

Impacts of sedimentation on river transport

Soil erosion is a significant problem in environments with high rainfall intensity. Forest soils are normally protected by the canopy and stabilized by roots and leaf litter. Following logging, repeated disturbance of the soil by burning, frequent weeding or overgrazing, the surface of the soil often forms a compacted crust, preventing infiltration and increasing surface runoff and soil erosion.

River sedimentation occurs when erosion upstream leads to higher sediment loads in rivers and deposition of sediment downstream. The process occurs naturally and river deltas are formed by sediment deposition, but land use changes upstream may lead to large increases in the amount of sediment entering a river system, causing significant problems for the more heavily populated floodplains. The HoB's mountainous landscape is vulnerable to erosion, and the problem will only worsen if HoB's forested ecosystems are not managed sustainably.

Forest sediments are rich in nutrients and can contribute to eutrophication in streams and damage aquatic species diversity.

Mountainous landscapes with steep slopes are especially vulnerable to erosion following deforestation. Figure 2.8 below illustrates the physical vulnerability of the soils of Borneo¹⁰⁵. The island's most erodible areas are primarily located within the HoB. Thus, deforestation and unsustainable practices in the HoB have disproportionate impacts on river basins throughout the island.

Forest sediments are rich in nutrients and can contribute to eutrophication in streams, with resulting impacts on aquatic species diversity. However, the most significant socio-economic impacts of increased river sedimentation in HoB have been borne by the river transport sector and those industries that depend upon it. Industries such as coal and timber use rivers to transport their products downstream to coastal cities, while household goods are typically shipped on barges to villages upriver.



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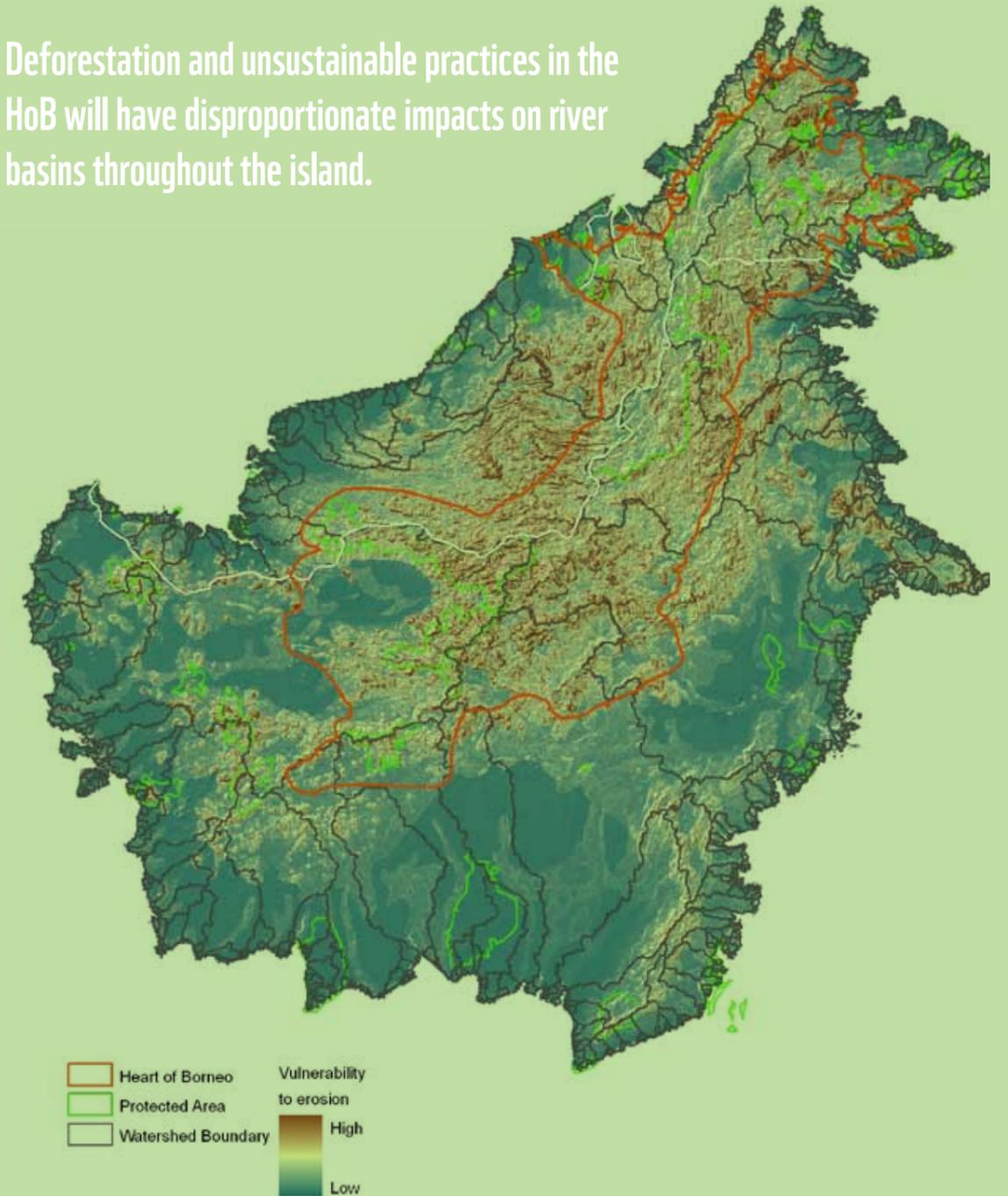


Figure 2.8: Physical vulnerability to erosion¹⁰⁶

A number of coal mining companies in Central and South Kalimantan have confirmed that transport capacity, rather than production capacity, is the main factor limiting their production. For example, production by coal mining companies is limited by the fact that the upper reaches of the Barito River are not navigable during 40 per cent of the year. Turnover could increase by US\$100 million/year in that region if river transport were possible year round (see Box 2.4).

The sea channels for the ports of Pontianak and Banjarmasin require maintenance and report dredging costs of US\$3 million and US\$11 million respectively per year (see Box 2.4 for more detailed numbers on the Barito-Kapuas river basin). Barges are still the least expensive means of transport (see Figure 2.9). The increased cost of dredging rivers may ultimately encourage railway or road construction that would lead to further deforestation and forest degradation.

All major rivers in Kalimantan require regular dredging. No sediment transport models or time series data are available to help estimate natural

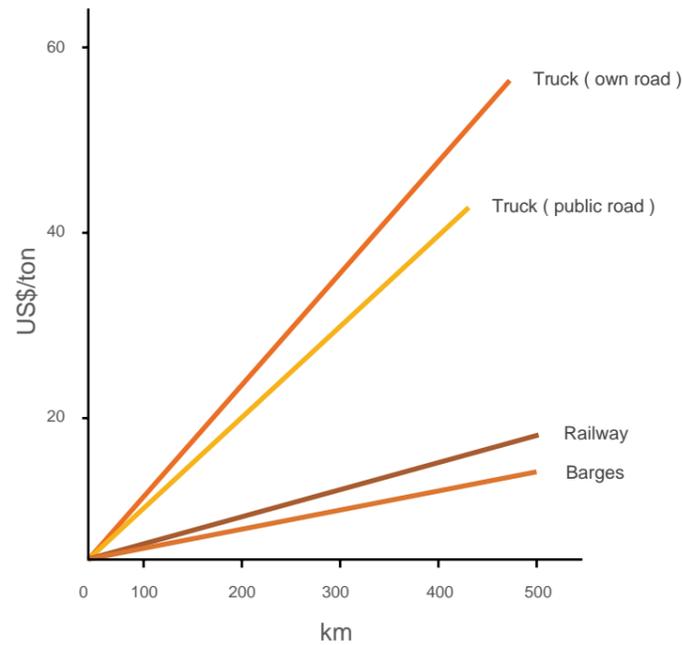


Figure 2.9: Estimated transport costs for mine produce in Kalimantan¹⁰⁷

sedimentation of these rivers or what percentage of the sedimentation may be anthropogenic, i.e., due to deforestation and land use change; nevertheless, deforestation is clearly an important contributor.

BHP has recorded on average 40 per cent of the year as non-barging days in the last 14 years.

Box 2.4: Barito-Kapuas river basin

Banjarmasin Port is Kalimantan's main port, serving many of the 2.6 million people in South Kalimantan and the 1.4 million people in Central Kalimantan. The port is located about 25 km upstream from the Barito River estuary, in the western region of South Kalimantan. Each year, approximately 250,000 twenty-foot equivalent unit (TEU) containers and 55 million tonnes of coal are transported through the access channel in the mouth of the Barito River estuary. The channel charges transport barges a fee of US\$0,337 per million tonnes of coal.

Due to heavy siltation, more than 4.5 million m³ of maintenance dredging is undertaken every year. In 2008, the access channel was realigned at a cost of US\$44 million, dredging an additional six million m³, but reducing the annual dredging requirement to two million m³/year. It is estimated that the Barito River contributes some 30 per cent of the silt accumulating in the access channel. Much of the remainder consists of materials from the surrounding tidal flat that has been re-suspended by wave action. Considering this, around US\$3 million can be allocated to sediment transport coming from the Barito River. Due to data limitations, it is not known how much can be allocated to deforestation in the river basin. In 2011 a large dredging program started in the rivers surrounding Banjarmasin, Kuin, Pelambuan and Kelayan, with costs budgeted at US\$250,000. (<http://sijaka.wordpress.com/2011/02/09/tiga-sungai-besar-ojek-pengerukan>)

Further up the Barito River, transportation barges experience difficulty at both high and low water. During times of low water, coal barges must travel partially loaded or not at all; during high water, barges cannot pass under bridges. Over the last 14 years, the mining company BHP has recorded an average of 40 per cent of the year as non-barging days, which severely restricts the industry's total annual transport capacity. A number of coal mining companies in Central and South Kalimantan have confirmed that transport capacity, rather than production capacity, is their limiting factor.

According to the Indonesian Coal Book 2010-2011, three companies with a combined annual sale of six million tonnes/year transport coal along the upper reaches of the Barito River. With a current market price of US\$50 per tonne of coal and assuming production capacity is sufficient, a 40 per cent limitation in transport capacity (instead of an average 20 per cent) implies a loss in turnover of US\$100 million/year.