

# Impact of the Tren Maya Megaproject on the Biocultural Heritage of the Mayan Area in Mexico's Best Conserved Tropical Forest



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## Abstract

The Tren Maya (Mayan Train), is a megaproject that is currently under construction along the Yucatan peninsula in Mexico, a very important region in terms of biocultural diversity. To this day, around 860,000 habitants are Maya speakers -although many more are not fluent in the language anymore. The Maya people have historically sustained the region's natural resources and biodiversity. The richness of the region includes one of the largest karst aquifers in the world and conserved tropical forest areas, being one of the most important in the continent. However, in the last decade, several megaprojects are threatening the livelihood of the Maya habitants, as well as the hydro-ecological systems that will result in the near future in an unsustainable development. In this context, the present paper recommends that development decision-making take place with the participation of the civil society through the establishment of participatory mechanisms, grounded on the values associated with the Maya biocultural heritage. and strengthening local governance to collectively and locally mitigate the negative impacts of such megaprojects.

**Keywords:** Biocultural diversity; Megaprojects; Sustainable development; Yucatan; Mexico; Maya territory; Biodiversity; Vulnerability

**Abbreviations:** IDB: Inter-American Development Bank; SEMARNAT Mexican Ministry of Natural Resources and Agriculture; CONANP Mexican Commission for Natural Protected Areas

## Introduction

The Tren Maya (Maya Train) will run 1,500km in the Maya area of southeastern Mexico. It will have 21 stations and 18 additional stops [1] and although it is already under construction, it is yet to be determined if all of them or how many of these stations/stops will become intermediate cities or "growth poles" with a non-stop tourism industry growth. The government's explicit objectives of the megaproject are to contribute to the social and economic well-being of the inhabitants of the territory, through the generation of employment, the detonation of the economy of the region and the construction of infrastructure. Nonetheless, the megaproject has met an important backlash from civil society, Maya communities, academics and environmentalists who all questioned whether the benefits will actually have the announced positive impacts, or if the Maya people will be negatively affected by the huge environmental and social impact of a massive tourism industry, while the profits will be mainly shared among few and powerful

investors. As an example to the latter, the Yucatan peninsula, harbors a well-known international touristic area that includes the city of Cancún and the Riviera Maya. Cancún started as a government-planned, IDB-financed touristic city in the Mexican Caribbean, and continued growing to date with one of the largest touristic industries in the country, also associated with problems such as extensive profit shares only to larger tourism industry investors, at the expense of precarious employment for the local Mayan communities, sexual exploitation, drug related violence and extensive cultural and environmental degradation [2,3].

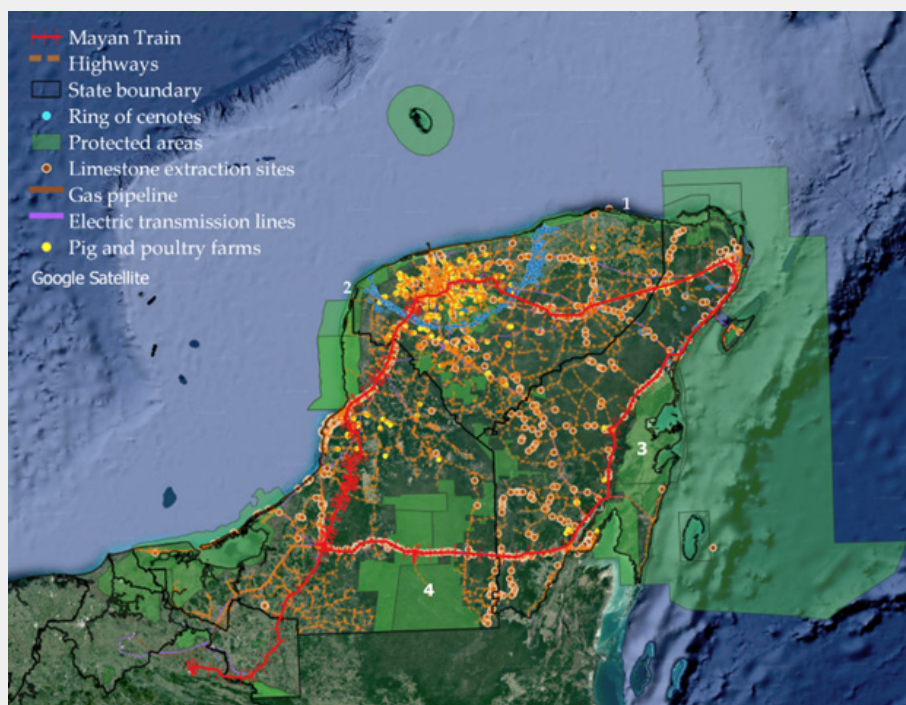
This region in southern Mexico is part of the second largest and best-preserved tropical forest of the continent, second only to the Amazon [4-6]. The nature reserve of Calakmul, Campeche alone hosts populations of 91 species of mammals and 286 species of birds [7]. These include flagship species such as the jaguar (*Panthera onca*), puma (*Puma concolor*), tapir (*Tapirus bairdii*),

and the howler (*Alouatta pigra*) and spider monkeys (*Ateles geoffroyi*), all especially meaningful to the Maya peoples. These species, along with other threatened fauna and flora, have healthy populations in the area in contrast to other regions of the country, where urbanization and habitat destruction have decimated their populations [8,9]. The Yucatan Peninsula also constitutes one of two transcontinental bird migration routes [10], making it a crucial conservation area.

The limestone platform of the Peninsula is “one of the most extensive and spectacular karst aquifer systems on the planet” [11]. Biodiversity in these karstic aquatic environments support the life of at least 987 species, including aquatic fauna in cenotes (sinkholes connected to the water table) and caves, such as two species of blind fish categorized as in danger of extinction: the white lady (*Typhliasina pearsei*) and the blind eel (*Ophisternon infernale*). Also, more than 45 species of stygobiont crustaceans can be found, including three endemic species of Remipedia, crucial to the evolutionary understanding of crustaceans and life on Earth [12]. Endemic species are indicators of the environmental conditions of caves and groundwater since these species are sensitive to habitat deterioration and pollution as they maintain specific adaptations closely related to habitat conditions. Moreover, a decrease in water quality and the presence of fecal pollutants has been reported in groundwater and coastal areas [13,14], which represents a potential human health risk if this situation continues without the planning and construction of

efficient sanitation infrastructure along with megaprojects.

Large nature reserves such as Calakmul and Sian Ka’an have slowed the impact of an increasing number of threats, such as urbanization, highways, eolic, and photovoltaic parks and contaminating industries (pig and poultry megafarms) which produce habitat degradation, fragmentation and outright destruction of the natural ecosystems. Figure 1 illustrates a selection of these threats using a geodatabase [15]. The map shows a higher fragmentation and density of farms and highways, along with less protected areas in the State of Yucatan, in the north of the Peninsula, while the largest nature reserves in Campeche and Quintana Roo maintain higher ecosystem integrity. Plant and animal populations have historically migrated between nature reserves, yet the Maya Train megaproject and other related infrastructure developments, such as the Tulum airport (under construction adjacent to the Sian Ka’an Reserve), which are being carried out with little effort to rescue local flora and fauna are already accelerating fragmentation, according to a representative of the Sian Ka’an Biosphere Reserve managed by the Mexican Commission for Natural Protected Areas (CONANP)<sup>1</sup>. Also, many of the limestone extraction sites identified on Figure 1 are related to the train construction sites. In this context, habitat fragmentation favors local species extinction; while the interruption of biological corridors detonates isolation, reduction of flora and fauna populations, and changes microclimates transforming local habitats.



**Figure 1:** Nature reserves in the Yucatan peninsula, planned Mayan train route, and other threats inducing habitat fragmentation [15]. Biosphere reserves: Ria Lagartos (1), Ria Celestun (2) Sian Ka’an (3) and Calakmul (4).

<sup>1</sup>Personal communication on November 25, 2022.

Another relevant resource of the peninsula is the large subterranean aquifer, which is estimated to represent 32% of the annual water recharge of the country [16]. The multiple tourist developments and the accelerated growth of human settlements in the peninsula are also generating uncertainty in the availability, accessibility and current and future quality of ecosystem services such as water, which support and ensure human well-being. These disturbances are having an impact that, if left unregulated, will fundamentally change the way of life of human populations in the Yucatan Peninsula. This is aggravated by the highly permeable karstic platform, which favors infiltration of organic and inorganic contaminants.

Examples of these impacts would be

- a) The reduction of aquifer recharge, which is mainly controlled by precipitation;
- b) A decrease in water quality and the increase of contamination mainly due to poor sanitation and population pressure (increase demand of water in quality and quantity);
- c) Reduction of aquatic biodiversity that sustains a high degree of endemic biodiversity; and
- d) The proliferation of emerging diseases associated with the use of a contaminated aquifer which would affect the human population, agriculture, and the resilience of ecosystems.

The cultural relationship with nature amongst the Maya peoples is based on the milpa system, which, in turn, is grounded on the conservation of biodiversity. This biocultural heritage can be understood as an inextricable link between biological and cultural diversity, which includes language, knowledge/spirituality, values and productive practices [17-19]. This interaction is evidenced in a diversified management of productive systems, including the milpa, where maize, squash, beans, tubers, among some 26 variants, are traditionally grown; the family garden, where species of more than 100 variants of plants and more than 20 species of backyard animals are kept; and the forest, *káax* in Maya, which includes spiritual beings, where hunting, collecting, beekeeping and rituals take place [17,20]. This system has ensured the long-term maintenance of the forests since ancient times, through practices that ensure regrowth and conservation as the forests provide nutrients to enrich agricultural soils, fodder for the bees, species with medicinal properties, for construction, among other uses.

Habitat destruction and fragmentation derived from the megaprojects, such as the Tren Maya, will increase the pressure on the region's socio-ecological system, which has adapted for millennia to rely on diversification of productive activities, in order to withstand climatic variation and seasonality [17] that have naturally occurred in the area [21]. The impoverishment of biodiversity will also aggravate the effects of climate change and decrease the resilience of the Maya productive systems.

In the context of the Tren Maya, these negative impacts are aggravated by the monetization of the territory due to financial speculation for land, contributing to the erosion of the *ejido* system and its related values and governance. Traditionally in Mexico, *ejido* refers to an area of communal land used for agriculture in which *ejidatarios*– or members of the *ejido*– have usufruct rights rather than ownership rights to land. The *ejido* system has historically enabled many communities to achieve a high level of autonomy and to efficiently manage their common resources over time [22]. However, since the modification of Article 27 of the Mexican constitution, in 1992, many *ejidos* have transitioned into a private property tenureship, which, in turn, has led to an increased acquisition of rural land by the agroindustry, among others, to develop megaprojects, contributing to the erosion of the traditional systems of production, such as the milpa [23].

For López Gómez et al. [24], the Tren Maya megaproject is a continuation of the integration of the Mesoamerican region to the hegemonic circuits of merchandise (legal and illegal) and the expansion of the extraction frontiers, aimed at expanding the sectors of basic infrastructure, productive activities (especially agro-industrial and manufacturing), extraction of resources, exploitation of aquifers and energy generation. All this is publicized with the rhetoric of economic integration to promote commercial exchanges, justified with a “post-neoliberal” discourse that promotes economic spillovers for the “benefit of the people” and “sustainable development.”

Paradoxically, the post-neoliberal discourse promoted by the federal government is supposed to favor a fairer and more respectful socio-economic paradigm for indigenous peoples, yet the projections on the benefits of the Train are still reflected in a neoliberal model, in favor of Big Capital, which threatens all that the biocultural heritage entails. The project's announced goals, however, have largely ignored indigenous communities' rights to prior and informed consent for their decision-making, regarding the impact of the megaproject on their livelihoods, as set forth in the rule for self-determination of the binding convention 169 of the International Labor Organization [25].

### Conclusion

The Yucatan peninsula is one of the most important Mexican regions in terms of biotic and abiotic resources as well as in its cultural diversity. The Maya Train megaproject constitutes a very serious threat to its natural resources not only because the direct destruction of the jungle is being carried out in many areas, but most importantly because it threatens to destroy the Maya being and livelihoods, and the identity of the historical guardians of this ecological habitat: the Maya people. Since ancient times, and through trial and error they learned that for them to live and thrive, biodiversity, water, wind and stones also had to live and thrive. It is therefore important to support the defense of their territories, and, as academics, facilitate the opening of participatory

mechanisms grounded on values associated with their biocultural heritage towards development decision-making. Since ancient times, in one of their books they explained the European invasions of the sixteenth century in precisely these terms: "But the *Dzulo'ob* [foreigners] came and destroyed everything. They taught fear, withered the flowers, they sucked the flowers of the others so that only theirs would live... they came to castrate the sun..." [26, A. García Quintanilla, trans.].

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