Ferrogrão railroad with a freight terminal in Matupá will split in half the indigenous lands of Xingu

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The EF-170 railroad project, known as Ferrogrão, is part of Brazil's large infrastructure planning for consolidating export corridors of agricultural commodities to the ports of the north of the country. Virtually parallel to the BR-163 highway, this railroad has been conceived as alternate route aimed at lowering transport costs to improve the competitiveness of agriculture in the Midwest of Brazil. Yet, this project remains highly controversial regarding its economic return (*1*) and potential socioeconomic impacts on the Xingu and Tapajós river basins, which are critical for forest conservation, regulation of regional rainfall and river regimes as well as protection of indigenous peoples. Regardless of much evidence that potential socioenvironmental impacts extent to hundreds of kilometers away from infrastructure projects (*2*,*3*), the preliminary environmental evaluation studies of Ferrogrão covered only the adjacent 10-km swaths on each side of the proposed railway route (*4*).

In a former study, we identified the main municipalities that would benefit from reduced transport costs due to Ferrogrão. We also pointed out how transport infrastructure projects can generate synergistic and cumulative impacts by inducing land use changes (*5*). In the same vein, here we focus on the MT-322 state highway, formerly known as BR-080. This road, which is partially paved, links the municipality of Novo Mundo in Mato Grosso to the state of Goiás.

The MT-322 road was built in the 1970s as part of the plan for integrating the Amazon region to the rest of the country by the military government at the time. Currently, it serves as a secondary road for linking the BR-163 (known as Cuiabá-Santarém) to the BR-158 highway (Fig. 1).

Since its opening, the MT-322 has been a source of conflicts and controversies, as it traverses the Xingu River in a region historically inhabited by indigenous populations. In 1971, as a result of the construction of the road, a portion of the territory of the middle Xingu was excluded from the proposed limits for the Xingu Indigenous Park (PIX), thus separating the Kayapó population that lived on both sides of the road (*6*). Only in 1984, after the so-called "ferry war" (*7*), the territory north of the road was demarcated as the Indigenous land of the Capoto-Jarina people and since then they have managed the ferry for crossing the Xingu, charging all non-indigenous people a fee (*8*). This 80 km track of the MT-322, running along the perimeter of the PIX and within the TI Capoto-Jarina territory, despite being in operation, does not have an environmental license. Moreover, there has been no study on the environmental impacts of this road on the indigenous peoples of the Xingu region (*9*).

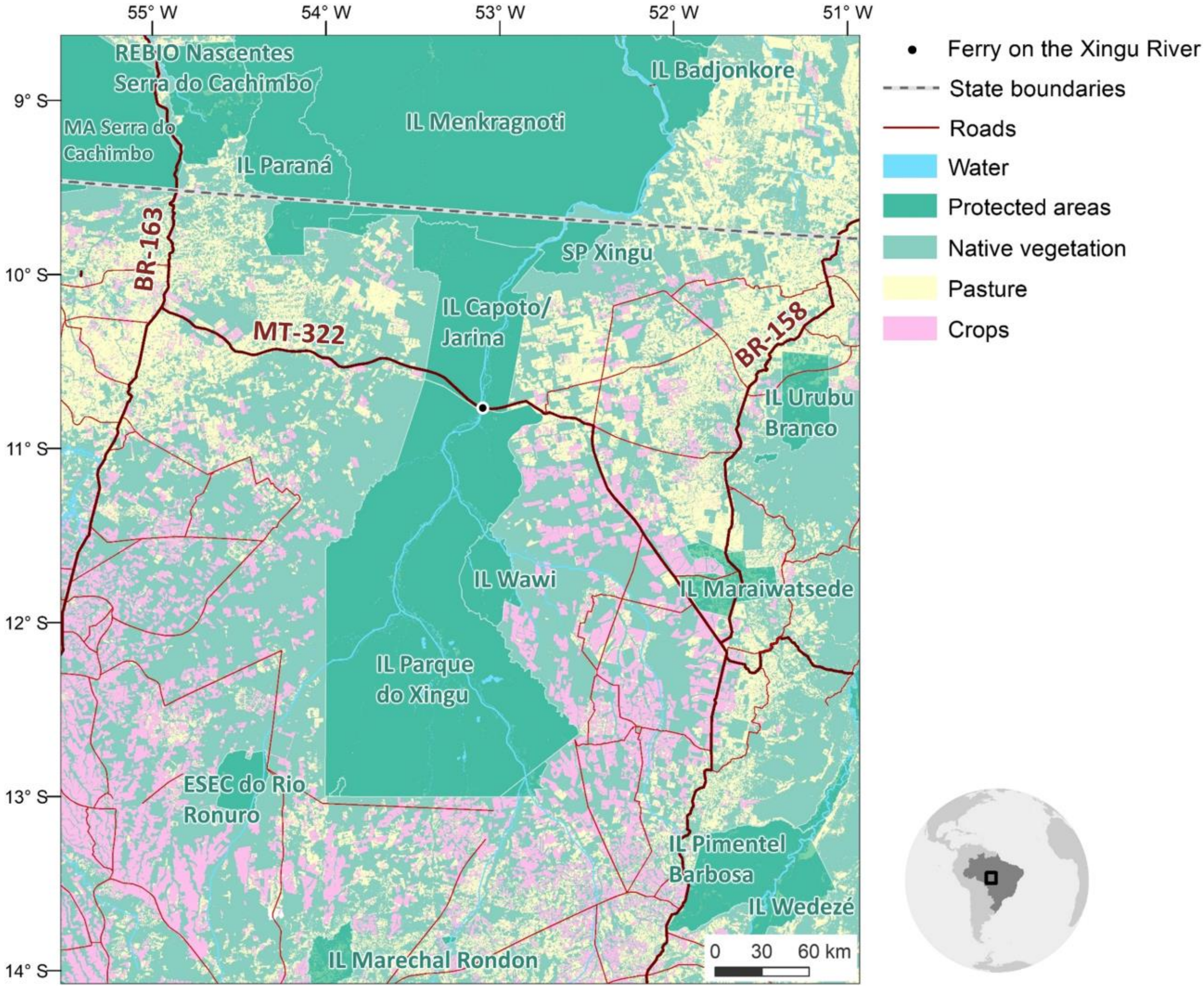

Figure 1 – Land use and road infrastructure in the surroundings of the Xingu Indigenous Park and Capoto-Jarina territory. MA (military area), IL (indigenous land), SP (state park), ESEC (ecological station) and REBIO (biological reserve).

Over the last decade, local farmers and ranchers have increasingly pressed for paving the MT-322 and building a bridge over the Xingu River, aimed at facilitating the transport of their products (*10*). Road users, mainly complain about the long wait and time for crossing the river, the fee, and the irregular hours of the ferry operation (*11*). In addition, the absence of paving of this track hampers the traffic, especially in the rainy season due to often impassible puddles.

Even though the paving of the highway divides opinions amongst the indigenous population (*8*), the proposal to build the bridge over the Xingu River is fully rejected by the region's indigenous associations, who claim that the replacement of the ferry by the bridge will deprive indigenous people from controlling access through their lands. They envisage, as a result, that increased traffic will encourage encroachment of their lands.

Within this context, the present study complements our former work (*5*) by focusing on the synergistic and cumulative impacts of Ferrogrão together with other planned road infrastructure in the Xingu region. We specifically analyze how the building of this railroad with the addition of a freight terminal in Matupá town, along with the paving of the MT-322 and the building of a bridge over the Xingu River, would increase the flow of cargo across the indigenous lands, leading to deforestation and consequent socioenvironmental impacts. Neglecting the impacts of infrastructure projects beyond their 10 km surrounding buffer severely affects the rights of the indigenous peoples for mandatory prior consultation (*12*).

To estimate the chain of effects of Ferrogrão on MT-322, and consequently on the PIX and TIs Capoto-Jarina, we used the OtimizaINFRA model that simulates the transport logistics in Brazil. The model employs as database the origin-destination matrix of transported goods, infrastructure maps and freight values for the different modes of transport, among other assumptions (*5*). The model simulates transport routes based on the lowest accumulated transportation cost between origins (producing municipalities, as in this study, of soybeans) and destinations (export units of the Federal Revenue Service, such as ports). To assess the economic implications from new infrastructure on the transportation costs, we developed simulations without and with a set of planned interventions. Additionally, the model also estimates the cargo flow of soybeans, hence number of vehicles, through all the region's transportation vias. We assess the logistic of soybean transportation under the following scenarios:

i. Current scenario: current infrastructure and 2018 origin-destination matrix.

ii. Ferrogrão scenario: construction of Ferrogrão with only two freight terminals, an initial one in the town of Sinop (Mato Grosso) and the final one in Miritituba on the Tapajós River in the town of Itaituba (Pará). This scenario reproduces the transportation of cargo by using the 2018 origin-destination matrix and then seeks to optimize the transport of soybeans to ports with the lowest access cost.

iii. Ferrogrão scenario plus interventions, including the construction of Ferrogrão with three terminals, an initial one in the town of Sinop, another intermediate in the town of Matupá and a final one in Miritituba's barge terminal in Itaituba. This scenario also reproduces the transportation of cargo by using the 2018 origin-destination matrix and then seeks to optimize the transport of soybeans to ports with the lowest access cost. For this last scenario, we ran the SimAmazonia deforestation model (*13*) incorporating the effect of increased traffic through MT-322 under a scenario of weak environmental governance (*14*).

As a result, OtimizaINFRA estimates that currently there is a daily traffic of 125 and 32 soy trucks (carrying 30 tons each) on the two main highways that give access the northern ports, BR-163 and BR-158, respectively. This corresponds to an annual cargo of 1.4 million tons (Mton) and 345 thousand tons (kton) of soybean, respectively. The model, however, does not indicate soybean transport through the MT-322, since traffic from municipalities in the northeast of the state of Mato Grosso goes through the BR-158 to the port of Belém (Fig. 2).

In the scenario with the implementation of Ferrogrão, the railroad becomes a cheaper alternative than the BR-163 for transporting soybeans. Due to the resulting competition, the transport of soybean by trucks on the BR-163 reduces by 81%, the equivalent to 24 trucks per day or 260 kton of soybeans per year, while the Ferrogrão railroad would result in a movement of 435 wagons per day, totaling 16 Mton per year (Fig. 3). Once again, there was no significant transport of soybeans through the MT-322. However, a certain amount of cargo would circulate through some vicinal roads close to MT-322. Figure 3 shows the logistic basins (areas of influence) of the ports, demonstrating that, even with Ferrogrão reducing the cost for accessing the Miritituba terminal or the Santarém port, it would still be cheaper for the northeastern municipalities of Mato Grosso to export soybean via BR-158 to the port of Belém.

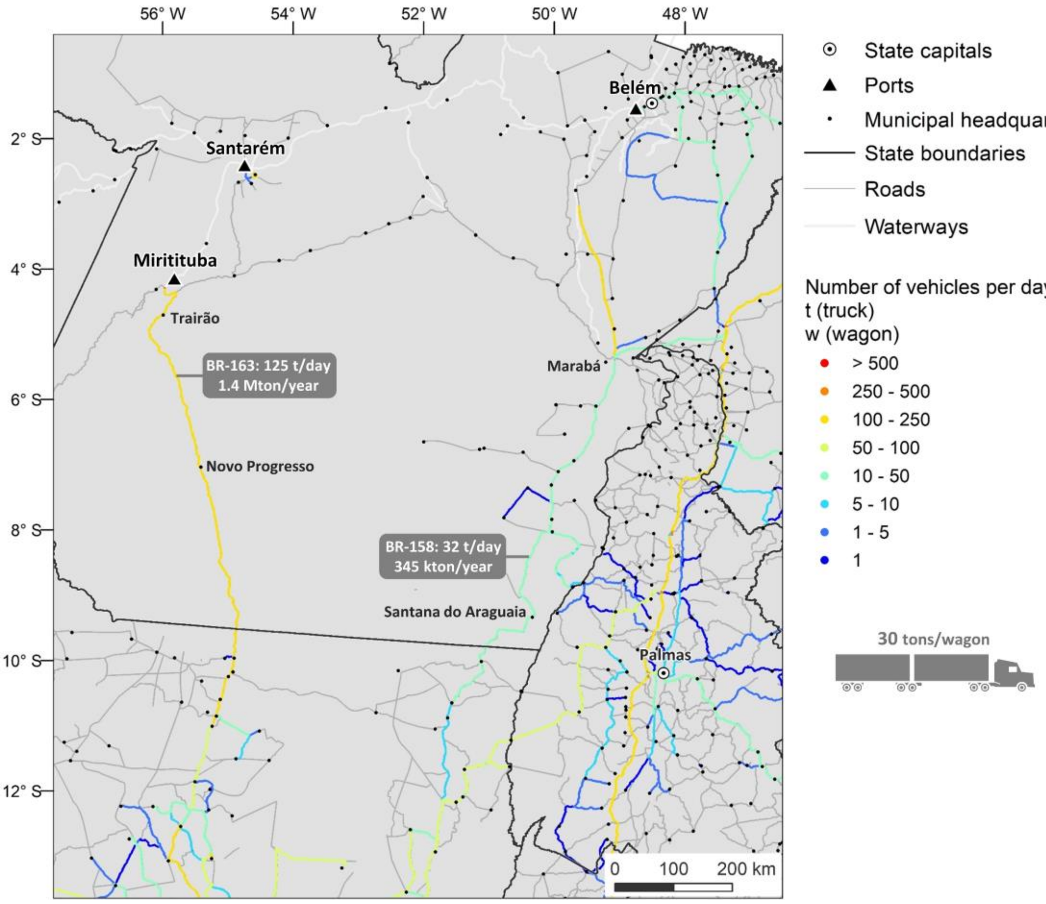

Figure 2 – Soybean transport traffic under the current scenario.

The third scenario, which includes a freight terminal at Matupá and interventions along MT-322, indicates that the building of such terminal would attract a much larger amount of cargo to the railroad, further reducing the traffic on the BR-163. As a result, Ferrogrão would increase its daily movement to 480 wagons (100 tons each wagon) or 17.5 Mton per year, whereas the BR-163 would only transport 24 kton per year or the equivalent of 2 trucks per day. The paving and construction of the bridge also change the dynamics of the region's traffic, as a group of municipalities, as highlighted in Figure 4, would have reduced transport costs, hence opting to export to the port of Santarém. The better quality of the road and the abolition of the ferry fee would turn the MT-322 quite viable as an access road to the Ferrogrão terminal in Matupá. As a result, 174 soy trucks daily or 1.9 Mton of soybean per year would cross the Xingu indigenous lands through the MT-322.

Another railroad, the FICO (Midwest Integration Railroad) (Fig.4), is planned in Mato Grosso to transport agricultural production and is currently in the studying phase. We simulated the last scenario, including this intervention as well, to verify its role in the state's logistics, should it come to fruition. In the same way as the previous ones, the optimization of the destination was considered (use of the port with the lowest access cost). However, no difference was found in the dynamics of the soy flows described above, since this railway does not present any advantage for the municipalities of Mato Grosso to access the ports with the lowest accumulated cost, Santarém and Belém.

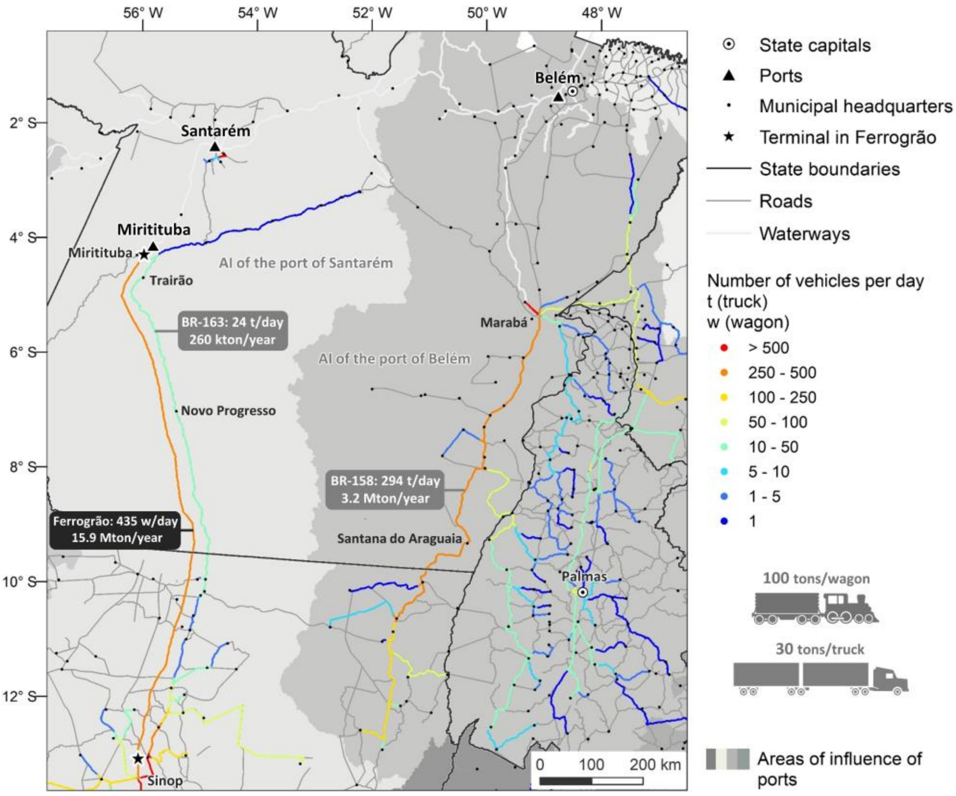

Figure 3 - Soybean transport traffic under the Ferrogrão scenario.

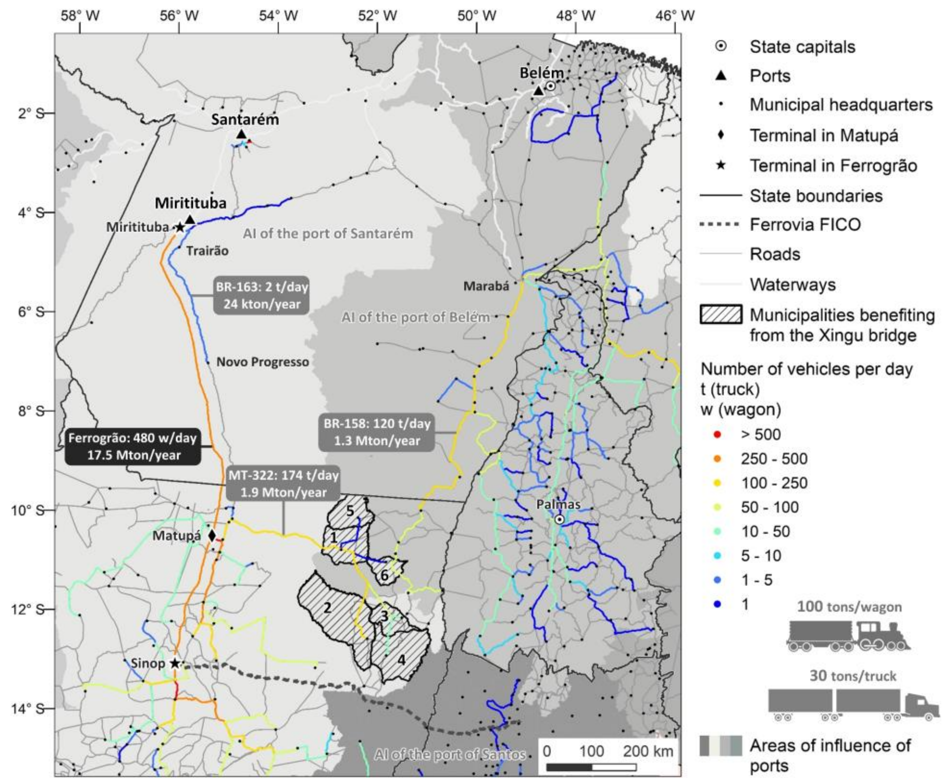

Figure 4 - Soybean transport traffic under the scenario of Ferrogrão plus interventions. 1-São José do Xingu, 2-Querência, 3-Bom Jesus do Araguaia, 4-Ribeirão Cascalheira, 5-Santa Cruz do Xingu, 6-Canabrava do Norte. See fig. 6.

Lowered transport costs due to the construction of the bridge (Fig. 6) will intensify greatly the traffic of vehicles from the soy-producing municipalities in the east of the PIX. Not only, will this new dynamics press the expansion of croplands in the region, it will also pose a threat to the indigenous lands by propelling the encroachment of their lands and consequently deforestation.

We estimate using the SimAmazonia model (*13*) that under a scenario of weak environmental governance (*14*), such as the current situation in Brazil, more than 230 thousand hectares will be deforested by 2035, just within the indigenous lands of eastern Mato Grosso, of which more than half would occur in the Xingu Indigenous Park alone (Fig. 5). Quite alarming, the loss of forest within the Ferrogrão's region of influence in Mato Grosso (Fig. 4) would reach 65% by 2035. Therefore, the economic impact of Ferrogrão goes far beyond the cannibalization of the BR-163, which would become just a regional road. Were the Matupá freight terminal implemented, economic losses related to CO_2 emissions from deforestation would reach the order of US$ 1 billion (US$ 10/ton of CO_2) for the indigenous lands alone. Moreover, this widespread deforestation will further decrease rainfall patterns that have already reduced by 48% in parts of the region, hence affecting agricultural productivity (*15*) and the energy generation by the Belo Monte hydroelectric power plant, which may drop to 25% of its maximum capacity (*16*). Associated impacts also include immeasurable losses of ecosystems services (*17*) and of the invaluable sociobiodiversity of the region (*6,18*).

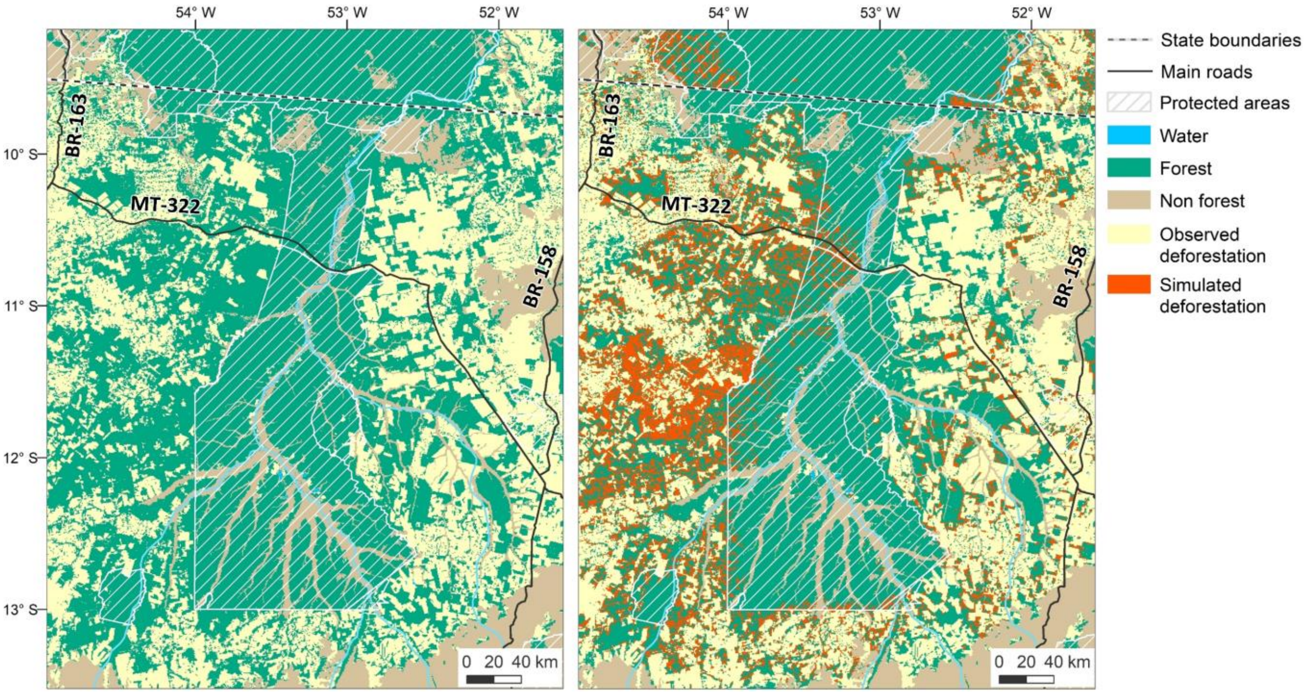

Figure 5 – Deforestation today and in 2035, as simulated from SimAmazonia.

In short, the Matupá freight terminal could potentially trigger a chain of events that would split in half of the contiguous indigenous lands of Parque do Xingu and Capoto Jarina, resulting into encroachment of areas along the MT-322. Therefore, assessment of the environmental impact of the Ferrogrão project must consider the whole area of influence of the project, and not just the 10 km buffers on each side of its planned route. Indeed, the large socioenvironmental and economic impacts due to the Ferrogrão must not be externalized from the project costs. Quite on the contrary, they must be accounted for in order to determine the project's economic feasibility, and consequently its potential return to the Brazilian society (*19*).

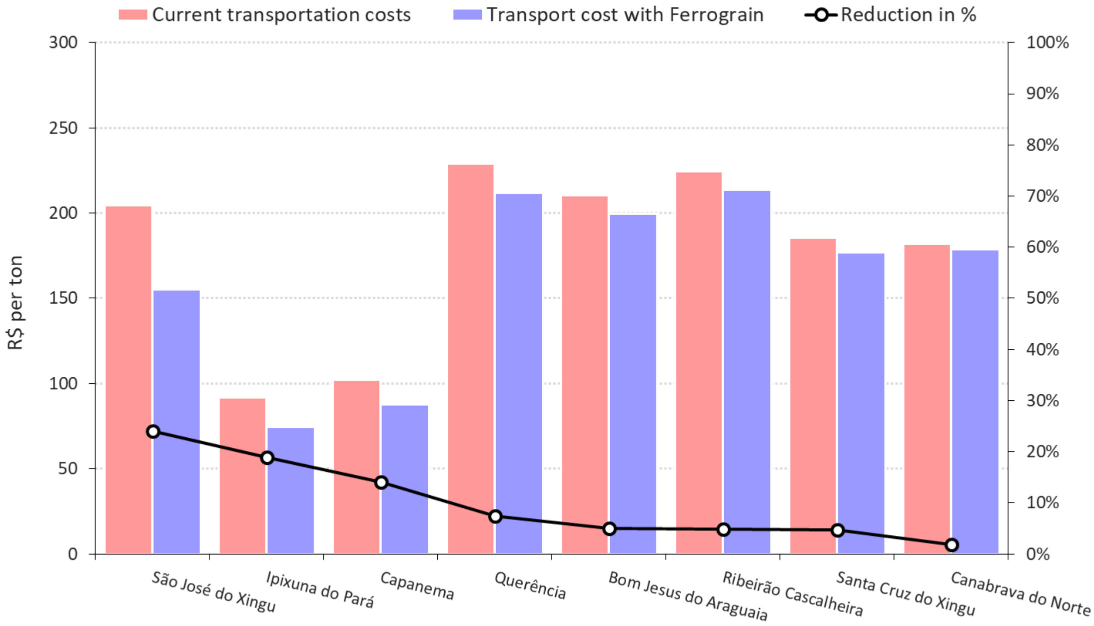

Figure 6 – Soybean transport costs for municipalities in eastern Xingu today and under the scenario of Ferrogrão plus interventions.

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