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Publication Date
2026-07-01

Data Availability
Associated data will be made available after this publication is published.

Semi-open data platform for exploring socioenvironmental data alongside ecological data in the context of the AmazonFACE project

Final report

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July 29, 2026

Platform link: https://amazon-eco-use.vercel.app/

This project is an interactive webGIS dashboard built for the AmazonFACE research context and developed as my deliverable of the SEEKCommons Fellowship. Its main goal is to merge ecological field data and socioenvironmental or ethnobotanical knowledge into a single exploratory platform. The core idea is that ecologists often work with tree-level forest data such as abundance, traits, and spatial distribution, but do not always have a way to connect those ecological observations to information about how species matter to people, such as food, medicine, construction, or other uses. This dashboard was designed to make that connection visible and easily explorable.

While the SEEKCommons broader theme is open socioenvironmental data, this project employs the critical nuances developed along the fellowship courses that showed the importance to critically engage with openness rather than assuming that more open is always better. The ecological data used in the dashboard is not yet fully open. It is currently under embargo by the AmazonFACE project because the researchers who produced the data have not yet published their primary analysis. Thus, at this moment, the platform is accessible only to AmazonFACE researchers and selected others.

This restriction responds to a recurring problem in research about the Amazon Forest and other Global South environments: that foreign researchers often use data collected by local researchers and publish about it without adequately recognizing the labor, authorship, institutional conditions, and local expertise that made the data possible. In that sense, the project treats openness as contextual and political. The dashboard is therefore not simply an "open data portal", it is a tool designed to help AmazonFACE researchers themselves benefit from the integration of their ecological data with ethnobotanical knowledge, while also protecting them from premature appropriation of unpublished work, and presenting some of the AmazonFACE's Socioenvironmental Research Group (Task 5) results to the other research groups within the project.

From a data perspective, the dashboard integrates three main layers of information:

1) individual-level ecological observations from AmazonFACE experimental plots, which are tree records with spatial coordinates and attributes such as species identity, genus, family, measured height, diameter at breast height (DBH), and several plant functional traits. The platform works at the level of individual trees, not just species aggregates;

2) species-level ethnobotanical data from two sources:

   i) a dataset created by AmazonFACE researchers Beatriz Tristão and Moara Canova, members of Task 5,

   ii) a dataset based on a study by Coelho et al. (2021) that shows that a very large share of Amazonian arboreal species has registered human use. These sources classify species according to use categories such as food, medicine or medicinal, manufacture, construction, thatching, firewood, and raw material, depending on the source. Species-level references are included so users can see not only that a species has a documented use, but also the references behind that claim; and

3) GBIF and iNaturalist information, including vernacular names and image galleries, to give species more taxonomic and visual context.

The dashboard is designed as an environment for exploratory analysis rather than a static report. The user experience centers on starting broad, filtering the data, and then focusing from species-level patterns to individual trees. The entire interface updates as a coordinated analytical system. The main interface includes a map, a filter panel, a search tool, a plant details drawer, and multiple charts.

Figure 1: The map.

The map (Figure 1) is the main entry point of the dashboard. It displays individual trees spatially across the AmazonFACE experimental plots. Points are visually differentiated according to whether the species has documented use information or no recorded use. Hovering the map provides tree-level or cluster-level details. Clicking a tree opens a detailed plant drawer. The map also supports programmatic navigation: if a user selects a tree from another component, the map can automatically fly to that tree, zoom in closely, scroll the page to the map section, and highlight the selected individual. This lets the map function as both an overview tool and a target of focused interactions.

Above the map, the dashboard presents summary filter statistics. These counts show how many trees and how many unique species are currently visible under the active filters, compared with the full dataset. The stats also distinguish between trees and species with documented use and those without use. This is important because the dashboard is not just filtering a list; it is constantly showing how much of the ecological dataset is being retained and how much of it intersects with socioenvironmental use information.

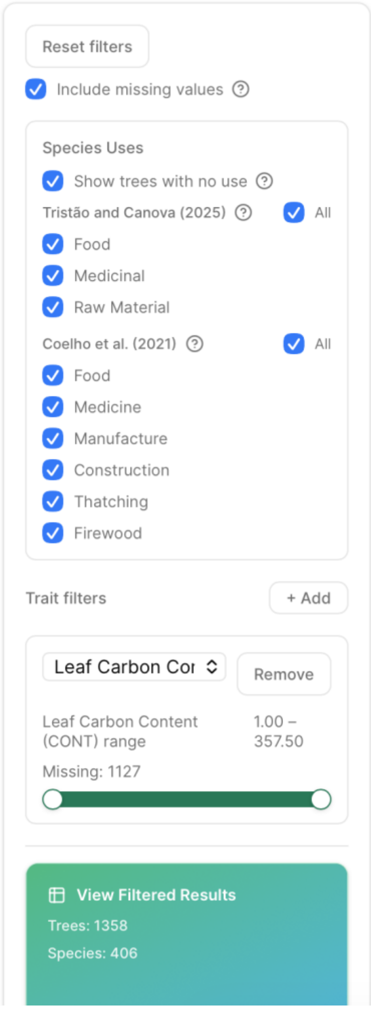

Figure 2: The filter panel.

The filter panel (Figure 2) is the main control surface for analysis. It lets the user filter by use categories and by numeric plant trait ranges. There is also explicit handling of missing data. This is important because the dashboard treats "no use recorded" as analytically significant rather than silently excluding it. The filter panel also includes a button that opens a table containing all currently filtered trees, along with their species, taxonomy, vernacular names, use labels, height, and DBH.

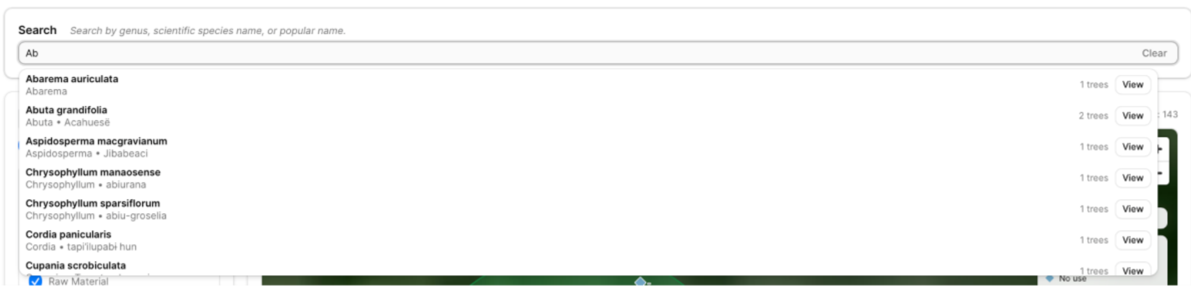

Figure 3: The search by species, family, genus or popular name tool.

A species search tool (Figure 3) supports direct lookup by scientific name, genus, and available popular or vernacular names. Selecting a species highlights it across the interface and also opens or centers on an example tree belonging to that species. This helps users who already have a target species in mind and want to move quickly from name-based search to spatial and analytical inspection.

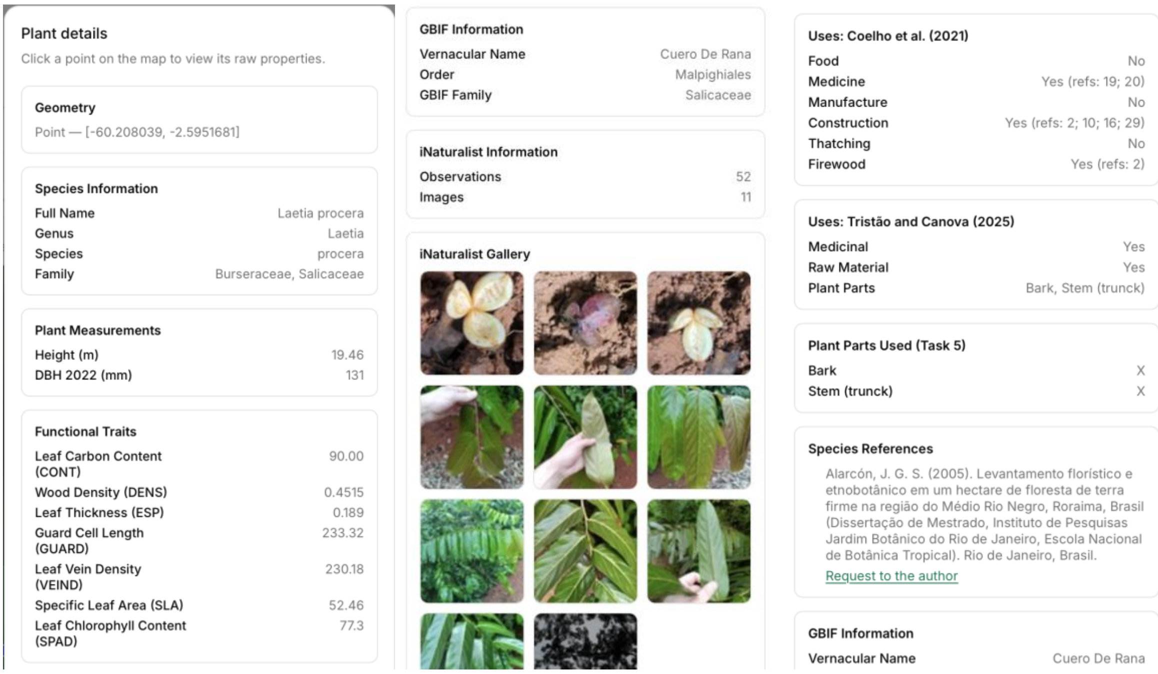

Figure 4: The plant details drawer separated in three sections due to its length.

When a tree is selected from the map or from a table, a drawer opens (Figure 4) with multiple layers of information about that individual and its species. It includes species identity, taxonomy, tree and plot identifiers, coordinates, measured height and DBH, and a set of functional traits such as wood density, SLA, and other ecological variables. It also includes ethnobotanical sections for both the Tristão and Canova dataset, and the Coelho dataset, showing use categories and related references where available. In addition, it can display species-level references from a compiled reference index and an image gallery sourced from iNaturalist. This drawer is where the project's core idea becomes concrete: a tree that might otherwise appear only as a point with measurements becomes both an ecological organism and a species with documented social value, cultural use, and visual identity.

The dashboard also includes a series of charts that reveal different kinds of patterns in the filtered dataset.

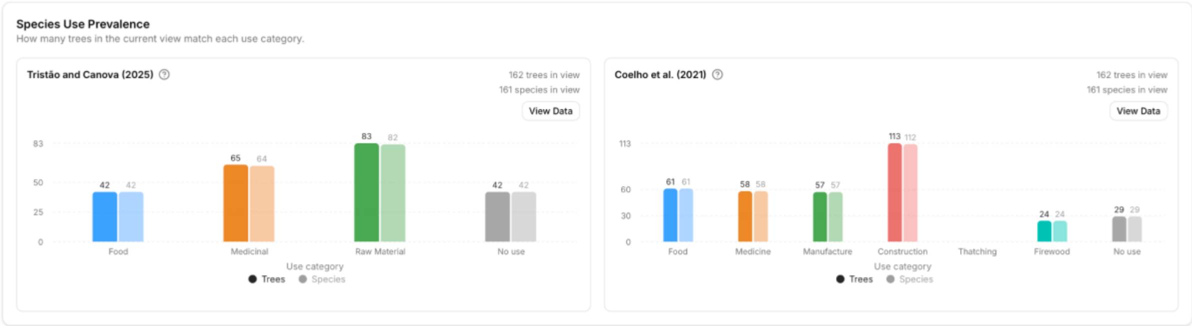

Figure 5: Species use prevalence chart.

The species use prevalence chart (Figure 5) summarizes how many trees in the current filtered view fall into different use categories. This gives a quick overview of how use information is distributed across the currently selected subset of the forest.

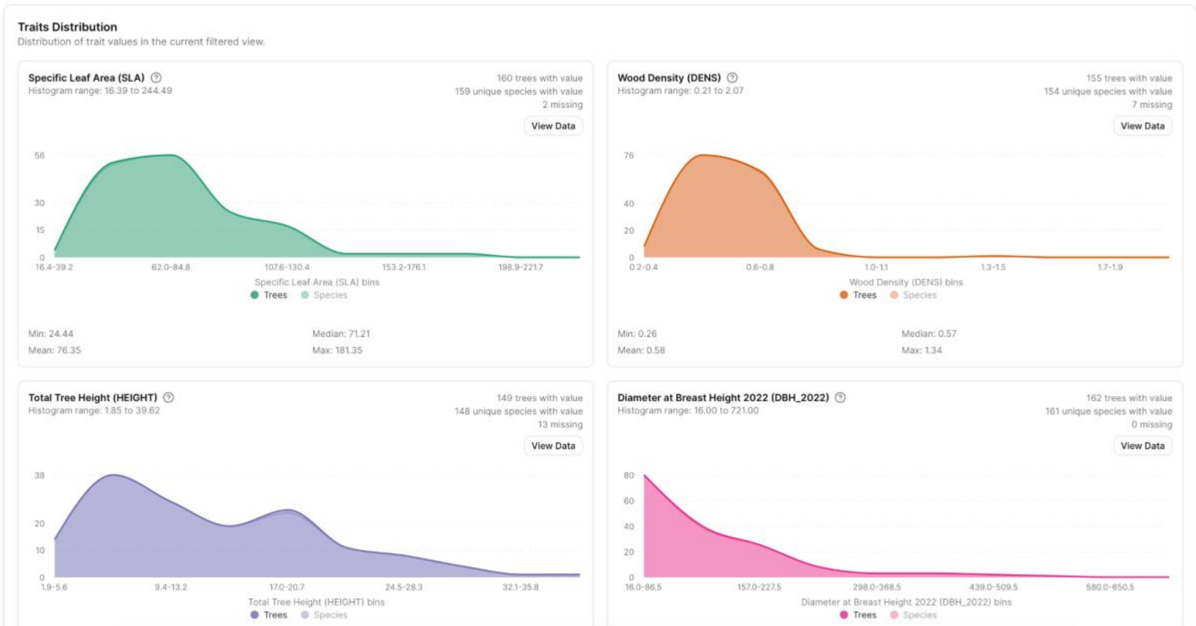

Figure 6: Trait distribution over plant population charts.

Another group of charts explores trait distributions (Figure 6) of the filtered plants over the total population. This is a traditional plant ecology chart used to make sense of a population of trees.

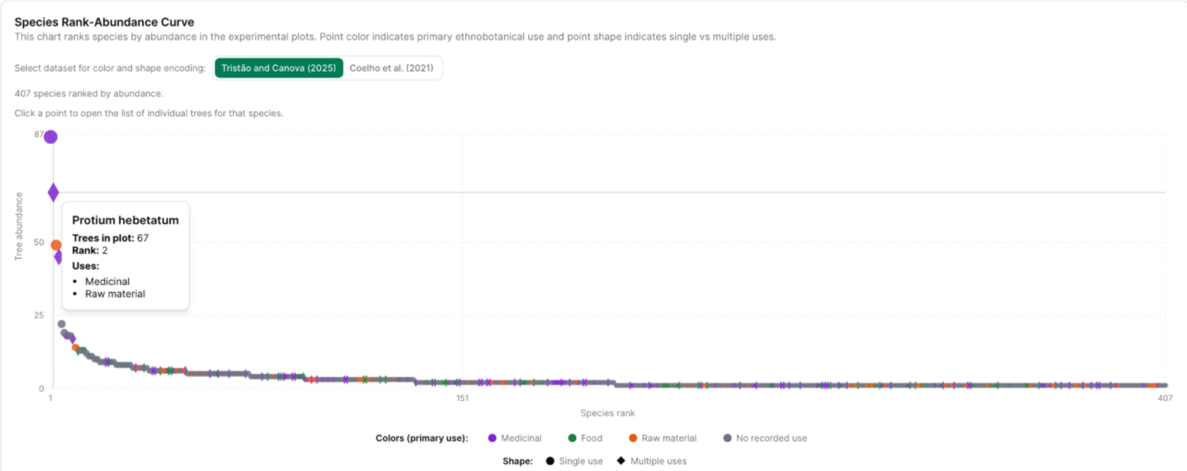

Figure 7: Species rank-abundance curve

The species rank-abundance curve chart (Figure 7) ranks species by how many individual trees occur in the currently filtered view. Users can switch between the Tristão and Canova dataset and the Coelho dataset as the source for use encoding. In the chart, point color indicates a species' primary use category, while point shape distinguishes between species with a single recorded use and those with multiple uses. Clicking a point opens a table of the individual trees belonging to that species. In that table, plant IDs can be clicked to open the full plant details drawer for a specific tree. This chart is especially useful because it links ecological prominence to human-use information: users can see which abundant species are also documented as useful, and which abundant species have no recorded use.

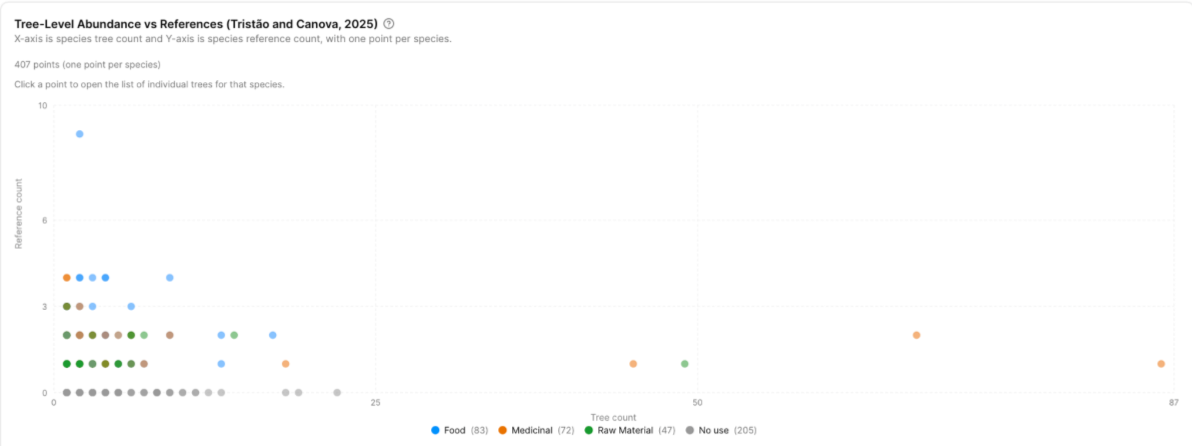

Figure 8: Trait-level abundance vs References from Tristão and Canova.

Another visualization is the scatter plot comparing tree abundance and bibliographic reference count at the species level (Figure 8). In this chart, each point is a species. The x-axis represents how many trees of that species appear in the filtered data, and the y-axis represents how many references are associated with that species. Point color reflects the use category. This chart helps users identify mismatches between ecological abundance and research. For example, a species may be abundant in the forest but relatively under-documented in the use literature, or the opposite.

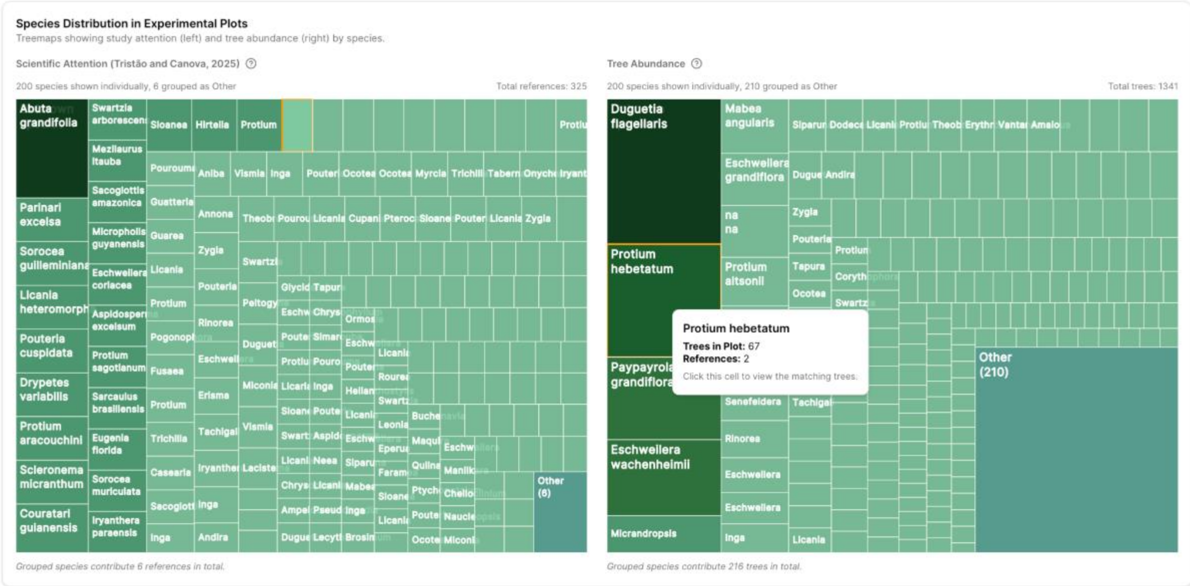

Figure 9: Linked scientific attention and species abundance chart.

The dashboard also includes two linked treemap charts (Figure 9). One treemap represents species by scientific attention, calculated through reference counts and scores. The other represents species by tree abundance in the filtered data. Hovering a species in one treemap highlights the same species in the other, helping users compare ecological prominence and literature attention side by side. Clicking a treemap cell opens a table of the trees for that species, including their IDs, taxonomy, Tristão and Canova uses and references, webpage information, height, and DBH. From that table, clicking a plant ID opens the plant details drawer.

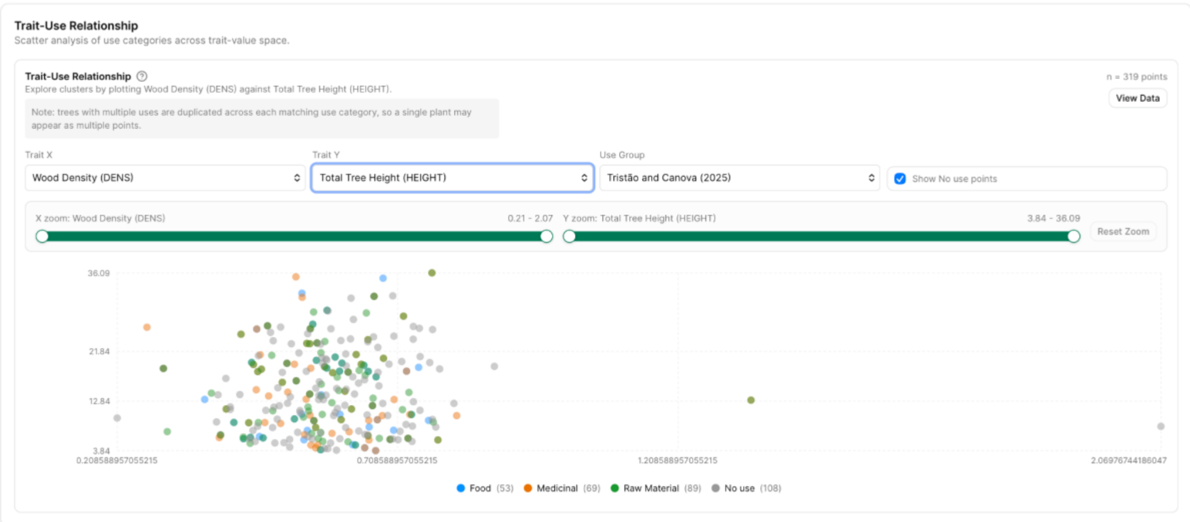

Figure 10: Dynamic trait x trait x use scatter plot.

The last chart presents a dynamic scatter plot chart (Figure 10) where the user can select any two plant traits and use categories from Tristão and Canova or Coelho to visualize how these three variables relate to each other. Through this exploratory analysis, researchers can evaluate whether wood-use species tend to be taller with denser wood, or if medicinal species are typically shorter, for example. This chart subverts the usual plant trait plot used by ecologists to study the relation between two traits and adds a third dimension, the registered use.

One important architectural feature of the dashboard is that all these views are synchronized, filters affect the map, summary stats, charts, tables, etc. The dashboard state is also encoded in the URL, including filters, selected species, and related view settings. This way an analytical view can be shared with collaborators simply by sharing the link, allowing other users in the AmazonFACE research groups to land on the same configured filter.

From a design and research perspective, the dashboard does not intend to be an exhaustive biodiversity visualization tool, but a tool to invite ecologists to ask not only which species are abundant, spatially clustered, or trait-dominant, but also which species are culturally relevant, materially useful, documented in ethnobotanical literature, or mostly absent from such literature. It suggests that "species value for people" can be something that can be analyzed in relation to ecological data rather than as a separate domain.

At the same time, the project's politics are on par to its functionality. The dashboard uses a model of semi-openness. It uses embargoed data within a bounded research community to give the researchers who produced the data the first opportunity to explore the socioenvironmental meaning of their own dataset. As noted above, this is particularly important in the Amazonian and other Global South socioenvironmental research contexts, where data circulation is entangled with the unequal power relations of global science. The platform thus is a practical exercise of how open socioenvironmental data can be approached critically, not as immediate public release in all cases, but as a process shaped by questions of recognition, timing, authorship and ownership.

On the technical side, the application is a modern webGIS app built with Next.js, React, TypeScript, Tailwind CSS, and shadcn/ui components. It uses Recharts for data visualizations and react-map-gl with MapLibre for the interactive map. It uses only open-source technologies. The platform includes a login-based access gate and protected routes, reflecting the current restricted-access phase.

Acknowledgements

I would like to acknowledge the researchers from the Socioenvironmental Area from the AmazonFACE for their interdisciplinary disposition. I would also like to acknowledge the NSF SEEKCommons Project for making this project possible and Gerd Heber for his always encouraging mentorship.