

Current finance mechanisms in Southwest Papua are limited to marine and coastal protection but provide a solid foundation for broader efforts. Understanding these enables decision-makers in Southwest Papua to take a strengths-based approach to design a sustainable finance mechanism for R2R conservation that addresses current gaps. Building around what is currently working in Raja Ampat and the Birds Head Seascape — notably with the established BLUD UPTD, Blue Abadi Fund (See Figure 13), and the Debt for Nature Swap deal announced in July 2024 — local efforts can be prioritized to secure financing for terrestrial conservation and sustainable land management.

FIGURE 13 | Extent of existing sustainable finance in Southwest Papua, which is concentrated on the ocean and coast, with some small-scale conservation activities on land



Source: Authors

Barriers local communities face to access sustainable finance

IPLCs in Southwest Papua face significant barriers to accessing global sustainable finance, limiting the impact and reach of local conservation efforts. Although IPLCs are vital custodians of at least 32 percent of the world's land and associated inland waters and are effective managers of biodiversity even when conservation is not the primary purpose (e.g., in Schuster et al. 2019; Corrigan et al. 2018), financial mechanisms are often inaccessible to them.

A key challenge for many IPLCs in Raja Ampat and Sorong is limited financial literacy and management skills. Local groups often struggle to independently plan, implement, and manage funds, as well as produce competitive funding proposals that meet donor requirements. While organizations like Indigenous Community Institutions (Lembaga Masyarakat Adat/LMA), and the Alliance of Indigenous Peoples of Indonesia (Aliansi Masyarakat Adat Nusantara/AMAN), can navigate these processes, many local indigenous groups or women's groups often rely on assistance from external

NGOs. This dependence on external support for proposal creation indicates a gap in the community's capacity for self-sufficiency in fundraising efforts. This highlights the need for improved financial readiness and capacity among IPLCs to manage funds effectively, as well as a call for financiers to better adapt their granting or investment requirements to a level that IPLC-led conservation efforts can work with.

Another major constraint is limited access to information regarding funding opportunities. Many communities lack awareness of available funding opportunities due to minimal outreach from the government. For instance, opportunities for funding in fishery product management and marketing, such as tuna, are rarely communicated to local groups, restricting their ability to access financial support that could support their sustainable development initiatives.

To address these issues, conservation NGOs and the Southwest Papuan Government through the Department of Maritime Affairs and Fisheries Service provided training to community leaders on proposal writing and communication with donors, empowering them to, hopefully, seek funding independently in future. For example, YKAN offers training programs to indigenous group leaders to enhance their proposal writing skills and communication with donors so they can secure funding on their own.

Role of environmental markets as supplemental funding

Environmental markets, such as carbon credit systems, offer additional funding opportunities, but given the relatively "low-cost" for a carbon credit and the current volatility of pricing and demand, environmental markets should be viewed as a supplement — rather than sole source — to a broader sustainable finance approach (Cumming et al. 2021).

However, the growing awareness and lessons from carbon markets to date provide a broader, unique opportunity for Southwest Papua and Indonesia, which have yet to officially adopt a national carbon market. To build a competitive position in the global environmental market and source of high-quality credits, Southwest Papua — and Indonesia more broadly — can embrace a jurisdictional approach for:

- high-integrity carbon credit standards;
- inclusion of IPLC in the ownership, design, and delivery of projects; and
- transparency in monitoring, results and verification (Seymour et al. 2020).

This strategy could enable Southwest Papua to attract supplementary funding for R2R conservation, although reliance on environmental market alone is unlikely to fulfill the long-term financing needs for sustainable R2R management.

Potential for results-based payments in forest conservation

Results-based payment schemes can provide significant value for conserving Southwest Papua's intact forests, which are essential for biodiversity preservation, carbon storage, and community livelihoods. Noting the finance gap supporting terrestrial conservation in Southwest Papua, the provinces' 1 million ha of intact tropical forest landscapes offers an untapped source of finance (Potapov et al. 2017). Intact tropical forests, which are relatively untouched by human development, generally have the highest level of biodiversity, have greater adaptive capacity, and store up to 35 percent more carbon than regrowth and degraded forests (Watson et al. 2018; Seymour et al. 2020; Mackey et al. 2023). Yet as part of global efforts to halt deforestation and promote reforestation, there is limited action, policy, or finance for preserving the world's remaining intact forest landscape, with climate finance currently designed to reward jurisdictions with high deforestation to incentivize restoration and additionality.

Additionally, protecting intact forests can support sustainable development for local communities, who often suffer low human development indicators (Mackey 2020; Mumbunan et al. 2021; Watson et al. 2018). Southwest Papua has the rare opportunity to leverage forest conservation as a pathway to sustainable development with a results-based payment scheme to create a revenue stream that benefits both biodiversity and people whose culture and livelihoods depend on forests.

Importance of a diversified financial approach for R2R management

Equitable, sustainable, and prosperous R2R management requires a balanced and complimentary blend of financial mechanisms. Crucially, the financial approach should not depend on just one mechanism but a blend of complementary sources, including grants, investments, and revenue from environmental markets. This is a widely shared sentiment across conservation projects but is an underdeveloped concept in Southwest Papua.

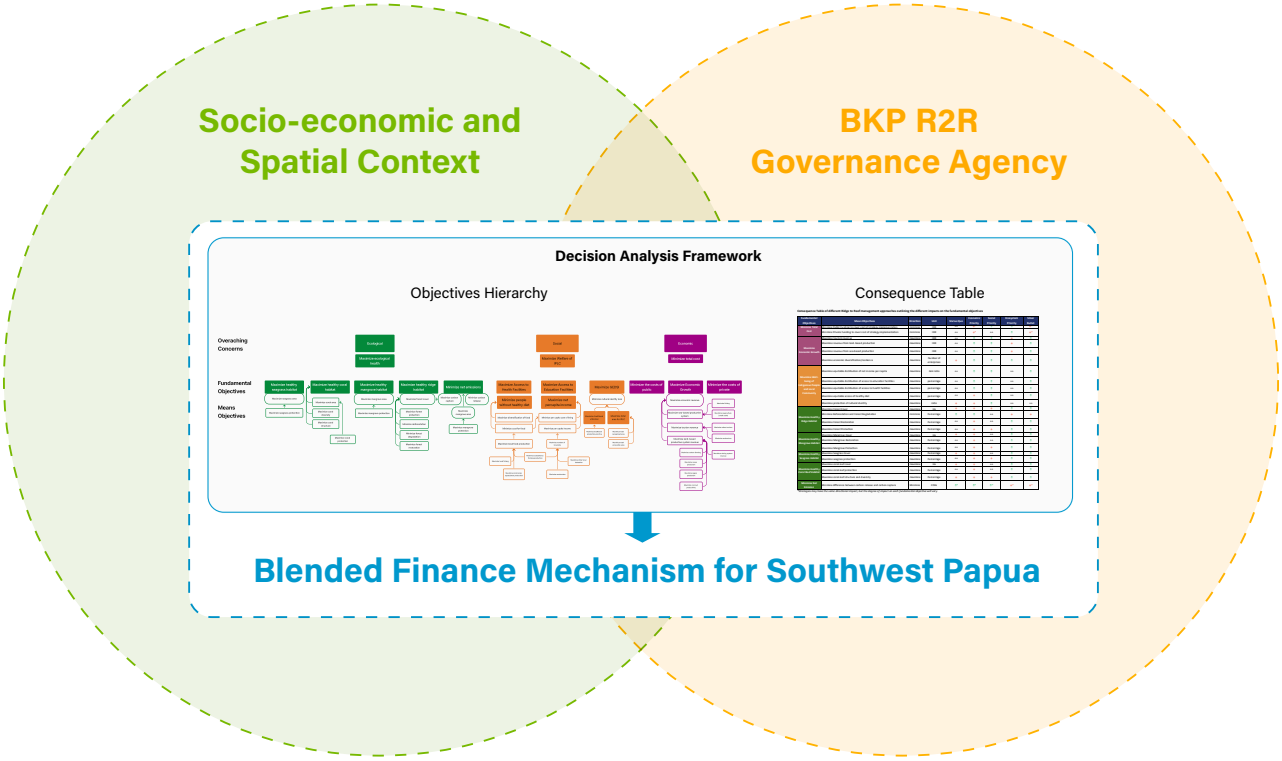
A diversified financial approach can offer reliable long-term support for R2R implementation. International Institute for Sustainable Development (IISD 2022), in applying a Sustainable Asset Valuation to peatland and mangrove restoration in Indonesia, found that "packages of interventions" instead of isolated measures help make conservation projects more successful. Successful projects such as Katingan Mentaya in Central Kalimantan have demonstrated that combining multiple funding sources and conservation interventions, such as canal blocking and tree planting, brought the largest benefits when combined with financed fire suppression and monitoring activities to prevent forest conversion to plantations and mining. In profiling Belitung Mangrove Park, the long-term rehabilitation of mangrove ecosystems was further enhanced by revenue from ecotourism activities. Other relevant examples of diverse and complementary combinations of funding and activities they can finance include long-term, dependable funding for ongoing management and salaries; short-term funding efforts for specific projects; and cyclical funding, such as from seasonal tourism to supplement budgets (Cumming et al. 2021).

Utilizing a decision analysis framework for effective sustainable finance

A decision analysis framework could provide Southwest Papua's stakeholders with the tools needed to identify funding needs, assess trade-offs, and make balanced decisions for R2R sustainable finance. This approach, increasingly used to manage and inform complex environmental decision-making, is valuable for aligning the goals of diverse stakeholders and the need to balance and reconcile their objectives (Hemming et al. 2022; Tranter et al. 2022). The framework provides a structured method for identifying funding needs, managing trade-offs, and evaluating options for R2R conservation, governance and financing, helping Southwest Papuans develop effective R2R strategies.

This framework leverages guidance from Hemming et al. (2022), as well as perspectives synthesized by focused group discussions. It defines the problems in Southwest Papua, elicits the objectives of stakeholders, and proposes alternative approaches by estimating consequences and trade-offs to inform the ideal R2R management strategy and the sustainable finance approach to support it. It could support the proposed BKPR2R government agency and emphasize how the perspectives of local stakeholders — especially IPLCs — are central to R2R decision-making. Noting where community involvement in natural resource governance (such as MPA zoning) often benefits both biodiversity protection and the provision of ecosystem services (Tranter et al. 2022), the framework provides an avenue for local stakeholders to co-design financing and governance arrangements for R2R while also being aware of their limitations and potential adverse effects.

FIGURE 14 | How the decision analysis framework methodology is key to identifying the appropriate financial mechanism for R2R management while supporting the proposed governance arrangement



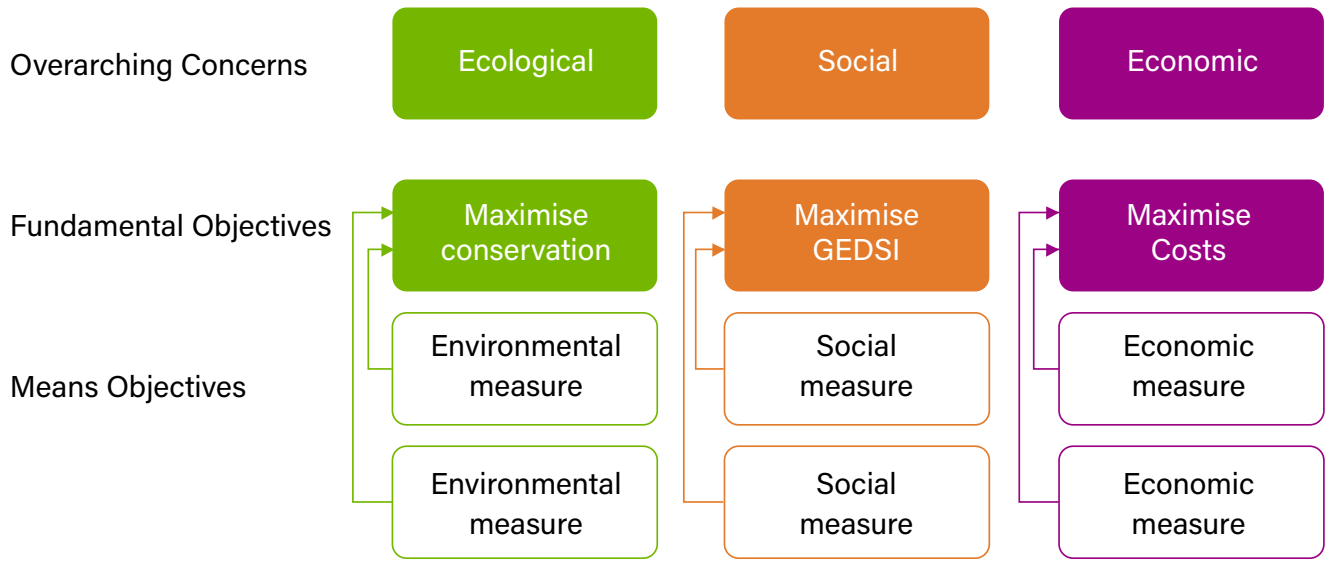
Source: Authors

The framework includes two main tools or components: the objectives hierarchy and consequence table (Figure 14):

- **Objectives hierarchy:** This tool organizes what stakeholders care about in R2R management. An objectives hierarchy provides structure to a diverse group of objectives and helps inform the context of the problem by identifying the relevant economic, social, and environmental objectives of different stakeholders. It is particularly relevant for R2R management in Southwest Papua as it helps inform how disparate objectives held by stakeholders are interrelated, how activities to achieve these can positively or adversely impact each other, and how common ground could be found through "fundamental objectives".

To illustrate this, we started by defining overarching concerns and issues that emerged from the primary data (e.g., FGDs) and supporting secondary data from Southwest Papua, and tested these issues by asking "Why is this important", "What do we mean by this factor", and "How might it be measured?" Through elicitation, discussion, and adaptation, we were able to deliberate the common fundamental objectives across stakeholders on which the decisions will be measured against. These are then supported by the underlying "means objectives" that can help achieve the fundamental objectives and inform management strategies for R2R. Figure 15 shows the illustrated structure of the hierarchy and the value it can bring to inform complex R2R decisions and foster greater understanding between stakeholder groups in Southwest Papua.

FIGURE 15 | An example of an objectives hierarchy chart for ideal R2R management. An example undertaken by the research team can be found in Appendix.



Source: Authors

- **Consequence table:** This tool can help understand trade-offs from R2R management strategies. This is a multi-criteria analytic tool that can help evaluate different R2R management strategies against the fundamental objectives and their measures, identifying potential trade-offs and quantifying the benefits and costs of each approach. Understanding how different approaches to R2R add or lose value among the fundamental objectives can also help quantify benefits and losses into financial terms. The consequence table provides insights into which strategies are most effective and cost-efficient, balancing impacts on the upland and downstream ecosystems and communities.

  Leveraging the primary data (e.g., FGDs) and supporting secondary data from Southwest Papua, our research team scoped the impacts on fundamental objectives from different management strategies that prioritized siloed economic, social, or environmental outcomes — with the present "status quo" as an indicative baseline (Figure 16). Even at this initial stage, a consequence table helps scope which R2R management strategy is likely to have the most impactful system benefit, where trade-offs can occur, and, to an extent, the likely cost-effectiveness of certain decisions. Preliminary observations from this include:

  - Too much emphasis on one fundamental objective — as opposed to a balanced approach in maximizing impact for all fundamental objectives — does not lead to sustainable, equitable, or prosperous outcomes for R2R conservation.
  - Conversely, to feasibly maximize benefits for all fundamental objectives is low, with modest benefits being more likely with a long-term horizon.
  - Illustrate how changes in a local upland environment (e.g., forest) can influence local economic systems in a downstream society (e.g., coastal and island communities).

FIGURE 16 | An example of a consequence table demonstrating potential impacts on R2R objectives from different management strategies.

Consequence Table of different Ridge to Reef management approaches outlining the different impacts on the fundamental objectives

Fundamental Objectives	Mean Objectives	Direction	Unit	Status Quo	Economic Priority	Social Priority	Ecosystem Priority	Silver Bullet
Minimize Total Cost	Minimize Public Funding to cover cost of strategy implementation	Minimize	IDR	↔	↓*	↑	↑	↓*
	Minimize Private Funding to cover cost of strategy implementation	Minimize	IDR	↔	↓*	↔	↑	↓*
Maximize Economic Growth	Maximize tourism revenue	Maximize	IDR	↔	↑	↑	↓	↑
	Maximize revenue from land-based production	Maximize	IDR	↔	↑	↑	↓	↑
	Maximize revenue from sea-based production	Maximize	IDR	↔	↑	↑	↓	↑
	Maximize economic diversification/resilience	Maximize	Number of enterprises	↓	↑	↑	↑	↑
Maximize Well-being of Indigenous People and Local Community	Maximize equitable distribution of net income per capita	Maximize	Gini ratio	↔	↑	↑	↔	↑
	Maximize equitable distribution of access to education facilities	Maximize	Percentage	↔	↑	↑	↔	↑
	Maximize equitable distribution of access to health facilities	Maximize	Percentage	↔	↑	↑	↔	↑
	Maximize equitable access of healthy diet	Maximize	Percentage	↔	↓	↑	↔	↑
	Maximize protection of cultural identity	Maximize	Ratio	↓	↓	↑	↔	↔
Maximize Healthy Ridge Habitat	Maximize Forest Cover	Maximize	Ha	↓	↓	↓	↑	↑
	Minimize Deforestation and Forest Degradation	Minimize	Percentage	↑	↑	↔	↓	↓
	Maximize Forest Restoration	Maximize	Percentage	↔	↓	↔	↑	↑
	Maximize Forest Protection	Maximize	Percentage	↔	↓	↓	↑	↑
Maximize Healthy Mangrove Habitat	Maximize Mangrove Cover	Maximize	Ha	↓	↓	↔	↑	↑
	Maximize Mangrove Restoration	Maximize	Percentage	↔	↓	↔	↑	↑
	Maximize Mangrove Protection	Maximize	Percentage	↔	↓	↓	↑	↑
Maximize Healthy Seagrass Habitat	Maximize Seagrass Cover	Maximize	Percentage	↓	↓	↔	↑	↑
	Maximize seagrass protection	Maximize	Percentage	↔	↓	↓	↑	↑
Maximize Healthy Coral Reef Habitat	Maximize coral reef cover	Maximize	Ha	↓	↓	↔	↑	↑
	Maximize coral reef protection	Maximize	Percentage	↔	↓	↔	↑	↑
	Maximize coral reef structure and diversity	Maximize	Percentage	↓	↓	↓	↑	↑
Minimize Net Emission	Minimize difference between carbon release and carbon capture	Minimize	CO_2e	↑*	↑*	↑*	↓*	↓*

**Strategies may have the same directional impact, but the degree of impact on each fundamental objective will vary*

Source: Authors

Using this framework can help Southwest Papua's stakeholders, including government and prospective financiers, better understand the complex decisions needed for sustainable R2R finance. If local stakeholders in Southwest Papua can consider the trade-offs between what R2R management actions are feasible in the short-term versus what actions deliver maximum impact versus the likely timeframe results that can be achieved, they can avoid the common financing pitfall of sacrificing long-term benefits for the sake of securing "quick wins". This depth of decision analysis and integration into conservation and sustainable development governance can better attract investors and funders, secure diverse and complementary revenue streams, and ensure a more equitable distribution of benefits to local stakeholders. Applying this framework in line with the proposed BKPR2R PPBD joined-up government arrangement can help inform the appropriate R2R management approach in Southwest Papua, to which a blended financial solution (as profiled in earlier sections) can be developed, supporting sustainable finance by integrating local priorities and enhancing stakeholder engagement. Without initially unpacking and workshopping stakeholder objectives and plotting the consequences of different decision pathways, R2R conservation and governance agencies may pursue financial mechanisms that do not meet the diverse needs of Southwest Papua's communities and environment.

In applying and testing this framework, our research team was able to draw preliminary recommendations for a blended finance approach that combines existing sources, like the recent debt-for-nature swaps, with philanthropic funding to build capacity and readiness for a results-based-payments-for-ecosystem-services scheme. While this requires careful planning and significant effort, it aligns well with the R2R conservation and sustainable development vision. This approach emphasizes deep and inclusive stakeholder engagement and participation, which are also core to the proposed joined-up government reforms through BKP R2R PPBD, will simultaneously make R2R in Southwest Papua more attractive to funders, and ensure the most impactful objectives and actions guide financial planning.

Concluding Remarks

Preserving Southwest Papua's diverse landscapes, from upland forests to coral reefs, is essential for biodiversity, climate resilience, and the livelihoods of local communities, particularly indigenous groups. This is especially relevant given the currently fragmented governance structures, lack of sustainable livelihood options, and limited sustainable financing that have hindered conservation efforts, creating significant challenges to maintaining ecological and social health across the region.

The R2R approach has the potential to improve natural resource management in Southwest Papua. It offers a promising pathway to sustainable, inclusive resource management by recognizing and integrating the ecological connections between land and sea. The feasibility of implementing R2R in Southwest Papua is supported by cultural alignment, with indigenous practices and values reflecting a deep connection to nature and holistic resource stewardship. R2R has been implemented informally in Southwest Papua from generation to generation. This cultural compatibility, combined with a growing commitment from local and regional governments, provides a strong foundation for R2R.

Nonetheless, critical barriers must be addressed for R2R to succeed. Governance is often fragmented, with sectoral priorities and competing interests impeding collaborative action. Sustainable financing is another major hurdle. Existing funding sources are not sufficient and sustainable. While funding exists for certain marine-focused initiatives, there is a significant need for integrated, long-term financial support for land-sea conservation. The challenge is how to bring in new funding sources to support conserving R2R in Southwest Papua. Effective R2R implementation requires a blended financing model that leverages resources from multiple sources, including government, international donors, and private-sector partnerships.

Finally, the importance of GEDSI within the R2R framework cannot be overstated. It will continue to be important to consider how GEDSI aspects can be integrated into effective R2R management, including through governance frameworks and sustainable finance mechanisms. Addressing systemic barriers to resource access, participation, and decision-making for women, indigenous groups, and people with disabilities is essential to achieving equitable outcomes. Empowering these groups to play active roles in conservation enhances both ecological sustainability and social resilience.

Lastly, an integrated R2R approach, grounded in local cultural values and bolstered by inclusive governance and sustainable financing, presents a viable path to protecting Southwest Papua's rich natural and cultural heritage. The findings and recommendations in this report provide a roadmap for policymakers, conservation practitioners, and community leaders to work collaboratively toward a resilient and inclusive future for Southwest Papua Province. Through concerted efforts and coordinated action, R2R can serve not only as a regional solution but also as a model for other areas facing similar conservation challenges.

The following recommendations are made to support the effective implementation of the R2R approach in Southwest Papua, addressing governance, sustainable financing, and social inclusion to create a robust conservation framework that benefits both ecosystems and communities:

- **Current and incoming government and policymakers should consider reintegrating the R2R approach into natural resource management in West Papua.** Integrated governance is essential for effective R2R implementation in Southwest Papua. Establishing a dedicated governance body like BKPR2R-PPBD will coordinate conservation efforts across land and marine environments, aligning sectoral priorities. Actively involving indigenous communities and local stakeholders in decision-making, with support from a structured analysis framework, will enhance strategic planning and promote cohesive resource management.
- **To gradually begin joined-up coordination and integration for the implementation of R2R in Papua.** The transition from sectoral (ridge and reef) to integrated (ridge to reef) management necessitates a gradual approach to build trust and inter-agency coordination required for effective collaboration.
- **A sustainable financing approach is crucial to enabling the stable and long-term implementation of R2R initiatives.** A blended financing model will ensure long-term financial stability. International partnerships can provide additional funding and expertise, while community-driven economic initiatives like ecotourism will align local economic benefits with conservation goals.
- **R2R governance and sustainable funding mechanisms should promote equity and inclusion, prioritizing local leadership.** GEDSI must be embedded in all stages of R2R efforts. Ensuring equitable access to resources and decision-making, GEDSI-focused capacity-building will empower marginalized groups to participate fully in conservation. Policies with clear accountability will promote the active involvement of women, indigenous communities, and people with disabilities in conservation processes.
- **Leveraging indigenous knowledge and practices will enhance sustainable conservation in Southwest Papua.** Integrating traditional knowledge into conservation strategies and protecting indigenous land rights will foster local ownership and align R2R initiatives with cultural values. Collaboration with indigenous leaders will ensure that conservation practices respect and incorporate local customs.

REFERENCES

ACIAR (2023) *Climate-smart regenerative ridge to reef landscapes for sustaining livelihoods of communities on custom land and food security in Vanuatu | ACIAR*. Available at: https://www.aciar.gov.au/project/sss-2021-120 (Accessed: 15 November 2024).

Adiastuti, A., Hartanto, H. and Utomowati, R. (2019) 'Sasi and Its Relation to the Economic Development and Marine Preservation (Case Study: Raja Ampat)', *Indonesian Journal of International Law*, 16(3). Available at: https://doi.org/10.17304/ijil.vol16.3.774.

Ambari, M. (2024) *$35m debt-for-nature deal aims to protect Indonesia's coral reefs*, *Mongabay Environmental News*. Available at: https://news.mongabay.com/2024/08/35m-debt-for-nature-deal-aims-to-protect-indonesias-coral-reefs/ (Accessed: 21 November 2024).

Andales-Escano, C. (2015) 'Ridge to Reef to Peace and Development', in H. Ha, R.L.S. Fernando, and A. Mahmood (eds) *Strategic Disaster Risk Management in Asia*. New Delhi: Springer India. Available at: https://doi.org/10.1007/978-81-322-2373-3.

ANTARA (2023) *Papua Barat Daya validasi data OAP guna realisasi Otsus*, *ANTARA News Papua Barat*. Available at: https://papuabarat.antaranews.com/berita/33525/papua-barat-daya-validasi-data-oap-guna-realisasi-otsus (Accessed: 7 November 2024).

Atmodjo, E., Lamers, M. and Mol, A. (2017) 'Financing marine conservation tourism: Governing entrance fees in Raja Ampat, Indonesia', *Marine Policy*, 78, pp. 181–188. Available at: https://doi.org/10.1016/j.marpol.2017.01.023.

Auriga (2022) *Hutan Adat (Papua) Menanti Asa: Peluang Masyarakat Hukum Adat (MHA) dalam Pemanfaatan HHK menuju Kelola Hutan Lestari di Tana Papua*. Available at: https://www.apkindo.org/storage/app/uploads/public/635/640/663/6356406 6329ed118866237.pdf (Accessed: 26 October 2024).

Blue Abadi Fund (2022) *Five Years of Impact and Lessons Learned from The Blue Abadi Fund 2016-2021*. Available at: https://blueabadifund.org/files/media/2022/11/Blue-Abadi-Fund-Lessons-Learned-Report_ENG.pdf (Accessed: 21 November 2024).

Browne, K., Katz, L. and Agrawal, A. (2022) 'Futures of conservation funding: Can Indonesia sustain financing of the Bird's Head Seascape?', *World Development Perspectives*, 26, p. 100418. Available at: https://doi.org/10.1016/j.wdp.2022.100418.

Conservation International (2018) *Lau Seascape Strategy 2018–2030*. Available at: https://static1.squarespace.com/static/5f6e6ced5f74dc06eded8ca2/t/5f7eb5adaad80539ea3edda2/1602139607711/Lau+Seascape+Strategic+Plan.pdf (Accessed: 23 October 2024).

Conservation International (no date) *Bird's Head Seascape, Indonesia*. Available at: https://www.conservation.org/places/birds-head-seascape (Accessed: 22 November 2024).

Corrigan, C. *et al.* (2018) 'Quantifying the contribution to biodiversity conservation of protected areas governed by indigenous peoples and local communities', *Biological Conservation*, 227, pp. 403–412. Available at: https://doi.org/10.1016/j.biocon.2018.09.007.

Cumming, T. *et al.* (2021) 'Building sustainable finance for resilient protected and conserved areas: Lessons from COVID-19', *PARKS*, 27, pp. 149–160. Available at: https://doi.org/10.2305/IUCN.CH.2021.PARKS-27-SITC.en.

Delevaux, J. *et al.* (2018) 'Linking Land and Sea through Collaborative Research to Inform Contemporary applications of Traditional Resource Management in Hawai'i', *Sustainability*, 10(9), p. 3147. Available at: https://doi.org/10.3390/su10093147.

Erdmann, M. and Jones, B. (2018) 'Crown of Thorns Seastar (COTS) in Raja Ampat', *Bird's Head Seascape*, 19 November. Available at: https://birdsheadseascape.com/regional/crown-thorns-seastar-cots-raja-ampat-mark-erdmann-burt-jones/ (Accessed: 25 November 2024).

Fache, E. and Pauwels, S. (2022) 'The ridge-to-reef approach on Cicia Island, Fiji', *Ambio*, 51(12), pp. 2376–2388. Available at: https://doi.org/10.1007/s13280-021-01669-w.

Fatem, S.M. *et al.* (2020) 'Species diversity, composition, and heterospecific associations of trees in three altitudinal gradients in Bird's Head Peninsula, Papua, Indonesia', *Biodiversitas Journal of Biological Diversity*, 21(8). Available at: https://doi.org/10.13057/biodiv/d210824.

Gaveau, D.L.A. *et al.* (2021) 'Forest loss in Indonesian New Guinea (2001–2019): Trends, drivers and outlook', *Biological Conservation*, 261, p. 109225. Available at: https://doi.org/10.1016/j.biocon.2021.109225.

Hemming, V. *et al.* (2022) 'An introduction to decision science for conservation', *Conservation Biology*, 36(1), p. e13868. Available at: https://doi.org/10.1111/cobi.13868.

International Institute for Sustainable Development (IISD) (2022) *How to Make Investments in Land Rehabilitation Economically Viable: Lessons learned from peatland and mangroves in Indonesia, a sustainable asset valuation assessment*. Available at: https://www.iisd.org/system/files/2022-06/savi-peatland-mangroves-indonesia.pdf (Accessed: 21 November 2024).

Jupiter, S.D. *et al.* (2017) 'Opportunities and constraints for implementing integrated land–sea management on islands', *Environmental Conservation*, 44(3), pp. 254–266. Available at: https://doi.org/10.1017/S0376892917000091.

Kereseka, J. (2021) *Solomon Islands Ridge to Reef Island Diagnostic Analysis Report*. Suva, Fiji: GEF Pacific International Waters Ridge to Reef Regional Project, Pacific Community (SPC). Available at: https://www.pacific-r2r.org/sites/default/files/2021-12/Solomon%20Islands_IDA.pdf (Accessed: 12 July 2023).

Koalisi Indonesia Memantau (2021) *Menatap ke Timur: Deforestasi dan Pelepasan Kawasan Hutan di Tanah Papua*. Jakarta, Indonesia: Koalisi Indonesia Memantau.

Konservasi Indonesia (2023) 'The Bird's Head Seascape: A Transition for Sustainable Impact. Lessons learned from Raja Ampat on the Development of the MPA network and the self-financing mechanisms to promote conservation and economic growth.' *KONEKSI Ridge to Reef Inception Workshop*, Southwest Papua, Indonesia, 24 October.

Loganimoce, I. and Meo, S. (2023) 'The significance of traditional practices in the Lau Islands, Fiji, and their importance to women for sustainable protection and production', *SPC Women in Fisheries Information Bulletin*, 37.

Mackey, B. *et al.* (2020) 'Understanding the importance of primary tropical forest protection as a mitigation strategy', *Mitigation and Adaptation Strategies for Global Change*, 25(5), pp. 763–787. Available at: https://doi.org/10.1007/s11027-019-09891-4.

Mackey, B. *et al.* (2023) *The role of natural forests, including primary forests and intact forest landscapes, in climate mitigation and limiting global warming to the Paris Agreement target of 1.5 °C*. Griffith University. Available at: https://doi.org/10.25904/1912/5091.

Mangubhai, S. *et al.* (2012) 'Papuan Bird's Head Seascape: Emerging threats and challenges in the global center of marine biodiversity', *Marine Pollution Bulletin*, 64(11), pp. 2279–2295. Available at: https://doi.org/10.1016/j.marpolbul.2012.07.024.

Manoby, W.M., Siscawati, M. and Dewi, K.H. (2023) 'Papua Special Autonomy in Engagement With Gender, Generations and Deforestation: Insight From Feminist Political Ecology', *Jurnal Bina Praja*, 15(2), pp. 431–442. Available at: https://doi.org/10.21787/jbp.15.2023.431-442.

McLeod, E., Szuster, B. and Salm, R. (2009) '*Sasi* and Marine Conservation in Raja Ampat, Indonesia', *Coastal Management*, 37(6), pp. 656–676. Available at: https://doi.org/10.1080/08920750903244143.

Ministry of Marine Affairs and Fisheries (2024) *SIDAKO KKHL, SIDAK KSDAE*. Available at: https://sidakokkhl.kkp.go.id/sidako/index (Accessed: 7 November 2024).

Mumbunan, S. *et al.* (2021) *Basic Income for Nature and Climate*. Jakarta, Indonesia: Research Center for Climate Change Universitas Indonesia. Available at: https://forclime.org/documents/Books/Mumbunan2021_Basic_Income_for_Nature_and_Climate_final_versi0n.pdf.

Mumbunan, S., Ring, I. and Lenk, T. (2012) *Ecological fiscal transfers at the provincial level in Indonesia*. Working Paper 06/2012. UFZ Discussion Paper. Available at: https://www.econstor.eu/handle/10419/55837 (Accessed: 22 November 2024).

Oestereich, C. (no date) *Case Study: Implementing a "Ridge to Reef" Approach to Protect Biodiversity and Ecosystem Functions in Tuvalu (R2R Tuvalu)*. Available at: https://sdghelpdesk.unescap.org/sites/default/files/2018-08/Green%20Growth%20R2R%20%28Ridge%202%20Reef%29.pdf (Accessed: 23 October 2024).

Phua, C. *et al.* (2021) 'Marine protected and conserved areas in the time of COVID', *Parks*, 27, pp. 85–102. Available at: https://doi.org/10.2305/IUCN.CH.2021.PARKS-27-SICP.en.

Potapov, P. *et al.* (2017) 'The last frontiers of wilderness: Tracking loss of intact forest landscapes from 2000 to 2013', *Science Advances*, 3(1), p. e1600821. Available at: https://doi.org/10.1126/sciadv.1600821.

Purwanto *et al.* (2021) 'The Bird's Head Seascape Marine Protected Area network—Preventing biodiversity and ecosystem service loss amidst rapid change in Papua, Indonesia', *Conservation Science and Practice*, 3(6), p. e393. Available at: https://doi.org/10.1111/csp2.393.

Rao, A. *et al.* (2017) 'Gender at Work: An Experiment in "Doing Gender"', in S.A. Tirmizi and J.D. Vogelsang (eds) *Leading and Managing in the Social Sector: Strategies for Advancing Human Dignity and Social Justice*. Cham: Springer International Publishing, pp. 155–173. Available at: https://doi.org/10.1007/978-3-319-47045-0_10.

Schuster, R. *et al.* (2019) 'Vertebrate biodiversity on indigenous-managed lands in Australia, Brazil, and Canada equals that in protected areas', *Environmental Science & Policy*, 101, pp. 1–6. Available at: https://doi.org/10.1016/j.envsci.2019.07.002.

Seymour, F.J., Aurora, L. and Arif, J. (2020) 'The Jurisdictional Approach in Indonesia: Incentives, Actions, and Facilitating Connections', *Frontiers in Forests and Global Change*, 3. Available at: https://doi.org/10.3389/ffgc.2020.503326.

Taluke, D. *et al.* (2022) 'Politik Pengelolaan Tanah Ulayat pada Era Otonomi Khusus Papua di Kabupaten Sorong Provinsi Papua Barat', *Jurnal Pendidikan dan Konseling (JPDK)*, 4(4), pp. 5398–5407. Available at: https://doi.org/10.31004/jpdk.v4i4.6339.

Tranter, S.N. *et al.* (2022) 'The inclusion of fisheries and tourism in marine protected areas to support conservation in Indonesia', *Marine Policy*, 146, p. 105301. Available at: https://doi.org/10.1016/j.marpol.2022.105301.

UNDP (no date) *Terminal Evaluation of Tuvalu Ridge to Reef Project, UNDP*. Available at: https://www.undp.org/pacific/projects/tuvalu-ridge-reef-project (Accessed: 23 October 2024).

UNEP (2021) *UNEP State of Finance for Nature*. Nairobi: United Nations Environment Programme. Available at: https://www.unep.org/resources/state-finance-nature-2021.

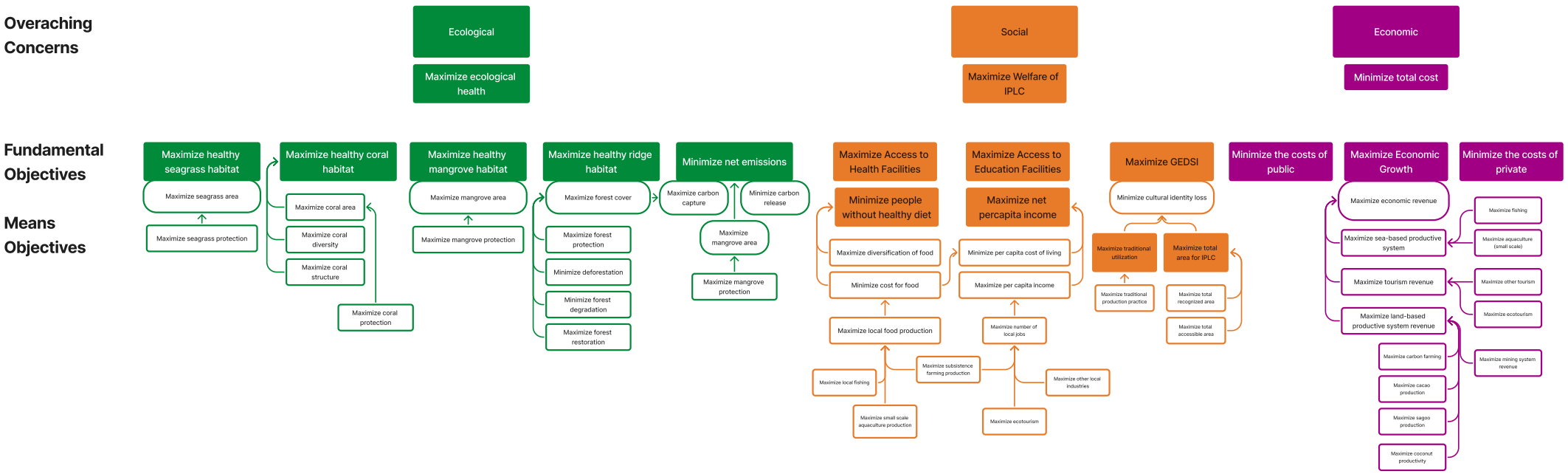
Watson, J.E.M. *et al.* (2018) 'The exceptional value of intact forest ecosystems', *Nature Ecology & Evolution*, 2(4), pp. 599–610. Available at: https://doi.org/10.1038/s41559-018-0490-x.

Wenger, A.S. *et al.* (2020) 'Best-practice forestry management delivers diminishing returns for coral reefs with increased land-clearing', *Journal of Applied Ecology*, 57(12), pp. 2381–2392. Available at: https://doi.org/10.1111/1365-2664.13743.

WWF, ICRI, & Japan Ministry of Environment (2015) *Case Studies From Ridge to Reef: Implementing coral reef conservation and management through a community-based approach emphasizing land-sea connectivity*. Available at: https://icriforum.org/wp-content/uploads/2019/12/ICRI_casestudies_2015_0.pdf (Accessed: 23 October 2024).

APPENDIX

FIGURE A-1 | Objectives Hierarchy chart for ideal Ridge-to-Reef management



ABOUT WRI INDONESIA

World Resources Institute (WRI) Indonesia, established in Indonesia as Yayasan Institut Sumber Daya Dunia, is an independent research organization dedicated to contributing to the socioeconomic development in an inclusive and sustainable way. Our work is focused on six main areas: forests, climate, energy, cities and transportation, governance as well as ocean. We turn big ideas into action at the nexus of environment, economic opportunity, and human well-being.

Our Approach

We measure our success through real-world change. Our approach consists of three crucial steps: Count It, Change It and Scale It.

COUNT IT

We start with data. We conduct independent research and use the latest technology to develop new understandings and recommendations. Our careful analysis aims to identify risks, open opportunities and inform targeted strategies. We focus our efforts on influential and emerging economies that will shape the future of sustainability.

CHANGE IT

We use our research to inspire real actions by governments, businesses and civil society. We test projects together with communities, companies and government institutions to build a strong evidence base. We then work with our partners to drive change that can reduce poverty and enhance human well-being. We set measurable and accountable goals to ensure the sustainability of our work.

SCALE IT

We don't think small. Once tested, we work with partners to adopt and expand our efforts at regional and global levels. We engage decision- makers to implement ideas and enhance impact. We measure our success through the actions of governments and businesses that can increase opportunities for the well-being of communities and the preservation of a healthy environment.

WRI INDONESIA

Wisma PMI, 3rd Floor
Jalan Wijaya I no. 63
South Jakarta 12170
wri-indonesia.org