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Beyond Ecotourism: Measuring the Social Return on Investment of Community-Based Whale Shark Conservation in Kwatisore, Indonesia

Melampaui Ekowisata: Social Return on Investment Konservasi Hiu Paus Berbasis Masyarakat di Indonesia

Purnomo[1], Ponco Nugroho[2], Alih Istik Wahyuni[3], Nabila Ismasari[4]

[1]Social Investment Indonesia; email: purnomo@socialinvestment.id
[2]Social Investment Indonesia; email: ponco.nugroho@socialinvestment.id
[3]PT Pertamina (Persero); email: alih.wahyuni@pertamina.com
[4]PT Pertamina (Persero); email: nabila.ismasari@pertamina.com

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Abstrak

Evaluasi konvensional terhadap program konservasi laut, khususnya yang berpusat pada megafauna karismatik seperti hiu paus, cenderung menyamakan nilai program dengan pendapatan wisata, sehingga menyembunyikan nilai sosial signifikan yang dihasilkan melalui tindakan pencegahan ekologis, penguatan kapasitas, dan dukungan kelembagaan. Studi ini menerapkan metodologi evaluatif Social Return on Investment (SROI), mengikuti Prinsip Nilai Sosial dari Social Value International, untuk menilai Program Konservasi Hiu Paus Kwatisore di Taman Nasional Teluk Cenderawasih, Papua Tengah, Indonesia, yang dijalankan oleh PT Pertamina International Shipping sejak 2021. Menggunakan data dari 32 informan pemangku kepentingan pada tujuh kelompok (2023–2025), studi ini memetakan empat belas outcome material yang mencakup pemantauan ekologis, pengelolaan sampah plastik, keselamatan menyelam komunitas, infrastruktur rantai dingin, dan edukasi konservasi. Total investasi program sebesar IDR 1.079.735.000 (Input), menghasilkan nilai kini outcome bersih sebesar IDR 2.429.384.408 dan rasio SROI 2,25:1. Berbeda dengan kerangka valuasi berbasis wisata, 73% nilai sosial total berasal dari jalur non-wisata, didominasi oleh nilai kelembagaan data pemantauan ilmiah (59,1%) dan pencegahan risiko paparan plastik. Delapan skenario analisis sensitivitas, termasuk penurunan 50% kunjungan wisatawan hiu paus, mengonfirmasi bahwa rasio tetap di atas titik impas (SROI minimum = 1,62), menunjukkan ketahanan struktural terhadap gangguan wisata. Temuan ini mendukung pembingkaian ulang konservasi laut berbasis komunitas sebagai investasi sosial strategis, bukan filantropi yang bergantung pada wisata, dengan implikasi bagi pembiayaan

konservasi, manajemen risiko ESG korporat, dan strategi pendanaan SDG 14 di negara-negara Global South.

Kata kunci: *Dampak Konservasi; konservasi hiu paus; kawasan konservasi laut; tanggung jawab sosial perusahaan; investasi sosial strategis; nilai preventif*

Abstract

Conventional evaluations of marine conservation programmes, particularly those centred on charismatic megafauna such as whale sharks, tend to equate programme value with tourism revenue, obscuring the substantial social value generated through preventive ecological action, capacity building, and institutional support. This study applies evaluative Social Return on Investment (SROI) methodology, following Social Value International's Social Value Principles, to assess the Kwatisore Whale Shark Conservation Programme in Cenderawasih Bay National Park, Central Papua, Indonesia, operated by PT Pertamina International Shipping since 2021. Using data from 32 stakeholder informants across seven groups (2023–2025), we mapped fourteen material outcomes spanning ecological monitoring, plastic waste management, community diving safety, cold-chain infrastructure, and conservation education. Total programme investment was IDR 1,079,735,000 (Input), yielding a present value of net outcomes of IDR 2,429,384,408 and an SROI ratio of 2.25:1. Contrary to tourism-centric valuation frameworks, 73% of total social value derives from non-tourism pathways, dominated by the institutional value of scientific monitoring data (59.1%) and preventive avoidance of plastic-exposure risk. Eight sensitivity scenarios, including a 50% decline in whale shark tourist visits, confirm the ratio remains above break-even (minimum SROI = 1.62), demonstrating structural resilience to tourism disruption. These findings support reframing community-based marine conservation as strategic social investment rather than tourism-dependent philanthropy, with implications for conservation finance, corporate ESG risk management, and SDG 14 financing strategies in the Global South.

Keywords: *Conservation impact; whale shark conservation; marine protected area; corporate social responsibility; strategic social investment; preventive value*

1. Introduction

Marine biodiversity faces accelerating anthropogenic pressures, including habitat degradation, plastic pollution, climate-driven changes in prey availability, and unmanaged tourism (Sequeira et al., 2016; Goldbogen & Madsen, 2018; Rohner et al., 2018). Addressing these pressures requires conservation programmes that are not only ecologically effective but also economically viable and socially legitimate (Bottrill & Pressey, 2012). Yet the dominant framework for evaluating marine conservation value continues to equate programme worth with tourism revenue—a reductionist approach that renders invisible a large share of the social return generated by preventive action,

capacity building, and ecosystem stewardship (Naidoo et al., 2019; Milner-Gulland et al., 2014).

The whale shark (Rhincodon typus), the world's largest fish, exemplifies this tension. Classified as Endangered on the IUCN Red List (Pierce & Norman, 2016), whale sharks attract growing ecotourism markets globally, with economic valuation studies reporting annual tourism values of USD 47.5 million in one Australian site alone (Catlin et al., 2013; Ziegler et al., 2018). However, reducing the conservation of whale shark aggregation sites to their tourism income obscures the broader social-ecological value created through habitat protection, scientific monitoring, waste management, community capacity development, and livelihood diversification. When tourism is disrupted—as occurred during the COVID-19 pandemic and at sites where over-tourism drove shark abandonment (e.g., Gorontalo, Indonesia)—programmes designed around tourism revenue alone prove structurally fragile.

Cenderawasih Bay National Park (Taman Nasional Teluk Cenderawasih, TNTC) in Central Papua, Indonesia, hosts one of the world's most significant whale shark aggregation sites, centred on the fishing hamlet of Kwatisore. The distinctive ecology of the site—year-round whale shark presence driven by natural interactions with traditional bagan (floating platform) fishers—creates an exceptional context for multi-component conservation programming. Since 2021, PT Pertamina International Shipping (PIS), Indonesia's largest national shipping company, has operated the Kwatisore Whale Shark Conservation Programme, encompassing systematic ecological monitoring, plastic waste management, community diving training and safety improvement, cold chain infrastructure (solar-powered ice production), and marine conservation education. These interventions generate value across multiple stakeholder groups and through multiple pathways, making the programme analytically rich yet methodologically challenging to evaluate using conventional approaches.

Social Return on Investment (SROI) is an established impact measurement methodology, grounded in the Social Value Principles of Social Value International (SVI), that translates social, environmental, and economic outcomes into a single monetised metric while preserving sensitivity to distributional and process dimensions of value (Nicholls et al., 2012; Mulgan, 2010). SROI has been applied to conservation programmes (e.g., de Lange et al., 2021; Ralphs, 2013) and CSR investments (Moro et al., 2020; Grieco et al., 2015), but its application to integrated community-based marine conservation in tropical biodiversity hotspots of the Global South remains limited, particularly in contexts where the primary value pathway operates through preventive ecological damage avoidance rather than direct income generation.

This article addresses three research questions. First, what is the aggregate social value generated by the Kwatisore Whale Shark Conservation Programme

relative to its investment cost? Second, what is the structural composition of this value across ecological, economic, and social dimensions, and how does it compare to a tourism-only valuation framework? Third, how robust is this value estimate under conservative sensitivity assumptions, including scenarios of severe tourism decline? By answering these questions, the paper contributes to the growing literature on impact measurement for conservation investments, offers a replicable SROI methodology for marine CSR programmes, and advances the conceptual argument that community-based marine conservation is best understood as a strategic social investment rather than a charitable expenditure.

2. Theoretical Framework

2.1 The Limits of Tourism-Centric Conservation Valuation

The literature on marine protected area (MPA) economics has long recognised the conceptual breadth of ecosystem service valuation (Costanza et al., 1997; Kenter et al., 2011). Total economic value frameworks distinguish use values (direct, indirect) from non-use values (existence, option, bequest), and environmental economics has developed sophisticated tools—contingent valuation, travel cost, hedonic pricing—to monetise non-market values (Bateman et al., 2002). Nevertheless, in practice, conservation programme evaluation for CSR purposes has remained dominated by direct economic proxies, particularly tourism receipts and visitor numbers.

This dominance reflects institutional incentives—tourism income is countable, reportable, and legible to corporate finance—rather than a considered judgement that tourism captures conservation value. Pauly et al. (2002) and subsequent scholars have demonstrated that the ecological value of habitat preservation consistently exceeds its tourism value, particularly for functionally important species such as elasmobranch megafauna. For whale sharks specifically, Catlin et al. (2013) note that visitor willingness-to-pay substantially underestimates total ecosystem service provision, while Ziegler et al. (2018) identify educational and existence values as structurally important. More broadly, the preventive value of conservation—value generated by avoiding future damage rather than creating present income—is systematically invisible in accounting-based programme evaluations (Milner-Gulland et al., 2014).

2.2 Social Return on Investment as an Integrative Framework

SROI was developed as a methodology to translate programme outcomes into monetary values comparable to financial investment returns, while embedding stakeholder engagement as a methodological requirement rather than an optional consultation exercise (Nicholls et al., 2012). The SROI ratio (total present value of outcomes / total value of input) is calculated after adjusting for counterfactual baselines (deadweight), attribution to other actors, displacement of benefits to non-target groups, and temporal drop-off in benefit persistence (Rotheroe et al., 2003; Arvidson et al., 2013).

SROI has several properties that make it analytically appropriate for integrated marine conservation programmes. It requires comprehensive outcome mapping across all material stakeholder groups, preventing analysts from focusing exclusively on primary beneficiaries. Its insistence on financial proxy valuation for non-market outcomes forces explicit engagement with preventive, institutional, and capacity-related value dimensions that are typically excluded from tourism-centric evaluations. And its sensitivity analysis requirements impose transparency about the robustness of value claims—a critical feature in conservation contexts where outcome attribution is often contested (White & Hendricks, 2013).

Prior applications of SROI to conservation contexts include studies of coastal wetland restoration (de Lange et al., 2021), community forestry (Bhatt et al., 2022), and urban green space provision (Guerry et al., 2015). These studies consistently find that the ratio of total social value to input cost substantially exceeds estimates based on direct economic proxies alone, and that preventive and capacity-building outcomes often constitute the majority of total value. To our knowledge, this study represents the first application of evaluative SROI methodology to an integrated whale shark conservation programme in a developing-country marine protected area.

2.3 Corporate Social Responsibility as Strategic Social Investment

The framing of corporate conservation expenditure as 'strategic social investment' rather than philanthropic CSR has important implications for both programme design and evaluation (Porter & Kramer, 2011). Strategic social investment implies intentional value co-creation: conservation activities are designed to generate measurable returns for multiple stakeholder groups, including the investing corporation, in ways that strengthen the business case for continued and expanded investment. Carroll's (1991) CSR pyramid and Porter & Kramer's (2011) shared value framework both suggest that programmes achieving the highest social return are those most tightly integrated with the corporation's core competencies and stakeholder ecosystem—in this case, PIS's maritime logistics operations in the same coastal waters that the programme seeks to protect.

For marine conservation specifically, strategic social investment reframes the question from 'what does conservation cost?' to 'what does conservation create?' This reframing has practical implications: programmes designed around social value creation invest in communities' long-term capacities, in ecological baseline data that supports adaptive management, and in governance mechanisms that maintain value after the corporate investment phase concludes. These design features are themselves generators of SROI—they create value that persists, distributes, and compounds beyond direct programme outputs.

3. Study Area and Programme Description

3.1 Kwatisore and Cenderawasih Bay

Cenderawasih Bay National Park (TNTC), covering approximately 1,453,500 hectares of marine and terrestrial habitat in Central Papua Province, is one of Indonesia's largest and most biodiverse marine protected areas (Ministry of Environment and Forestry, 2022). The park encompasses exceptional coral reef ecosystems, extensive seagrass beds, and pelagic habitats supporting high densities of megafauna including the whale shark (Rhincodon typus), dugong (Dugong dugon), and multiple sea turtle species.

Kwatisore, a small coastal hamlet within Yaur Sub-district, Nabire Regency, is globally significant as one of the world's most reliable whale shark aggregation sites. Biophysical conditions are optimal for year-round aggregation: water temperatures of 28–32°C, salinity averaging 32‰, and the abundance of zooplankton associated with the bagan fishing system create predictable feeding opportunities. By 2024, systematic photo-identification monitoring had documented 203 individual whale sharks, including 20 newly identified individuals in 2024 and 16 in 2025, establishing Kwatisore as the site hosting the most consistently documented whale shark population in Indonesia. Approximately 98% of identified whale sharks in Indonesian national databases have been documented within TNTC waters (Garda Animalia, 2025).

The community of Kwatisore and the adjacent hamlet of Akudiomi includes indigenous Yaur people alongside migrant communities of Bugis and Buton descent. Most households depend on artisanal fishing, particularly the bagan system—floating bamboo platforms anchored in the bay and baited with light at night to attract fish schools. Bagan operations incidentally attract whale sharks, making fishers key actors in the conservation landscape. Access to Kwatisore requires approximately 1.5–3 hours by speedboat from Nabire town, creating logistical constraints that have historically limited educational services, cold chain access, and recreational diving infrastructure.

3.2 Programme Components

The Kwatisore Whale Shark Conservation Programme was initiated by PIS in collaboration with Pertamina Foundation (PF) and Balai Besar TNTC (BBTNTC) in 2021, with field data used in this study spanning 2023–2025. The programme comprises five integrated components:

(i) Ecological monitoring and tagging: Systematic monthly photo-identification surveys, satellite tagging with SeaTag-MOD devices capable of recording depth data to 300m, and biodiversity documentation supporting evidence-based conservation planning by BBTNTC.

(ii) Plastic waste management: Structured outreach to bagan fishers on marine plastic hazards, provision of waste collection infrastructure, and behaviour change facilitation leading to measurable reductions in plastic discarded into the bay.

(iii) Community diving training and safety: Open-water dive training and PADI certification for 16 local youth, contributing to a cumulative 203 certified divers in the TNTC area by 2024. Training addressed the high incidence of decompression injuries and fatalities associated with traditional compressor-based fishing diving practices.

(iv) Desa Energi Berdikari (independent energy village): Installation of a 4,000 WP solar photovoltaic system powering cold storage infrastructure (Ojab-O facility), enabling local ice production for fishery value chain improvement and reducing community dependence on expensive, frequently damaged ice imported from Nabire.

(v) Conservation education and marine governance: Operation of the Whale Shark Center (WSC) as a hub for visitor education, community awareness programming, and collaboration with research institutions and government regulators.

4. Methodology

4.1 SROI Framework and Scope

This study follows the evaluative SROI methodology as specified by Social Value International (Nicholls et al., 2012), conducting a retrospective assessment of actual outcomes generated during the programme period 2023–2025. The assessment boundary encompasses the five programme components described above and all stakeholder groups who experienced material changes attributable to programme activities. SROI ratio is calculated as:

SROI = Present Value of Net Outcomes / Value of Total Input

For multi-year outcome streams, present values were calculated using the Bank Indonesia reference interest rate for each assessment year (r_{2024} = 5.81%; r_{2025} = 6.10%).

4.2 Stakeholder Engagement

Stakeholder identification followed the materiality principle: inclusion required both (a) evidence of significant, direct outcome experience attributable to the programme, and (b) relevance of that outcome to the programme's theory of change. A total of 32 primary informants participated in data collection (Table 1), including representatives of BBTNTC (n = 6), bagan fishers (n = 8), open-water dive training graduates (n = 8), women's MSME group members (n = 2), village energy facility managers (n = 1), village officials (n = 3), Pertamina Foundation staff (n = 2), and PIS corporate staff (n = 2).

Data collection employed three complementary techniques: (i) Focus Group Discussions (FGDs) for collective outcome validation and social norm change assessment; (ii) in-depth interviews (IDIs) for individual outcome depth, financial proxy validation, and counterfactual estimation; and (iii) secondary document review

covering programme operational records, BBTNTC monitoring data, and published marine conservation literature.

Table 1. Stakeholder Engagement Summary

No	Stakeholder Group	n	FGD	IDI	Material Outcome(s)
1	BBTNTC (park authority)	6	✓	✓	Scientific data quality; plastic exposure risk
2	Bagan fishers	8	✓	✓	Waste responsibility; ecotourism incentive
3	Dive training graduates	8	✓	✓	Diving safety; conservation awareness
4	Women's MSME members	2		✓	Cold-beverage sales price
5	Energy village facility manager	1		✓	Ice production revenue
6	Village officials/Village residents	3		✓	Community governance context, Accident risk reduction; ice access
7	PIS / Pertamina Foundation	4		✓	Brand exposure
	Total	32			

4.3 Outcome Identification, Indicators, and Financial Proxies

Fourteen material outcomes were identified across seven stakeholder groups through iterative FGD and IDI processes, subsequently subjected to materiality testing to exclude outcomes that were immaterial, non-attributable, or insufficiently evidenced. Financial proxies were selected according to three criteria: relevance to the nature of the outcome, conservatism (preference for lower-bound estimates), and local contextual validity (Indonesian unit costs rather than global benchmarks). Primary sources included Indonesian government programme cost data (Ministry of Marine Affairs and Fisheries; regional health service schedules), commercial market prices, published ecological monitoring cost studies, and local informant price confirmation. Full proxy justifications are provided in the Supplementary Material.

Key proxy decisions included: (i) scientific data value proxied by avoided cost of independent ecological survey per newly identified individual (estimated IDR 75 million per individual based on Papua field survey cost structure); (ii) avoided plastic exposure risk proxied by whale shark evacuation and evidentiary cost (IDR 50 million per averted incident, consistent with BBTNTC operational data); (iii) plastic waste diversion proxied by the national marine plastic subsidy programme unit cost (IDR 43.45 million/tonne, sourced from KKP Gerakan Nasional Bulan Cinta Laut data); (iv) diving accident risk reduction proxied by avoided emergency medical evacuation and hyperbaric treatment cost (IDR 10 million per serious incident avoided); and (v) ecotourism incentive for bagan fishers based on direct stakeholder-reported payments (IDR 4 million per bagan visit, confirmed by BBTNTC staff and fishers).

4.4 Discount Factors

Four discount factors were applied to gross outcome values following Social Value International guidelines. Deadweight (the proportion of change that would have occurred without the programme) was estimated through stakeholder consultation and cross-referenced with published baseline data. Attribution (proportion of change attributable to actors other than PIS/PF) was calculated based on documented contributions of BBTNTC, government agencies, and other external parties to each outcome pathway. Displacement was applied where programme benefits shifted harm or cost to another context. Drop-off was applied to outcomes expected to decay over time in the absence of continued intervention. The full discount matrix is reported in Table 3.

4.5 Sensitivity Analysis

Eight sensitivity scenarios were tested, including stepwise increases in attribution (±10%, ±20%), reductions in financial proxy values for intangible outcomes (−20%, −30%), increases in discount rate (to 8%), a combined conservative scenario (attribution +10%; proxy −20%; r = 8%), and an extreme tourism disruption scenario (50% decline in whale shark visitor numbers). The purpose was to identify the conditions under which SROI drops below 1.0 (net social value destruction) and to determine which outcome categories are most sensitive to assumption changes.

5. Results

5.1 Outcome Map and Value Composition

Fourteen material outcomes were confirmed across seven stakeholder groups, spanning scientific knowledge production, ecological risk prevention, economic livelihood creation, community capacity building, and institutional reputation. Table 2 presents the full outcome map with associated present values for 2024 and 2025.

Total programme investment (Input) was IDR 1,079,735,000, reflecting PIS's direct financial contribution over the assessment period. Total present value of net outcomes was IDR 2,429,384,408, yielding an SROI ratio of 2.25:1. The programme generated net social value of IDR 1,349,649,408 above the investment cost.

Table 2. SROI Outcome Map: Present Values by Stakeholder Group (IDR)

Outcome	PV 2024 (IDR)	PV 2025 (IDR)	Share (%)
BBTNTC – Improved scientific data quality for conservation decisions	814,278,138	621,849,122	59.1%
BBTNTC – Reduced whale shark plastic exposure risk	43,527,659	41,551,583	3.5%
BBTNTC – Reduced plastic waste discharged to sea	9,861,658	8,636,522	0.8%

Outcome	PV 2024 (IDR)	PV 2025 (IDR)	Share (%)
Energy Village – Ice production revenue	19,987,190	7,631,923	1.1%
Bagan Fishers – Increased plastic responsibility	44,971,178	42,929,569	3.6%
Bagan Fishers – Ecotourism service incentive income	341,114,717	325,628,734	27.4%
Divers – Increased marine conservation awareness	6,995,517	6,677,933	0.6%
Divers – Reduced diving risk	–	13,228,667	0.5%
Divers – Increased confidence to share dive knowledge	–	2,119,979	0.1%
Women's MSME – Higher cold-beverage sale price	6,995,517	6,677,933	0.6%
Village Residents – Reduced diving accident risk	–	40,703,592	1.7%
Village Residents – Increased motivation for dive training	–	2,119,979	0.1%
Village Residents – Reduced ice transit spoilage cost	1,998,719	763,192	0.1%
PIS – Increased brand exposure (avoided media cost)	16,167,416	2,967,970	0.8%
TOTAL Present Value	1,305,897,709	1,123,486,699	100%
Total Investment (Input)	1,079,735,000	–	
SROI Ratio			2.25

5.2 Value Composition by Dimension

Analysis of outcomes by sustainability dimension reveals a strongly nature-oriented programme (64% of total present value in ecological outcomes), with a substantial economic component (30%) and smaller but structurally significant social (4%) and wellbeing (2%) contributions.

The ecological dimension is dominated by the scientific data quality outcome: the systematic identification and documentation of 36 previously unknown whale shark individuals during the programme period (20 in 2024; 16 in 2025), providing BBTNTC with updated population baselines that would otherwise require approximately IDR 75 million per individual to produce through independent surveys. This outcome's high financial value reflects not just its ecological importance, but its institutional significance: BBTNTC's conservation decisions, permit conditions, and patrol resource allocation all depend on up-to-date individual identification data. Avoided plastic exposure costs (IDR 85.1 million across both years) represent a preventive value component invisible to tourism-centric evaluation frameworks.

The economic dimension is led by ecotourism incentive income for bagan fishers (IDR 666.7 million, 27.4% of total), reflecting the systematic integration of bagan platforms as whale shark tourism destinations by BBTNTC. Each of six active bagan platforms received an average of 16 tourist visits per year, generating average

payments of IDR 4 million per visit. This mechanism embeds a conservation incentive directly into the livelihoods of the community actors most capable of disrupting the ecological basis of the programme, a design feature with important implications for long-term programme resilience.

The social dimension captures outcomes from the diving safety and capacity building component, including reduced accident risk for 13 active divers (IDR 13.2 million), increased conservation awareness (IDR 13.7 million), reduced incident risk for the broader village population (IDR 40.7 million), and interpersonal knowledge diffusion as trained divers shared safe practices with community members (IDR 2.1 million). The wellbeing dimension includes the women's MSME economic empowerment outcome and ice access improvements for village residents. While smaller in absolute value, these outcomes address equity and gender dimensions of programme impact often absent from conservation SROI assessments.

5.3 Stakeholder Distribution of Value

Value distribution across stakeholders reveals a programme that is inclusive rather than elite-captured. BBTNTC receives the largest share (63%), primarily reflecting the scientific data outcome's institutional value to the park authority's management mandate. Bagan fishers receive 31%, concentrated in the ecotourism incentive mechanism. The remaining 6% distributes across village residents (2%), the energy village manager (1%), dive training graduates (1%), women's MSME members (1%), and PIS itself (1%).

This distribution has significant implications for programme legitimacy and sustainability. The relatively modest direct benefit to PIS (1%) compared to community and institutional beneficiaries (99%) positions the programme credibly as a community-oriented investment rather than reputational rent-seeking. The concentration of value in BBTNTC and bagan fishers aligns with the programme's theory of change, which targets the two actor groups most critical to long-term conservation effectiveness: the regulatory authority and the community-based resource users.

5.4 Sensitivity Analysis

Table 3 presents results of the eight sensitivity scenarios. Key findings are: (i) SROI remains above 2.0 under modest attribution increases (+10%) and proxy reductions (−20%); (ii) even under the combined conservative scenario (attribution +10%; proxy −20%; r = 8%), SROI remains at 1.81, 80% above the investment break-even point; (iii) the extreme tourism disruption scenario (50% decline in whale shark visitors) yields SROI of 1.62, confirming that programme value is structurally diversified beyond tourism dependency; and (iv) no tested scenario produces SROI below 1.0. The minimum SROI across all scenarios is 1.62.

Table 3. Sensitivity Analysis Results

No	Scenario	Modified Assumption	Total PV Outcome (IDR)	SROI Ratio	Δ vs. Baseline
1	Baseline	Deadweight 0%; existing attribution; r ≈ 6%	2,429,384,408	2.25	–
2	Attribution +10%	Other actor contributions increased 10%	2,186,000,000	2.02	↓ 10%
3	Attribution +20%	Other actor contributions increased 20%	1,943,000,000	1.80	↓ 20%
4	Financial Proxy −20%	Intangible/reputational proxies reduced 20%	2,100,000,000	1.94	↓ 14%
5	Financial Proxy −30%	Intangible/reputational proxies reduced 30%	1,980,000,000	1.83	↓ 19%
6	Discount rate = 8%	Higher social discount rate	2,200,000,000	2.04	↓ 9%
7	Combined Conservative	Attribution +10%; Proxy −20%; r = 8%	1,950,000,000	1.81	↓ 20%
8	−50% Tourism Visits	Severe ecotourism disruption	1,750,000,000	1.62	↓ 28%

The tourism disruption scenario deserves particular attention. A 50% decline in whale shark visitor numbers substantially reduces the ecotourism incentive outcome—the second-largest value component—but the SROI ratio of 1.62 remains well above breakeven. This is because the programme's dominant value pathway (scientific data improvement: 59.1% of total present value) is entirely independent of tourism volumes. The structural implication is that the programme's social value is anchored in its ecological monitoring and waste management functions, not in its ecotourism facilitation role, reversing the conventional assumption that marine conservation value is tourism-dependent.

6. Discussion

6.1 Reframing Conservation as Strategic Social Investment

The SROI ratio of 2.25:1 situates the Kwatisore programme within the upper range of social return ratios reported in the conservation impact measurement literature (cf. Ralphs, 2013; de Lange et al., 2021). However, the more analytically significant finding is the structural composition of this return. Conventional evaluations of whale shark tourism programmes report benefit-cost ratios in the range of 3–10:1 (Ziegler et al., 2018; Catlin et al., 2013), but these ratios are built almost entirely on visitor expenditure and willingness-to-pay estimates that are highly sensitive to access conditions, market fluctuations, and global shocks. The Kwatisore SROI, by contrast, shows that 73% of social value is generated by non-tourism

pathways: ecological data production (59.1%), plastic waste prevention (4.3%), fisher responsibility outcomes (3.6%), and safety and capacity outcomes (5.7%). This compositional diversity represents genuine value resilience, as demonstrated by the robustness of SROI above 1.0 in the 50% tourism disruption scenario.

This finding aligns with and extends the preventive value argument in the conservation economics literature (Milner-Gulland et al., 2014; Naidoo et al., 2019). The whale shark plastic exposure outcome is paradigmatic: at the time of assessment, no documented cases of plastic ingestion injury to whale sharks had occurred in TNTC waters. The social value of this outcome is entirely preventive—the value of a catastrophic event that did not happen. Standard programme evaluations would report this as a null finding. SROI methodology, by monetising the reduction in risk exposure using ecologically-grounded avoided cost proxies, makes this preventive value visible and comparable to value generated by direct income transfers. The annual avoided cost of IDR 50 million per averted whale shark stranding incident reflects both the practical cost of marine evidentiary and evacuation operations and the signal value of a zero-incident record in a national park context where stranding incidents have been increasing nationally at an average of 9–10 annually.

The programme also instantiates the shared value logic of Porter & Kramer (2011) in a marine conservation context. PIS, as Indonesia's largest maritime shipping company, operates vessels in the same coastal ecosystems that the programme protects. Healthy whale shark populations sustain ecotourism markets that generate conservation compliance incentives for bagan communities, which in turn maintain the environmental quality standards on which BBTNTC's management legitimacy depends. PIS's brand exposure outcome (0.8% of total value, IDR 19.1 million) substantially understates this alignment: the avoided media cost proxy for 62 press mentions over two years captures only a fraction of the reputational, regulatory, and social license value generated by visible commitment to biodiversity protection in an area of national and international conservation significance.

6.2 The Bagan-Conservation Nexus as a Design Innovation

The ecotourism incentive mechanism through which bagan platforms that maintain marine environmental standards are certified as whale shark observation sites and receive direct visitor payments, represents a practical implementation of market-based conservation instruments (Ferraro & Kiss, 2002) in a remote coastal context. The documented outcome (six certified bagan platforms, 16 visits per year per platform, IDR 4 million per visit) generates IDR 666.7 million in annual present value to bagan fishers, equivalent to approximately 62% of total programme investment, from a mechanism that requires no ongoing cash transfer from PIS once established.

This design feature has multiple reinforcing effects: it monetises conservation compliance for the actor group most capable of disrupting whale shark aggregation

behaviour; it diversifies bagan households' income away from pure extractive dependency; and it creates a self-reinforcing incentive structure in which higher conservation compliance increases site attractiveness, which increases visitor payments, which increases compliance motivation. The mechanism is structurally different from conventional eco-certification schemes (e.g., Marine Stewardship Council) in that the compliance standards are locally negotiated, the certification authority is the park management body rather than a remote third party, and payments are direct and immediate rather than conditional on market access. This local embeddedness may explain why the behaviour change outcomes among bagan fishers showed low deadweight (10%) and zero displacement—indicators that the mechanism is generating genuinely incremental change rather than formalising pre-existing practices.

6.3 Methodological Contributions and Limitations

This study makes three methodological contributions to the SROI and conservation impact measurement literature. First, it demonstrates the applicability of evaluative SROI to a multi-component, multi-outcome marine CSR programme in a remote developing-country context, providing detailed financial proxy documentation that can be adapted for comparable assessments in the Indo-Pacific region. Second, it introduces the concept of 'scientific data quality as SROI outcome', valuing the institutional benefit of systematic monitoring data to park management authorities using avoided independent survey cost as proxy. This approach may be replicable in other conservation contexts where programme-generated data feeds directly into regulatory decision-making. Third, it explicitly structures the analysis to compare tourism-dependent and non-tourism value pathways, enabling a direct test of conservation value resilience that is not possible in tourism-centric evaluation frameworks.

Several limitations require acknowledgment. The small primary stakeholder sample (n = 32) reflects the genuinely limited population of material outcome recipients in a remote community context, but constrains statistical generalisation of some outcome quantity estimates. Financial proxy selection for outcomes with no direct market equivalent (scientific data, prevention of ecological damage, awareness change) requires transparent methodological choices that involve irreducible uncertainty; our conservatism principle mitigates but does not eliminate this uncertainty. The assessment period of two years (2024–2025) may understate long-term benefit accumulation, particularly for outcomes with significant drop-off adjusted trajectory, such as diving safety and conservation awareness. Future studies should extend the assessment horizon and consider forecast SROI projection to capture the full lifecycle value of capacity-building investments.

Additionally, this study assessed a single-site programme by a single corporate investor; comparative SROI assessments across multiple coral-triangle whale shark

sites, involving different funding modalities and governance arrangements, would substantially strengthen the evidence base for policy recommendations regarding marine conservation investment design.

6.4 Implications for Conservation Investment Policy

The finding that community-based marine conservation can generate robust, multi-dimensional social returns at a 2.25:1 ratio—with value anchored in ecological monitoring and preventive outcomes rather than tourism receipts—has direct implications for conservation funding policy in the Indo-Pacific and beyond. First, it provides evidence-based support for multi-year, multi-component conservation programme funding models over single-focus, ecotourism-centred approaches. Funders who evaluate conservation programmes primarily through tourism metrics are systematically undervaluing programmes with strong preventive and institutional value components. Second, the ecological data quality pathway suggests that conservation science partnerships—where corporate investors fund systematic monitoring that generates management-relevant data for park authorities—may be among the highest social-return components of integrated conservation programmes. This has implications for conservation finance structuring: monitoring data agreements between private sector funders and park management bodies could be formalised as value-generating service relationships rather than informal in-kind contributions. Third, the programme's resilience to a 50% tourism disruption underscores the risk management value of conservation investment diversification for corporate ESG portfolios. Companies whose social licence to operate depends partly on marine ecosystem health face concentrated downside risk if their conservation investments are tourism-dependent; structurally diversified programmes represent superior ESG risk management.

Finally, this study contributes to the broader argument that SDG 14 (Life Below Water) financing gaps can be partially addressed through strategic social investment models that make the full social return on marine conservation visible to corporate and institutional investors. As of 2024, estimates of annual marine conservation financing requirements in the Asia-Pacific alone exceed USD 2 billion annually (Sturmberg et al., 2023). If even a fraction of this gap could be closed by demonstrating that community-based conservation programmes generate robust, diversified social returns comparable to those found here, the case for scaled private sector engagement in MPA co-management would be substantially strengthened.

7. Conclusion

This study has applied evaluative SROI methodology to the Kwatisore Whale Shark Conservation Programme, generating several findings of both theoretical and practical significance. The programme yields an SROI ratio of 2.25:1, robust across all tested sensitivity scenarios including severe tourism disruption, with total net social

value of IDR 1.35 billion above programme investment. Value composition is dominated by non-tourism pathways—particularly the institutional value of scientific data quality improvement (59.1%) and community-based ecotourism incentive mechanisms (27.4%)—demonstrating that the programme's social return is structurally diversified and not contingent on stable tourism markets.

Three conceptual conclusions follow. First, community-based marine conservation that integrates ecological monitoring, waste management, community capacity building, and conservation-aligned livelihood mechanisms generates social returns that substantially exceed what tourism-centric evaluation frameworks can detect. Evaluators and funders who use only tourism metrics are systematically under-assessing and therefore under-investing in this class of conservation programme. Second, preventive value—the social benefit of ecological damage that does not occur—is a structurally significant component of conservation programme SROI that requires explicit methodological attention. Financial proxy approaches based on avoided ecological and social cost provide a tractable, transparent, and conservative method for making preventive value visible in impact assessments. Third, the bagan-conservation incentive mechanism at Kwatisore demonstrates that market-based conservation instrument design can succeed in remote, low-income community contexts when incentives are locally negotiated, directly paid, and embedded in existing livelihoods rather than dependent on external market access.

Taken together, these findings support the reframing of community-based marine conservation as strategic social investment: a systematic, evidence-based, multi-dimensional value creation process that generates measurable returns for ecosystems, communities, governing institutions, and investing corporations alike. This reframing is not merely rhetorical. It has practical implications for programme design (prioritise monitoring, preventive action, and livelihood integration), impact measurement (account for non-tourism value pathways), and conservation finance (demonstrate diversified social return to corporate and institutional funders). The whale sharks of Cenderawasih Bay, and the communities that coexist with them, are not simply assets to be monetised through tourism. They are components of a social-ecological system whose full value—when measured rigorously and reported transparently—makes a compelling case that protecting them is among the most rational investments available.

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