

## A Green Vision for Sumatra: Report Summary

In Indonesia, district and provincial spatial plans specify where timber harvest, plantation expansion, infrastructure development and conservation should take place. In 2010, the 10 governors of Sumatra made an island-wide commitment to conduct ecosystem-based spatial planning, which supports sustainable development and conservation. Six national government agencies and a forum of non-governmental organizations including WWF developed an ecosystem vision for Sumatra as an alternative to the existing government spatial plans.

This report demonstrates how spatial and economic analyses of ecosystem services and wildlife habitat can support the spatial planning process in central Sumatra. By assessing the benefits from nature that the people of Sumatra manage and depend on, we can identify the full costs and benefits of alternative future development trajectories. Our results are drawn from comparison of Sumatra's landscape in 2008 with the Government Plan and the Sumatra Vision for 18 districts and six main watersheds in central Sumatra. The study area includes parts of three provinces – Riau, West Sumatra, and Jambi – as well as the RIMBA priority area, one of the last remaining forested regions in central Sumatra (Figure i). Our recommendations focus on the five priority actions identified by the Indonesian government for implementing and financing ecosystem-based spatial planning in Sumatra: forest restoration, forest carbon payments, payments and programs for watershed services, best management practices for forestry, and best management practices for plantations.

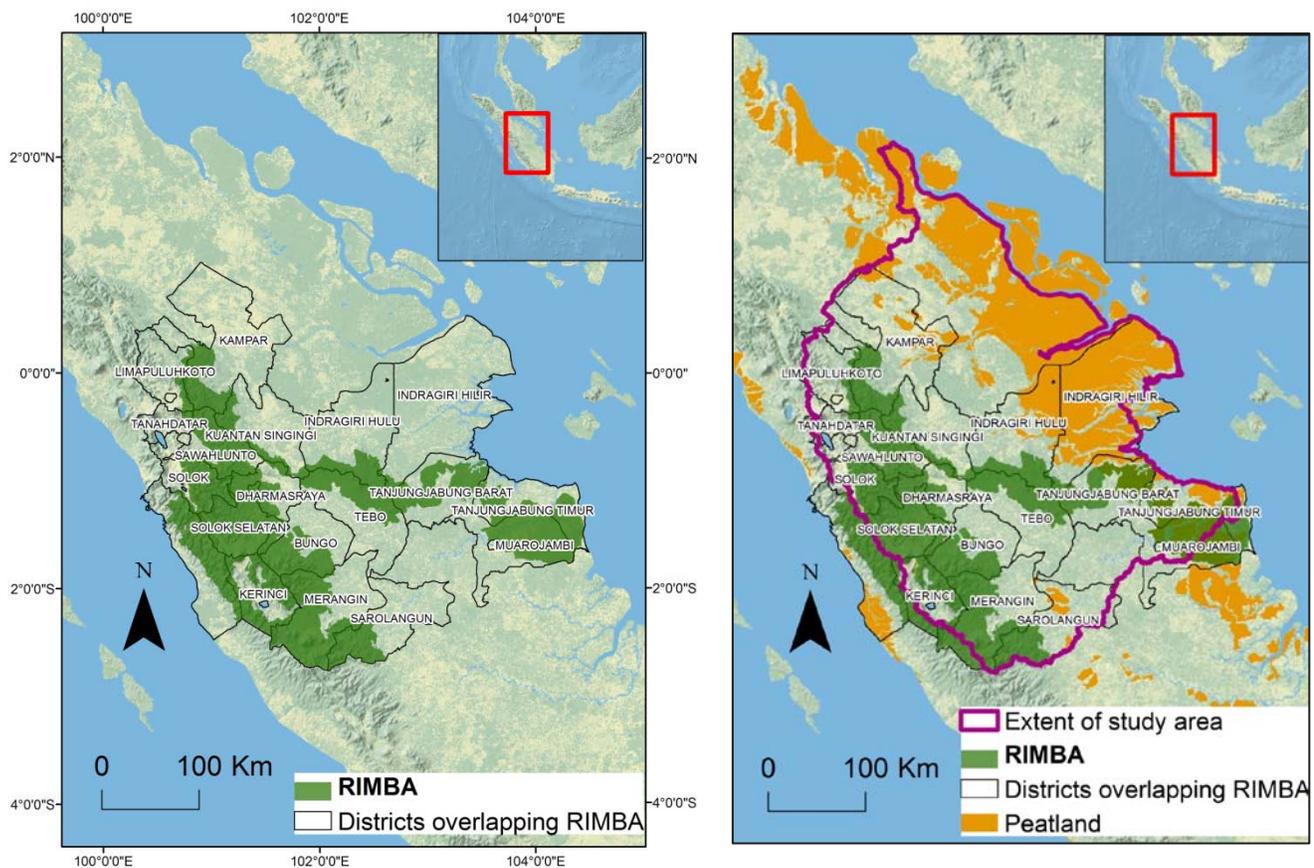


Figure i. a) The 18 districts in the study and the RIMBA priority area. b) The extent of the study area, covering the six watersheds in central Sumatra.

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In each of the report’s five chapters, readers will find transparent and comprehensive methods for reaching scientific and policy conclusions for each of the ecosystem services we assessed with the modeling tool InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs): climate benefits from carbon storage and sequestration; watershed services, including erosion control, water yield, and avoided nutrient pollution; habitat quality for biodiversity; and, the tradeoffs and synergies among multiple services and economic activities. There are also suggestions for further analysis and recommendations, either by replicating our approach for additional districts, or by integrating new information and methods.

### Key Findings: Central Sumatra

Our key findings are instructive for spatial planners at the provincial and district levels, as well as government agencies and other institutions that are considering investing in the region. We observe that implementing the Sumatra Vision rather than the Government Plan could result in net gains in habitat quality, total carbon stock and avoided nutrient pollution relative to 2008 (Figure ii). It would also lead to moderate increases in erosion across parts of the study area; however, the total erosion would be four times greater in the Government Plan.

Relative to 2008, implementing the Sumatra Vision would result in a gain of 350 million tonnes of carbon (MtC) stored in the six main watersheds over 50 years.

Conversely, the entire region would lose 1000 MtC over 50 years under the Government Plan. These carbon losses, which equal 3,667 million tonnes of CO<sub>2</sub> emissions, are driven by new conversion of forest and continued operation of plantations on peat swamps, which results in ongoing emissions. As a result, forest carbon projects and programs on peat swamps and in highly biodiverse upland forests in central Sumatra could offer global climate benefits. The RIMBA priority area alone could gain 60 MtC under the Sumatra Vision, whereas 100 MtC would be lost under the Government Plan, indicating an opportunity to establish forest carbon projects in the region to shift development away from business as usual and toward green prosperity.

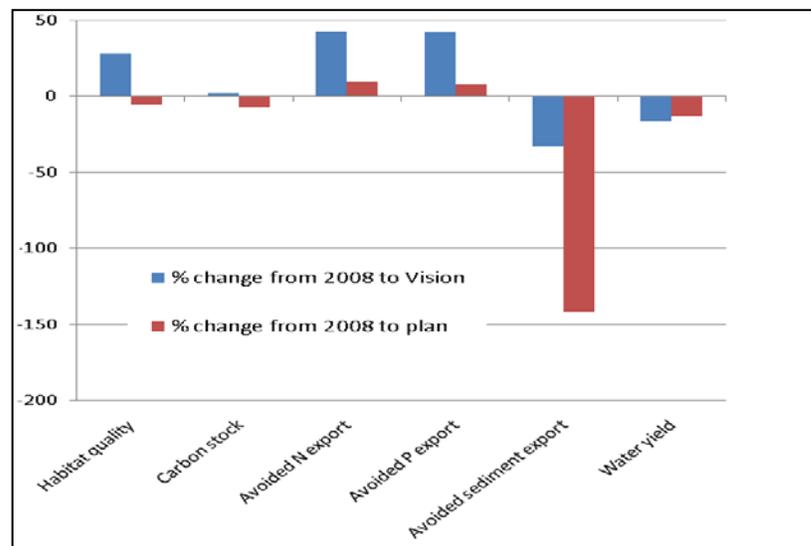


Figure ii. The difference in ecosystem services and habitat quality between the Sumatra Vision and the Government Plan, relative to 2008.

Additional ecosystem service and biodiversity benefits provided by the Sumatra Vision could be supported through priority actions identified by the Indonesian government. Plantations and production forests adjacent to high-quality habitat could reduce their impact on tigers and other biodiversity by implementing several best management practices, such as establishing riparian corridors, reducing human-wildlife conflict and poaching, and seeking environmental certification. Improved watershed management, and potentially payments for watershed services, could ensure more long-term benefits for people and biodiversity.

Several locations are of particular importance for ecosystem services. In particular, of 69 sub-watersheds studied, only one ranked in the top 25% for habitat quality and most ecosystem services (Figure iii). This sub-watershed covers most of the Reteh basin, including part of the RIMBA priority area, and is shared by 2 districts: Indragiri Hulu and Indragiri Hilir.

Under the Sumatra Vision, watershed management programs in the sub-watersheds upstream of population centers, including the towns of Tembilahan and Rengat, could protect habitat for tigers in the RIMBA priority area while reducing erosion and nutrient pollution by more than 80% in some areas. A shift to the Sumatra Vision would also provide greater erosion control upstream of Koto Panjang, the single large hydropower dam supplying the region, which could reduce dredging costs or long-term damage to turbines and other infrastructure that the people of Sumatra depend on.



Figure iii. The single sub-watershed that is ranked in the top 25% for habitat quality and most ecosystem services.

### Key Findings: Provinces and Districts

#### West Sumatra: Dharmasraya, Solok, Solok Selatan, Tanahdatar, Sawahlunto, and Limapuluhkoto districts

The western sub-watersheds in central Sumatra appear especially vulnerable to erosion. Districts in West Sumatra that could be particularly affected contain the mountainous Bukit Barisan Range: Limapuluhkoto, Tanahdatar, Sawahlunto, Solok, and Solok Selatan.

In many locations across central Sumatra, increases in most ecosystem services and habitat quality are accompanied by losses in plantation area and annual water yield. This is true for most districts in West Sumatra; however, compared to other districts, Solok is singled out for its potential to provide ecosystem services without big tradeoffs. Under the Sumatra Vision, Solok would experience large gains in erosion control *without* large losses in plantation area relative to the Government Plan, making it a good candidate for improved watershed management programs.

#### Jambi: Tebo, Muarojambi, Sarolangun, Tanjungjabung Barat, Tanjungjabung Timur, Merangin, Bungo, and Kerinci districts

The sub-watersheds within the Batanghari and Pengabuan Laban watersheds are also very vulnerable to erosion. Districts that have large impacts under the Government Plan include those in the lower elevations of Jambi: Bungo, Sarolangun, Tebo, Tanjungjabung Barat, Tanjungjabung Timur and Muarojambi. Kerinci and Merangin districts, with reaches in the Bukit Barisan Range, are also likely to experience increases in erosion and sedimentation. Yet, under the Sumatra Vision, Merangin would improve erosion control *without* large losses in plantation area relative to the Government Plan. These districts could avoid substantial erosion by implementing improved watershed management programs.

Under the Government Plan, four of the five districts that stand to lose the most habitat quality – 18 to 36% – relative to 2008 are in Jambi: Muarojambi, Merangin, Sarolangun and Bungo. These districts could prioritize forest restoration and other priority actions to avoid severely affecting the Sumatran tiger.

### Riau: Kampar, Indragiri Hilir, Indragiri Hulu, and Kuantan Singingi districts

Like West Sumatra and Jambi, Riau province faces increases in ecosystem degradation under the Government Plan. Some districts could avoid those impacts with relatively few tradeoffs. In particular, Kampar could avoid increases in nutrient pollution by targeting key areas for forest restoration and best management practices *without* large losses in water yield and plantation area. Under the Sumatra Vision, both Kampar and Indragiri Hulu would experience larger increases in biomass carbon stock than most other districts, with only small losses in plantation area and water yield. These minimal tradeoffs suggest strong potential for forest carbon projects in these districts at comparatively low cost.

Based on historical deforestation rates, Kampar, Indragiri Hilir, Indragiri Hulu, and Kuantan Singingi are at high risk of losing important forest habitat for tigers. Much of the remaining forests in these districts are in lowland areas that are under pressure from expanding plantations and other human activities. These districts should be prioritized for habitat conservation and priority actions that sustain forest habitat in central Sumatra.

### Recommendations

Mountainous districts in central Sumatra, which have relatively low opportunity cost for agriculture, together account for 90% of the possible gains in erosion control in the Sumatra Vision relative to the Government Plan; but, they account for only 40% of the possible gains in other services and habitat quality. Sumatra could ensure large gains in avoided erosion at relatively low cost by implementing habitat restoration, forest carbon projects, and improved watershed management on slopes in the region; however, interventions in the higher opportunity cost districts in the lowlands, which are more suitable for agriculture and less prone to erosion, are necessary to realize substantial gains in habitat quality, carbon storage, and nutrient retention.

Most of the sub-watersheds in central Sumatra would have high gains – in the top 25th percentile – in at least one service under the Sumatra Vision relative to the Government Plan (Figure iv). To ensure big increases in ecosystem services and biodiversity, interventions would be needed across about 75% of central Sumatra. Put another way, investment in priority actions almost anywhere in central Sumatra could result in substantial increases in ecosystem services or habitat quality. Future research should focus on identifying specific winners and losers of alternative development trajectories and potential for implementing priority actions in central Sumatra.

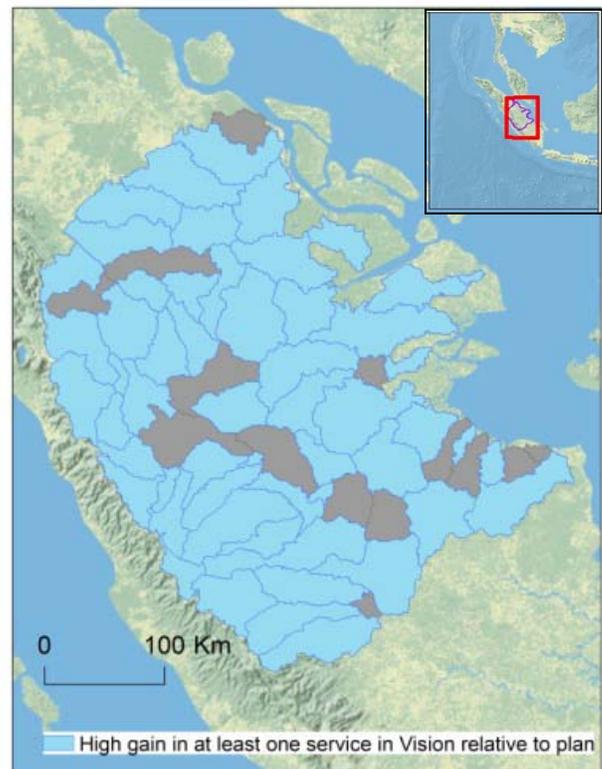


Figure iv. Sub-watersheds that could have among the highest comparative gains in one or more services by implementing the Sumatra Vision instead of the Government Plan.