



Cross analysis of Strava Metro Data and bikeways in Rio de Janeiro

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Introduction

State of the art of studies carried out in RJ



Several works and studies were carried out on cyclists and cycling infrastructure in the city of Rio de Janeiro.

One of the most advanced studies on the subject, the CicloRio bikeways expansion plan, carried out in 2022 (available here) was based on several data sources to study these characteristics:

- Analysis of current cycling infrastructure
- Shared Bicycle System (BikeRio | ItaúBike)
- Analysis of traffic accidents
- Surveys carried out in person and online

To our knowledge, statistics based on cyclist counts have not been used.



Cyclist counts and Strava data



Volume of bicycle trips is generally difficult to obtain, as it requires installation of counting material or visual counting sessions. Furthermore, even when such data is available, it may not present the spatial and temporal detail necessary for analysis across the entire city and over time.

In Rio de Janeiro, we are not aware of the existence of automatic meters. However, several cyclist counting sessions were carried out by the Transporte Ativo association.

Data collected by smartphone applications appears as a new source of data for analyzing cyclist traffic in cities. UCB's partnership with Strava Metro, which provides cycling travel data collected from the Strava app, could be an opportunity to add new analyzes to the work already done.



Goals of this study

This study is the first carried out by the Strava Metro Data Analysis Committee of UCB – União de Ciclistas do Brasil with data from Strava Metro in Rio de Janeiro. It has the following goals:

1. Analyze Strava Metro data in Rio de Janeiro and assess relevance for studies and decision-making
2. If possible, produce content and maps that can be used by cyclist mobility actors in Rio de Janeiro and that can contribute to future studies
3. Show how Strava data can be used as a new source of information in studies and decision-making in Brazilian cities, encouraging its use in other cities and other contexts.
4. Stimulate the cycling community in Rio de Janeiro with this new source of data, collect demands for new possible analyzes (correlation with counts, preliminary design for installation of counting solutions, evaluation of current infrastructure, impact evaluation of new infrastructure, ...)



Strava data analysis



Global statistics: number of trips



Bike trips recorded in the app:

- In the state of Rio de Janeiro: ~2M trips in 2023
- In the city of Rio de Janeiro: ~700k trips in 2023

This value would represent a little less than 1% of total trips (the latest PDTU and Origin and Destination surveys allowed us to estimate an order of magnitude of 50 to 200 million trips by bicycle per year in the city of Rio (CicloRio))

Note: to confirm the representativeness of trips recorded on Strava, it would be convenient to carry out a comparative study with cyclist counts (carried out by meters or people on site), as has already been done in other cities. It could be carried out in a future study, for example using data made available by Transporte Ativo.



Global statistics: types of trips

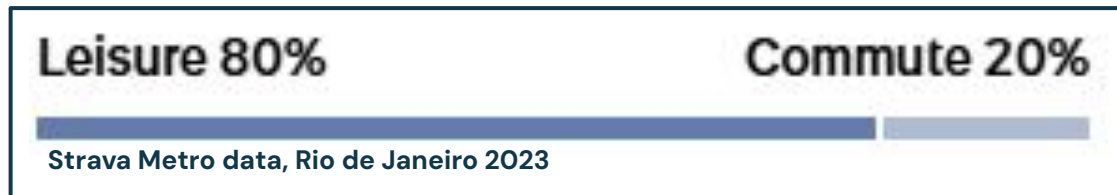


The Strava Metro platform includes a differentiation of trips into two distinct types, identified by the user in the application or by trip characteristics:

- “Commute” trips
- “Leisure” trips

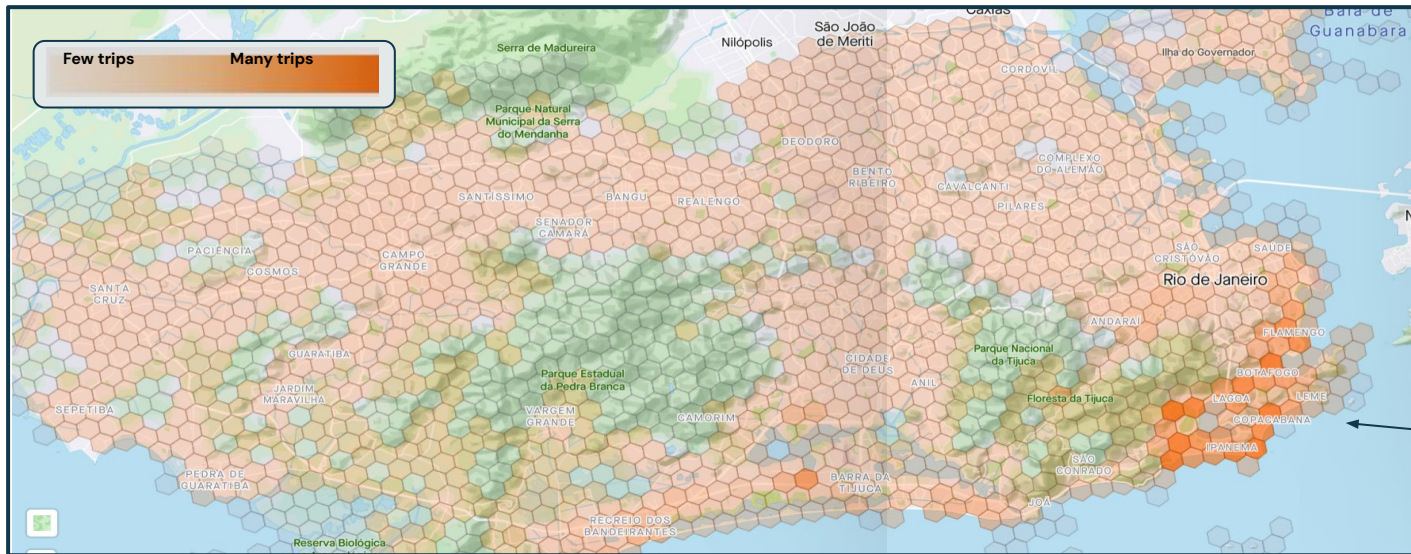
We note that errors can occur in the identification process (either by the user or by the Strava app), which can cause “leisure” trips to be identified as “commutes” (see this article)

Strava data shows 80% of “Leisure” type trips, consistent with what was identified in the literature (source). In the following analysis, we will first work with all trips, and then only with “commute” trips.



Trip location [1/2]

Trip start location, Strava Metro, 2023



The entire area of the city of RJ was divided into a little more than 1000 standard units for analysis, and we observed how many trips were initiated in each of the units

South Zone of RJ, concentrating the highest travel densities

Trip location [2/2]



Observations:

- Most trips start in units corresponding to neighborhoods in the South Zone (Flamengo, Botafogo, Lagoa, Copacabana, Ipanema, Leblon, Gávea)
- Of the 1000 standard units in the city, the 20 units with the most trips (all located in the South Zone) account for 30% of all trips in the city
- However, we observed trips in almost the entire urban area of the city of Rio de Janeiro (South Zone, West Zone, North Zone, Center).

Interpretations:

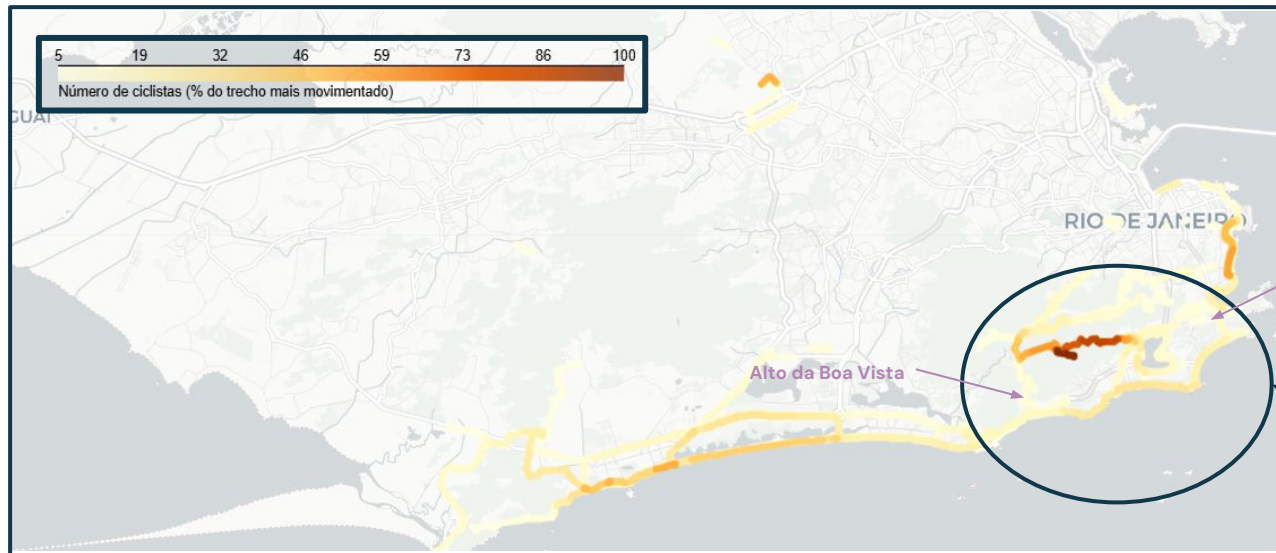
- Being a denser area with more tourist attractions, the South Zone has reasons to concentrate the largest number of trips in the city
- There may also be a selection bias in the data (residents of the South Zone may be more likely to use the Strava app, for socioeconomic reasons)



Most used roads [1/2]



Sections with the most trips per month (sections > 5% of the most used section)



South Zone of RJ, concentrating the highest travel densities, especially in tourist areas (Aterro do Flamengo, beaches, lagoon, Alto da Boa Vista)



Most used roads [2/2]



Observations:

- The most used sections are located in the South Zone, mainly in Flamengo along the Atterro park, on the seashores, in Alto da Boa Vista (a steep road often used by cyclists in training), as well as in the Deodoro park in the North Zone.

Interpretations:

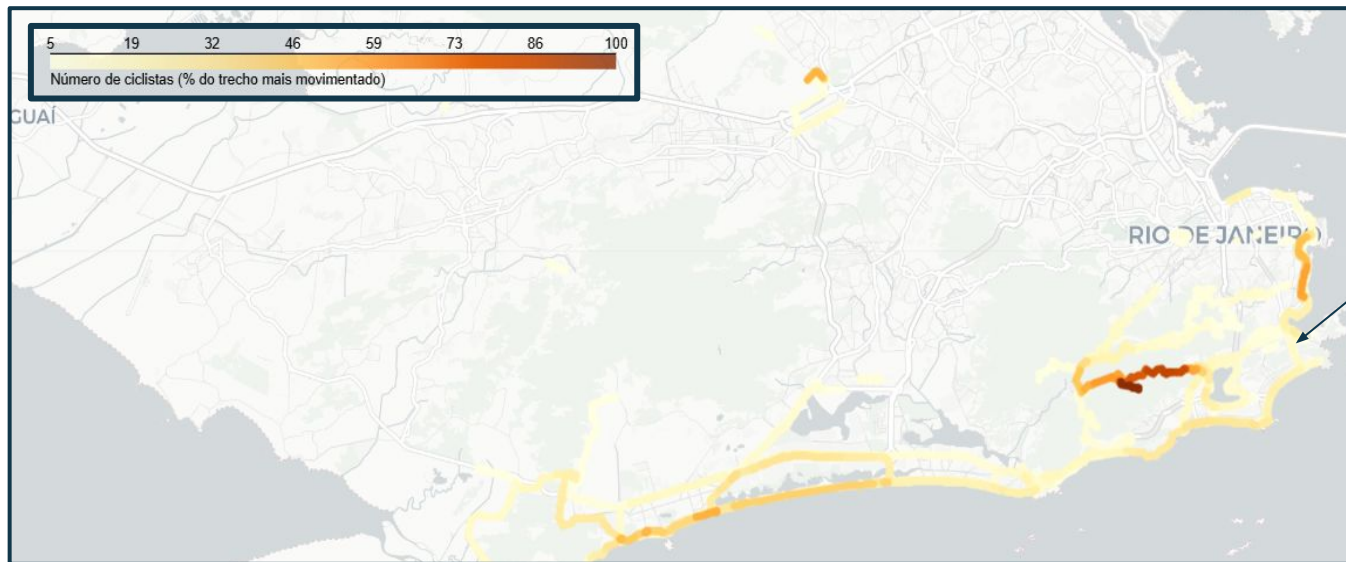
- The sections with the highest statistics correspond to the sections most used by sports or leisure cyclists (corresponding to “leisure” type trips), and do not correspond to the most important sections for commutes
- We will now use Strava’s “leisure” / “commute” separation and perform the same work considering only “commute” trips.



Most used roads (“commutes” only) [1/4]



Sections (“commute” trips only) that contain the most trips per month (sections > 5% of the most used section)



The South Zone of RJ also has the highest concentration of commute trips

However, there are “commute” trips throughout the municipality.



Most used roads (“commutes” only) [2/4]



Observations:

- There is a high density of “commute” trips on the seashores and the lagoon.
- Cyclist training areas (such as Alto da Boa Vista) still show a significant density, but much lower than on the previous map with all trips
- There are also roads with a lot of trips in the Center and in the North and West zones, on roads that are not known as tourist places.



Most used roads (“commutes” only) [3/4]



Interpretations:

- The seashores and the lagoon have good quality bikeways. It is possible that these bikeways are more used by cyclists when they travel (including when they represent a slightly longer itinerary), because they are more pleasant and safe
- It is also possible that the separation of trips between “leisure” and “commute” is not carried out perfectly by Strava. A portion of the trips identified as “commute” may actually correspond to leisure trips, explaining medium/high densities, specifically in Alto da Boa Vista, and elsewhere



Most used roads (“commutes” only) [4/4]

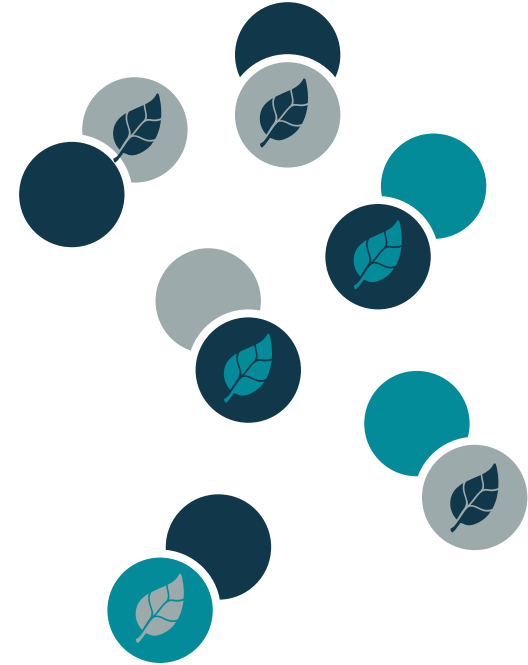


Conclusions:

- We concluded that this second map better represents the most used roads for “commute” type trips (although it may still have an influence from leisure cycling, especially along the beaches and the lagoon), and can be used for detailed analysis
- The highest concentration of trips is observed in tourist places in the South Zone, highlighting the need for good infrastructure in this region
- The North and West zones and the Center have a large number of “commute” trips (despite their trip density being lower than in the South Zone), also highlighting a high demand for infrastructure in these regions
- In the end, it is clear that all areas of the municipality have high numbers of “commute” trips, and that each one must be considered when planning cycling infrastructure.
- The next part of this study will focus on comparing this demand with existing infrastructure

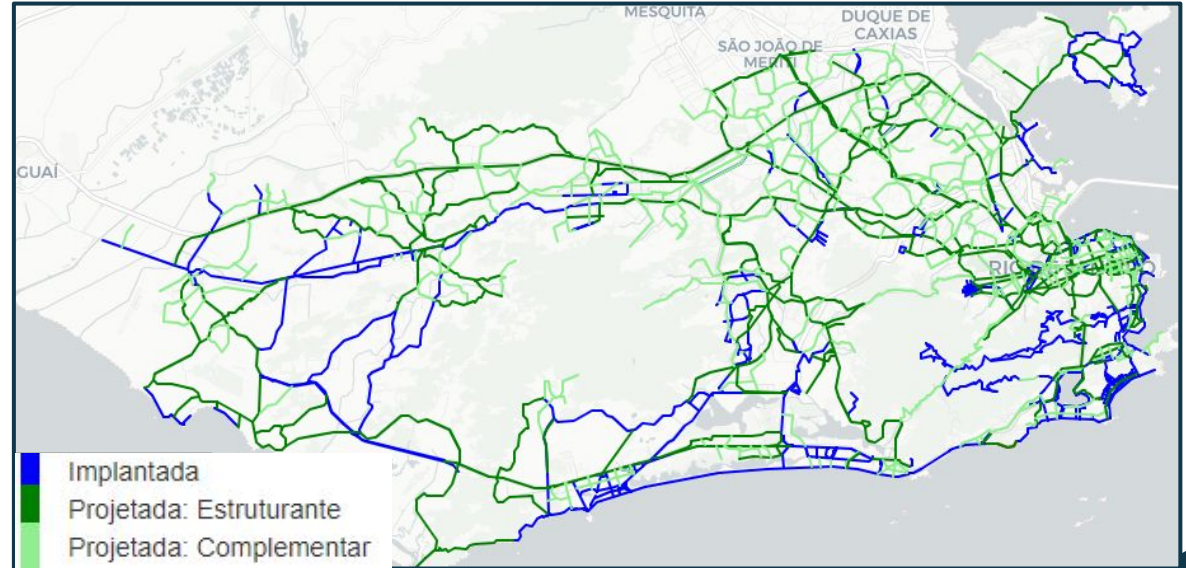


Cross analysis: Strava vs bikeways



Bikeways data

- All information on existing bikeways in Rio has already been gathered in the preparation of the CicloRio bikeways expansion plan
- For our cross-analysis with Strava data, the files were retrieved from the Rio de Janeiro Open Data platform

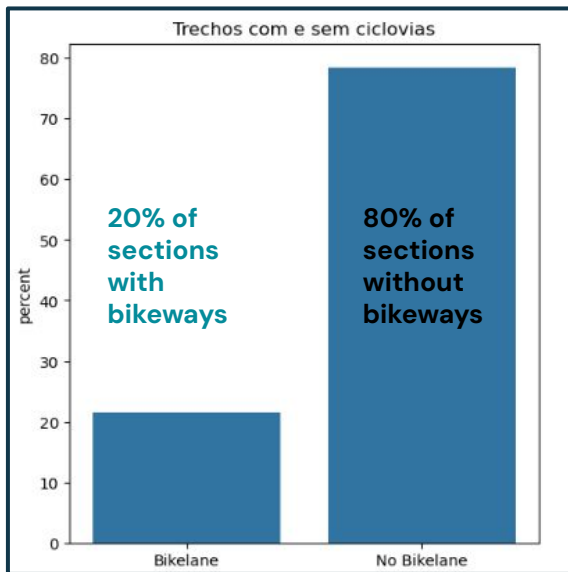


Bikeways usage statistics

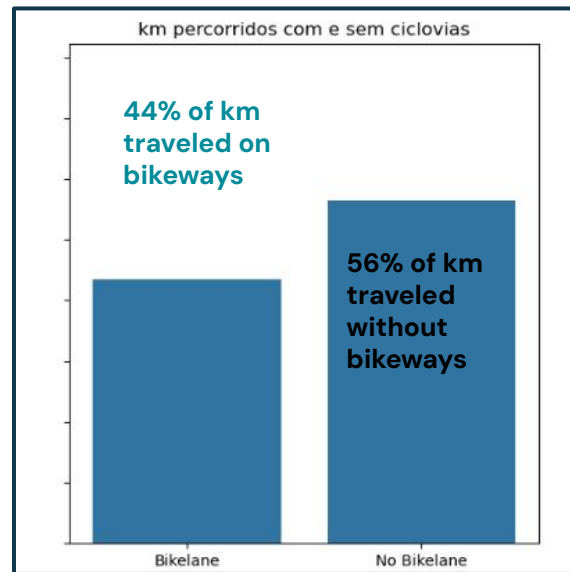
(“commutes” only)

For all Strava sections analyzed, we observed that only 20% have bikeways. This corresponds to the reality in Rio, where most roads do not have integrated bikeways.

However, the number of km traveled on bikeways is almost equal to the number of km traveled without bikeways: cyclists tend to use more bikeways than roads without bikeways



Analysis carried out with data downloaded from the Strava Metro platform and bikeways, Rio de Janeiro 2023

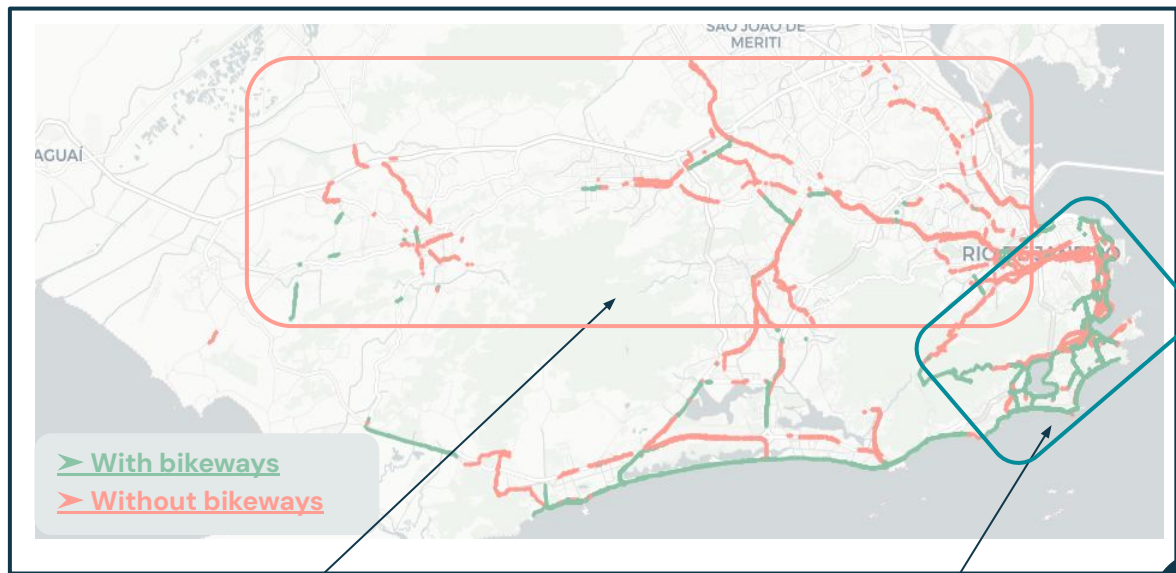


Trips ↔ bikeways [1/2]

Combining the map of the most used roads for “commute” trips (already computed before) and the map of existing bikeways, we can differentiate:

- the most used sections that have bikeways
- the most used sections that do not have bikeways

Sections (“commute” trips) with the most trips per month (sections > 5% of the most used section), with and without bikeways



North and West zones with several heavily used sections without bikeways

South and Center Zone with several used sections and bikeways, but important sections are missing to have an integrated network

Trips ↔ bikeways [2/2]



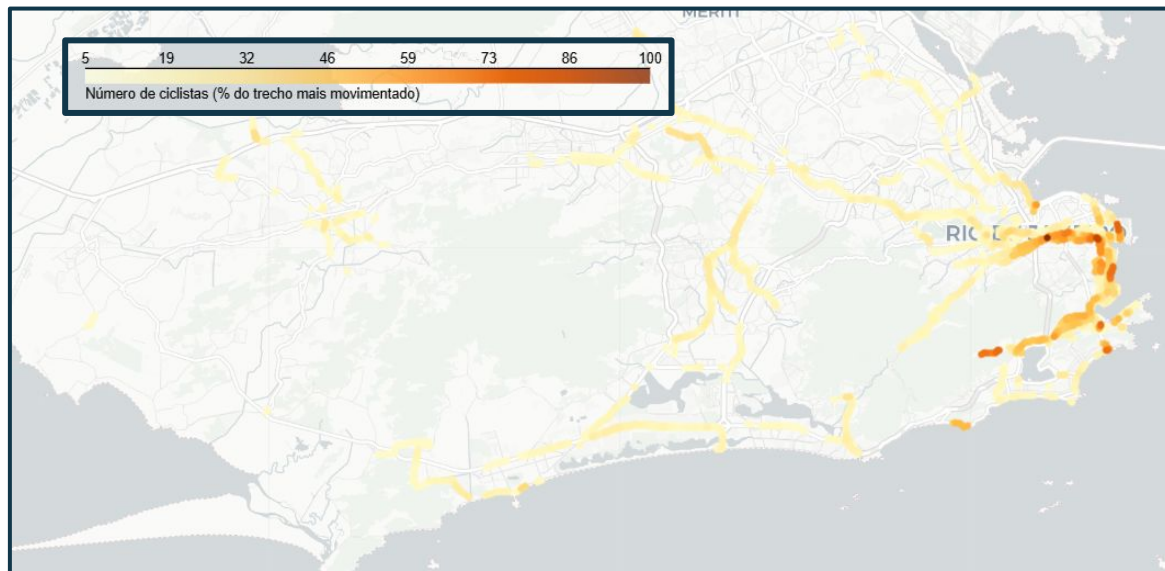
- Observations:
- Observations vary according to geographic zone
- Center, South Zone and Barra da Tijuca / Recreio region:
 - These neighborhoods concentrate many of the most used sections and also many of the bikeways
 - A large part of the most used sections (as “commute”) by Strava users coincide with existing bikeways
 - However, there are several junctions missing to have an integrated network: Humaitá–Botafogo junction, Flamengo–Catete, Glória–Lapa–Estacio–Tijuca, ...
- North and West Zones:
 - Although there are bikeways in these areas, most of the most used sections do not have bikeways, among others:
 - the junction Centro – Maracanã–Méier–Madureira–Deodoro
 - the Madureira–Jacarepaguá junction
 - the Campo Grande area



Sections without bikeways [1/2]

For a detailed analysis of sections without bikeways, we also created a map showing only the sections without bikeways, with a different color depending on the number of trips

Sections (“commute” trips) with the most trips per month (sections > 5% of the most used section), without bikeways and ordered by number of trips



Sections without bikeways [2/2]



Observations:

- The sections without bikeways most used by Strava users (“commute” type trips) are concentrated:
 - in the South Zone, at previously identified missing junctions
 - in the Center
 - At the Centro–Tijuca junction
 - In some specific points in the North and West zones



Conclusions



Conclusions [1/2]

- The data provided by Strava show very interesting information about cycling trips in Rio de Janeiro. Cross-analysed with data from existing bikeways, they made it possible to create maps showing the most used sections with and without bikeways.
- These maps suffer from some limitations (representativeness of Strava users' trips compared to all cyclists in Rio, separation of "leisure" and "commute" trips, ...), and consequently, it is not recommended to use them as the only source of information to determine Rio de Janeiro's bikeways expansion policy
- However, they can be used to complete and support work already carried out with other data sources, for example the CicloRio plan



Conclusions [2/2]

- More specifically, these maps can be used to:
 - Show the large number of cyclists riding in sections where there is no counting data, and justify the installation of biking infrastructure
 - Support the extension plan, showing that the planned projects correspond to heavily used sections, or draw attention to inconsistencies, contributing to improving some details of the plan
 - Prioritize extension works for the most frequented sections, allowing quick results
- New questions or ideas for studies using this data may also emerge from this work.
- UCB makes this document available, as well as maps in HTML format (allowing better interactivity), hoping that the cycling community in Rio de Janeiro can use them for more elaborate analysis or future studies.

[Click here to download the maps](#)



Who are we?



UCB – União de Ciclistas do Brasil is a civil society organization that brings together Cyclists' Associations, cyclists and other entities and people interested in promoting the use of bicycles as a means of transport, leisure and sport, in urban and rural regions, as well as sustainable mobility.



A UCB initiative, the Bicycle Observatory is a reference center for information, monitoring public policies and civil society experiences on bicycles as a means of mobility in Brazil.



Nathan Blassel works as a consultant and data analyst in the energy and mobility sector. He has worked on several projects in Brazil and Europe. He is part of the UCB Strava Metro Data Analysis Committee.



Strava Metro cooperates with public entities to improve infrastructure for cyclists and pedestrians, providing useful data, both for planning and building new infrastructure and for measuring impact and behavior change after a project is completed.

- This article was produced by Nathan Blassel within the scope of the Strava Metro Data Analysis Committee of UCB - União de Ciclistas do Brasil and originally published on 07/01/2025 on ObservaBici
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