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**COVER IMAGE**
Realigning within Planetary Boundaries: (credits: Senger und Partner GmbH)

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# Mapping spatial transformations of commodities' private ports in Amazonia

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This contribution presents partial results of my doctoral research, *Urbanising the Jungle, Privatising the River*, developed in cotutelle between ENSA Paris-La Villette, Le Cnam (France) and USP (Brazil), and funded by the French Ministry of Culture. The project examines the spatial impact of private port infrastructures in the Amazon basin, with a focus on their role within global commodity supply chains. In the context of Brazil's rising production of agricultural and mineral commodities—raising questions regarding forest preservation and sustainable development goals (Garrett et al. 2021)—and the progressive relaxation of regulations on the private appropriation of river margins, these infrastructures represent an understudied dimension of anthropogenic pressure, linked not only to extraction but also to the circulation of resources.

The study develops an *atlas of private ports* in the Amazon basin by systematically identifying industrial terminals and organised ports. Through a combination of classification criteria (Rodrigue 2025), flow mapping, and the spatial articulation of ports with adjacent territories (Ducruet & Notteboom 2023), the atlas provides a comparative understanding of how port infrastructures reshape urbanisation processes. By mobilising cartographic methods at multiple scales—from the Amazon basin to the immediate surroundings of the ports—the analysis highlights new forms of urbanisation that transcend the conventional categories of city, countryside, and forest.

The methodology combines quantitative and qualitative approaches. On the quantitative side, the study cross-references thirty years of land cover data from *MapBiomas* (Souza et al. 2020) with other open-source georeferenced datasets on transport and port infrastructures. This enables the measurement of land-use transformations associated with private port development across the basin, distinguishing between industrial expansion, urban growth, and the conversion of natural vegetation. On the qualitative side, an in-depth case study of Barcarena (Pará, Brazil) provides insight into the local socio-spatial dynamics generated by these infrastructures.

Barcarena, located in the Amazon River delta, is emblematic of these transformations. Since the 1980s, the Vila do Conde port has operated as a major hub for bauxite and alumina processing industries. More recently, the city has become a strategic site for grain exports, hosting both an organised port (a public port managed by a state authority but operated under concession agreements by private companies) and several private terminals. Over the last thirty years, cartographic analysis reveals a significant expansion of non-vegetated areas, closely linked to transport corridors and port facilities. Population growth—from 46,000 in 1991 to 125,000 in 2022—has been accompanied by substantial land uptake, with the consolidation of new residential areas between the industrial port and the old urban nucleus of Barcarena Velha, thereby creating a new urban centrality. Additional private terminals to the northwest further extend this process, while in the south, industrial-port activities increasingly articulate with the neighbouring territory of Abaetetuba. These urban-industrial dynamics generate continuous pressure on surrounding forests, wetlands, and vegetated stream banks, and raise concerns about environmental risks (infrastructure security) and urban governance (planning policies favouring practices that are not environmentally sustainable).

By combining basin-wide quantitative analysis with the qualitative examination of a local case, this research demonstrates the active role of transport infrastructures in shaping territorial transformations in Amazonia. It argues that private ports are key drivers of an extended urbanisation process (Schmid & Topalovic 2023) that reconfigures land use, environmental conditions, and social relations far beyond the conventional limits of urban space. This work constitutes a first step towards specifying the spatial tensions and land conflicts emerging between private port infrastructures, urban dynamics, and natural areas. These findings will be further cross-verified during the doctoral research through the analysis of municipal-level urban planning decisions in medium-sized cities of the Amazon.

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