

Surf Protected Areas: Bridging Conservation, Communities, and Sustainable Development in Western Sumatra, Indonesia

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Environmental Problem

Surf ecosystems provide critical ecosystem services and support important economic, social, and cultural benefits. Despite their high value, surf breaks are under threat from global climate change and coastal development. While some protection through marine protected areas (MPAs) and locally managed marine areas (LMMAs) are in place in some locations in western Sumatra, many ecologically significant coastal ecosystems remain unprotected.

Objectives

1. Identify Surf Protected Areas: Which areas are priorities for the establishment of SPAs in western Sumatra?
2. Cost Analysis: How much would it cost to establish SPAs in western Sumatra?
3. Benefit Analysis: Does establishing SPAs lead to greater economic value?
4. Business Case: Why and how should the SPAs be implemented?

Findings

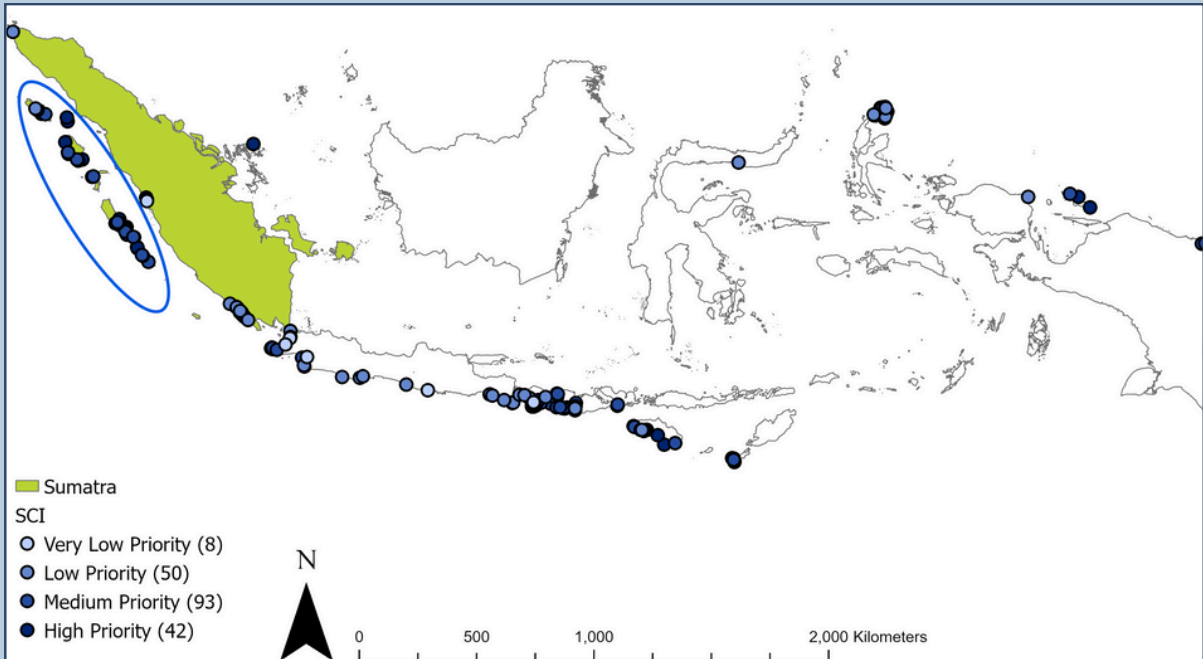
While the target sites experienced **lower human pressure** from development, they also had **less area formally dedicated to conservation**—potentially due to their remote locations and limited access.



Estimated costs for protection vary widely based on village population size, population to staff ratio, and cost per workshop. Under the parameters set in this study, the median cost of surf conservation in USD was estimated at **30** times the village population.



Support for sustainable management strategies— such as local business development, crowd control, and conservation policies— is strong, but ensuring **equitable stakeholder participation** remains a key challenge.



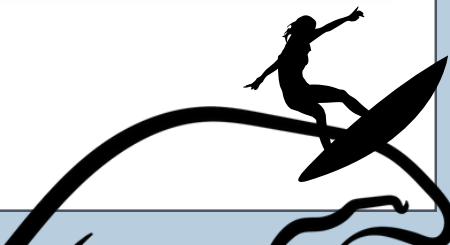
SCI: Map of Indonesia with the calculated SCI values split into high, medium, low, and very low priority based on human pressure and ecosystem value. The area circled in blue includes the surf spots that were analyzed as candidate SPAs for this report. Within this region, the **Mentawai Islands** tended to have higher priority sites for conservation.

Willingness to Pay (WTP)

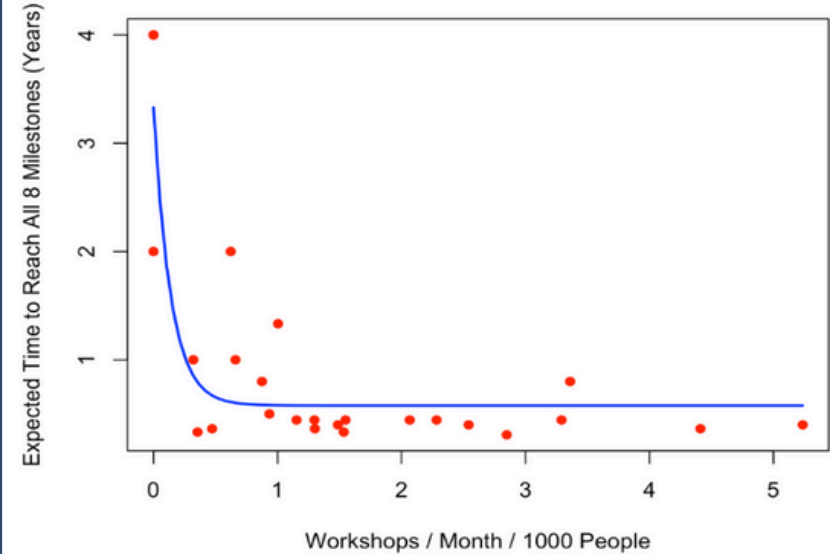
We surveyed **44 surf tourists** on how much they were willing to pay for potential conservation actions:

- **68.2%** WTP for crowd management
- **81.8%** WTP for environmental management & local benefits
- **72.7%** WTP for locally operated surf experiences

| WTP General Expenditure Mean | WTP General Expenditure Median | WTP Crowd Management Mean | WTP Crowd Management Median |
|------------------------------|--------------------------------|---------------------------|-----------------------------|
| 3046.053 | 3750 | 310.9259 | 100 |
| WTP Conservation Fee Mean | WTP Conservation Fee Median | | |
| 189.4737 | 100 | | |

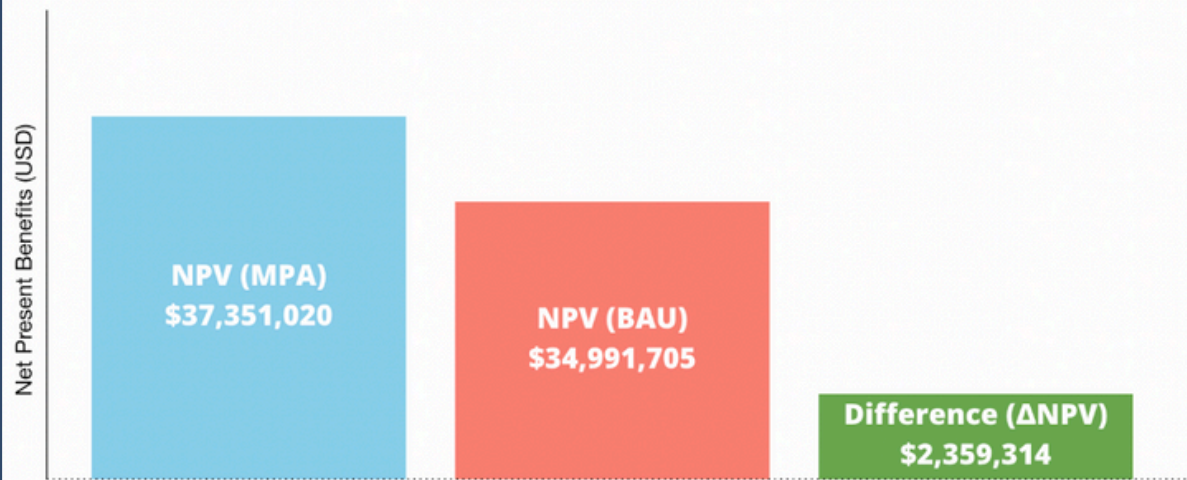


| Village Population (Individuals) | Median Cost (USD) | Mean Cost (USD) |
|----------------------------------|-------------------|-----------------|
| 1000 | 29340 | 62140 |
| 2000 | 58680 | 124280 |
| 5000 | 146700 | 310700 |
| 10000 | 293400 | 621400 |



LMMA Implementation

We used **8 key milestones** (Crawford et al. 2006) as indicators of LMMA (Locally Managed Marine Area) success, which followed the assumption that once a village reached all 8 milestones, further external support would no longer be required. We projected the expected time required for full LMMA completion under the assumption of a linear progress rate. The resulting data distribution showed that implementing approximately **2 workshops per month per 1000 individuals** would require about **9 months** to achieve all milestones.



Coral Reef Protection

Net present value (NPV) of coral reefs is higher under the Marine Protected Area (MPA) scenario over a 23-year horizon. The **\$2.36 million positive difference** highlights the long-term benefits of protecting critical marine resources like corals.

Environmental Impact

- While the SCI works as a valuable, landscape-scale prioritization tool, it should not be used as the sole determinant for selecting conservation sites. Instead, it can be used as a guiding framework to determine where conservation efforts may be more beneficial, but analysis at a more focused level is necessary to determine the best places for implementation.
- Addressing environmental concerns through effective waste management and conservation strategies, ensuring equitable economic distribution, and implementing community-driven tourism policies could help mitigate the most pressing concerns associated with surf tourism development.
- Conserving and protecting coral reef ecosystems through interventions such as MPAs or SPAs offers significant, long-term ecological and economic benefits over a BAU (Business as Usual) scenario that does not provide marine protections.

Next Steps

- Analysis at a more focused level to determine the best places for SPA implementation based on which pressure-state-response variable is more important to achieving intended conservation goals.
- Expand Cost Benefit Analysis beyond coral reefs to have a more comprehensive comparison against the costs of establishing SPAs.
- Refine projections of total economic impact by estimating how surf tourist visitation may decline at specific breaks in response to proposed SPAs in surf-rich areas.
- Quantify non-market costs and benefits perceive from surf development and surf conservation initiatives