

La  
Aguacatala  
transport hub  
in Medellin

P a b l o P e l a e z  
P e r e z

2022/2024  
Diploma project  
Czech Technical University in  
Prague

STUDIO ACHTEN - PAVLIČEK

FA



## **DIPLOMA PROJECT**

Studio Achten - Pavliček

LS 2023/2024

Advisor:

Achten Henri H, Prof. Dr. & Pavliček Jiří,

Ing. Arch., Ph.D.



**FACULTY  
OF ARCHITECTURE  
CTU IN PRAGUE**

A challenge for sure, but a welcome one.

# CONTENTS

## Triggering events | p7-14

The introduction of new transportation methods to the Aburra Valley are changing the conditions, requiring additional infrastructure to accommodate these changes.

## Creating a hub | p15-32

Examining the connections and particular conditions of the means of transportation that will interact in the transportation hub.

## Site analysis | p33-43

Identifying the current state and projected expansion of the site's periphery.

## study cases | p44-51

Project influences and examples where solutions are applicable to the developing project.

## Project proposal | p52-72

Architectural design and how it interacts with the immediate urban panorama.

## References | p73

## Declaration of Diploma | p74





TRIGGERING EVENTS

01

# TRIGGERING EVENTS

## NEW MEANS OF TRANSPORT ARE COMPLEMENTING THE EXISTING INFRASTRUCTURE

Medellin, is the second biggest city in the Colombia with a population of over 3.5 million, Located in the middle of the Andes Mountain chain, Medellin serves as the main population center of the greater Aburra Valley Metropolitan area, an administrative organization composed of several municipalities which put their resources together to guide the urban development of the area, currently the upcoming river train and the light metro are bound to revolutionize the urban paradigm once again.

The transformation of Medellin since the late 1980s is a remarkable journey from a city plagued by violence and drug-related crime to a model for urban innovation and general development. In the late 1980s and early 1990s, it gained international notoriety for being one of the most dangerous cities in the world, due to the activities of drug cartels and armed conflicts.

However, beginning in the late 1990s, Medellin embarked on a transformative path to change the turbid reality the city had. Local leaders and residents worked together to implement comprehensive social and urban development initiatives. One key aspect of this transformation was the investment in education and cultural programs. The construction of innovative public spaces, libraries, and educational institutions aimed to create opportunities for learning and better community engagement.

The implementation of the Medellin Metro system, starting in 1995, played a pivotal role in fostering social integration and economic development. By connecting different neighborhoods and supplying reliable transportation options, the metro became a catalyst for positive change. The development of cable car systems, such as the Metrocable, further enhanced accessibility to previously marginalized areas in the hills surrounding the city, fostering social inclusion, and breaking down socio-economic barriers.

Nowadays the city fosters several social and cultural events of national and international renown as the Festival of Flowers and the Lights Festival, which celebrate the city's cultural heritage and memory. The transformation of Medellin serves as an example of how a city can overcome adversity through innovative urban planning, community engagement, and a collective commitment to building a brighter future. Today, Medellin stands as a testament to resilience and progress, attracting attention for its positive turnaround and serving as an inspiration for conscious urban development.





## **MEDELLIN, COLOMBIA**

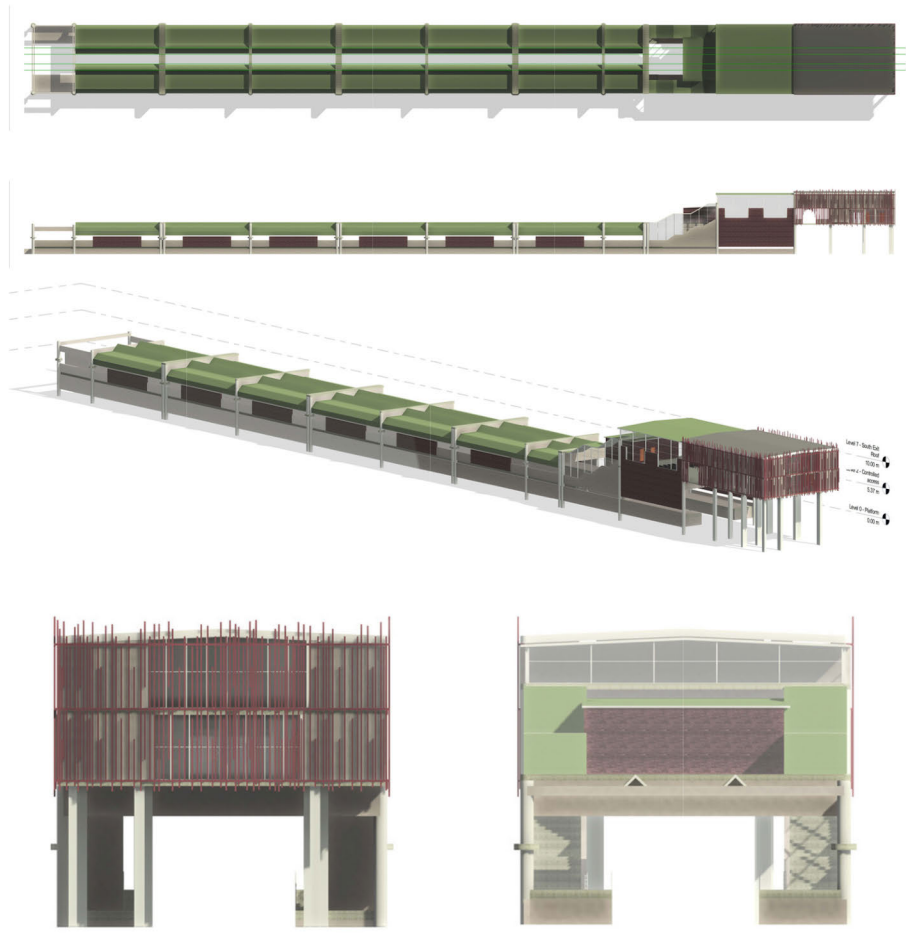
### LOCATION IMPORTANCE

La Aguacatala station is one of the main nodes of the upcoming river train and its integration with the existing metro system, not only will it connect the river train system to the metro line A but it will create a transport hub as the upcoming light metro of the 80th av connects nearby and future plans for both the urban system of articulated buses, Metroplus, will be expanded to take passengers to this new site.

Through current state analysis it can be concluded that the existing layout typology used by the station does not suit itself to efficient expansion and user comfort, plus it does not make efficient use of the narrow area available for the project, this will be further explored on the project explanation.

The station nowadays does not possess the necessary physical infrastructure to handle the expected user load nor spatial connections to address the urban challenges presented by the development of this transport hub, because of this we find necessary to develop a proposal for a new railway station which allows for system integration, more efficient user transfer and better suited urban growth for the area, all this in order to strengthen social connections and combating the existing physical challenges present.

# CURRENT CONDITIONS



Current conditions for the station, authors work.



Daoss, Aguacatala station from the highway



Project location, author scheme.

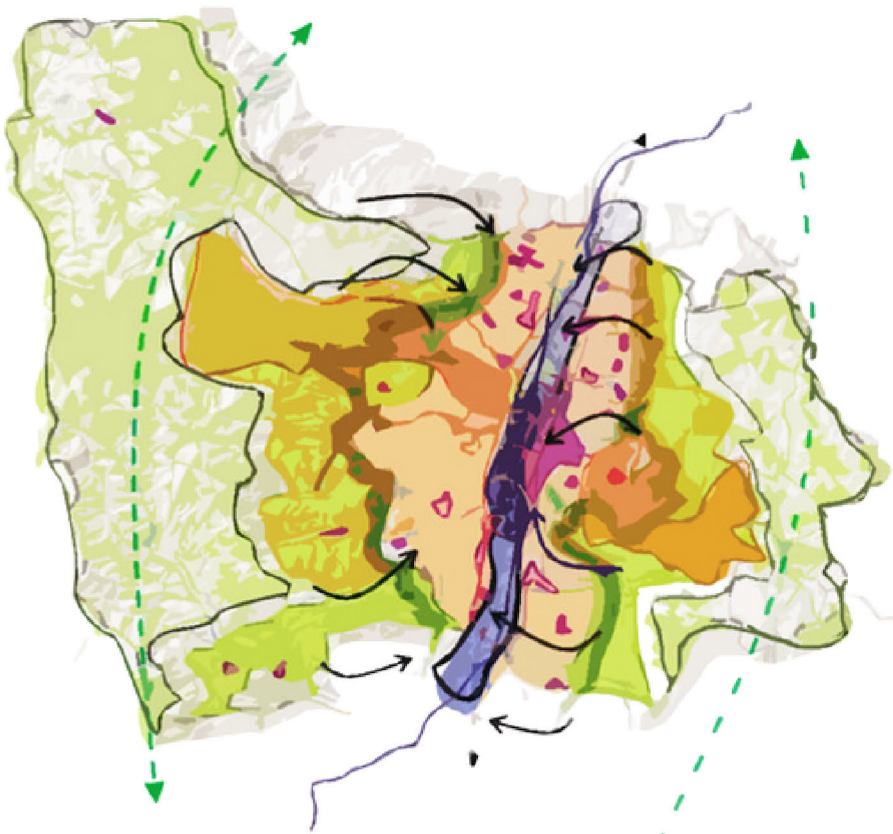
## RELEVANT CONNECTIONS

### TERRITORIAL PLANNING TOOLS AND CONCERNING LAWS IN MEDELLIN, COLOMBIA:

The concerning law frame for the project include all the corresponding building codes such as the NSR-10, the Formulario Unico Nacional (FUN) to be granted a building permit and relevant documents such as the Public Space Design Manual from the city of Medellín which will determine certain characteristics of the projects design.

The Plan de Ordenamiento Territorial (POT) is the main urban planning tool in any city in Colombia, revised every certain year it defines the main guidance for building projects in the city and where the urban development is heading.

The current POT dates from 1999 and can be summed up as "growing to the inside" which aims at creating a more compact city, reducing distances, a healthy mix of diverse uses, renewing the city center into a more attractive area and pushing back against the unplanned informal expansions present at the hillsides while focusing on attracting people towards the main mass transport infrastructure along the Aburra River to ease the ever-growing traffic and create better live quality for everyone involved.



Territory ordinance plan for Medellín 2014-2027 (2014)



Territory ordinance plan (2014), Scheme showing how the POT purposed public space guidelines align with the principles of growing towards the inside.

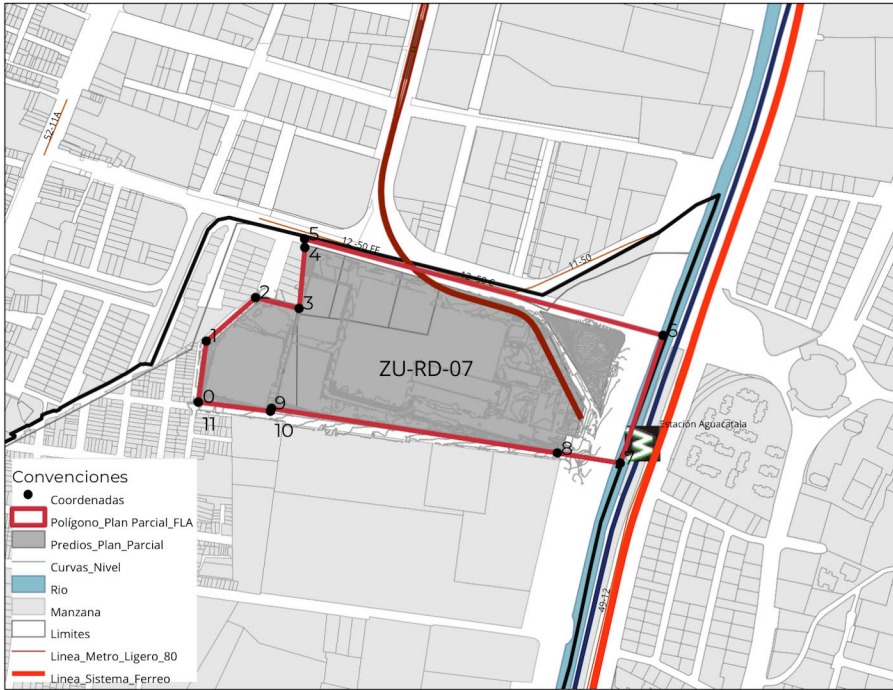
The role of the POT throughout the years of urban renewal the city has undertaken in the last 25 years is fundamental to the 180 degrees turnaround it has had, allowing for better public space infrastructure with initiatives like Library parks, Cable car public transport lines to previously unreachable neighborhoods, development of urban scale infrastructure such as the planetary, Ruta N and recreational tactical developments around the city.

The POT has fourteen areas and principles in which it focuses on[1]:

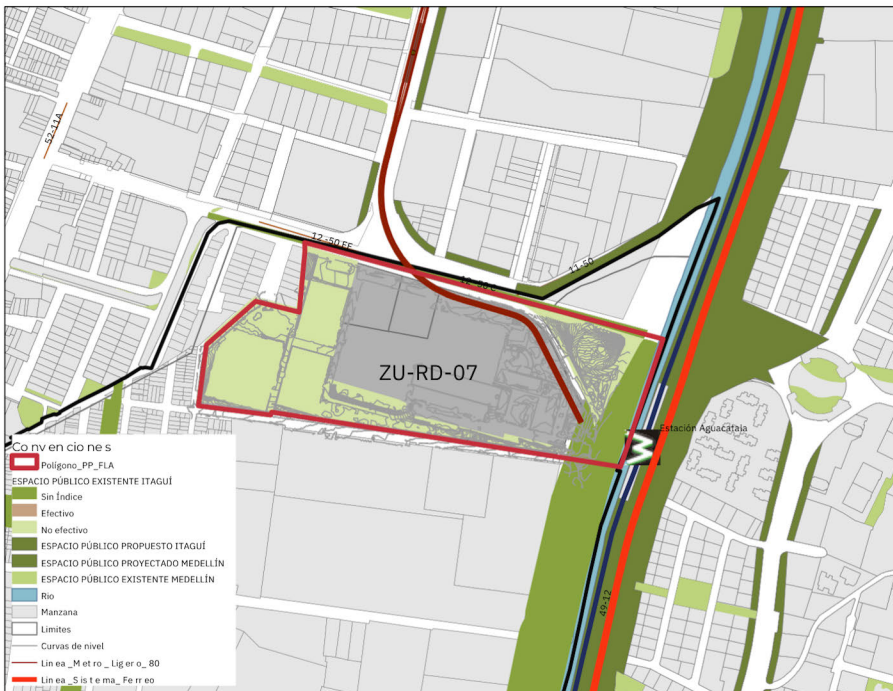
- Articulating regional and metropolitan territories.
- A compact city which grows towards the inside and promotes coexistence.
- Limiting peripheral uncontrolled urban growth.
- Ecological structure and inherent risk management.
- Protection and renewal of rural land.
- Protection and revitalization of the city center as a metropolitan centrality.
- Promoting economic development and competitiveness through the territorial model.
- Sustainable transport infrastructure.
- Public Space.
- Urban system of centralities.
- Habitat and housing policies.
- Management and financing instruments.
- Institutional adjustments for better territorial control.
- Participatory management.

The POT functions as the main guideline for any project to be developed in the city and all its principles should be kept in mind, as transport infrastructure is fundamental to urban growth and economic development the expansion of the Metro system and the creation of a transport HUB in the Aguacatala station is coherent with these values and principles as the expansion of public infrastructure such as schools, universities, mixture of uses and encouraging higher housing density along the Aburra river help at making this area of the city more appealing to users and developers.

Thanks to this guideline and law frame a specific polygon was delimited and named **ZU-ED-07**, corresponding to the land currently occupied by the Antioquia Liquor Factory (FLA), expected to be utilized for future urban growth and development.



Information forwarded thanks to collaboration with Metro of Medellín.  
 Polygon delimitation and railway lines relevant to it.



Information forwarded thanks to collaboration with Metro of Medellín.  
 Polygon delimitation and public space delimitation relevant to it.



CREATING A HUB

02

# CREATING A TRANSPORT HUB

## SPECIFIC CHARACTERISTICS OF A HUB

A multimodal transportation center is a type of building complex in which several transportation modes are present, and passengers are to go from one to the other. They are articulated around heavy railway lines and lesser user-capacity modes of transportation orbit around this. Some other modes of transportation present are:

- Commuter trains
- Metro
- Tram
- Cable car systems
- Pedestrian access
- Bicycle lanes.

The creation of such a building complex makes it easier for commuters to use multiple modes of transportation.

Multimodal transportation centers attract users through design elements such as[1]:

- Shops and restaurants.
- Adequate and attractive walkways, bike facilities, and vehicle access and parking.
- Appropriate bus facilities.
- Accessible platform areas for rail lines.

In our case the Aguacatala station will become the connection point between the existing metro line, the currently under construction 80th avenue Light Metro system, the existing feeder bus routes and the future proximity railway, sum to this the existing highway system that runs along the site, the need for more bicycle lines and the possibility of expansion for the tram lines along the Poblado Av, and we have a highly relevant and demanding project in our hands.

[1] TRPC (2016)

## RELEVANCE OF CONNECTING TRANSPORTATION SYSTEMS:

La Aguacatala Station will become the connecting point for the existing metro system, the currently under construction Light train System of 80th avenue and the planned interurban train system on its first stage, becoming a transport hub for multiple transport systems in the city of Medellin.

Because of this, a relevant project to be developed is updating the existing Aguacatala Station to fulfill the future demands of the upgraded multimodal transport system.





Schematic plan for the current layout of the Metro of Medellín.

# FUTURE AHEAD

## PLANNED RELEVANT TRANSPORT INFRASTRUCTURE

### **80TH Avenue Light Metro System**

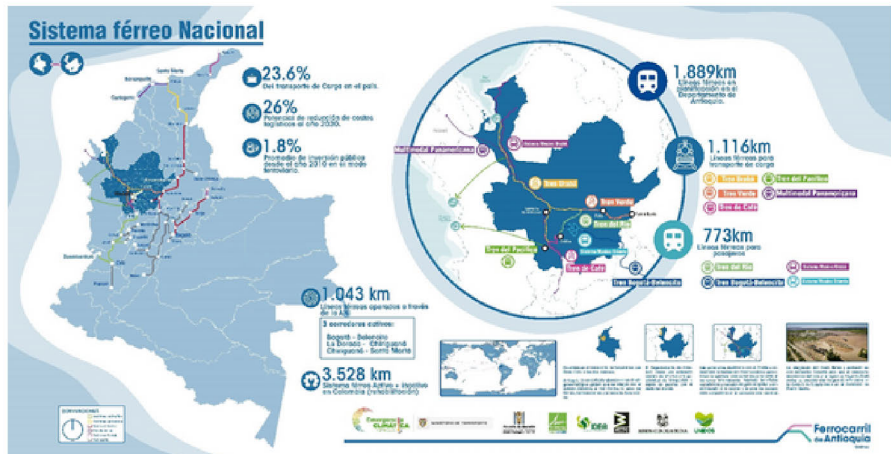
Due to the future developments planned for the city and the importance of La Aguacatala station in the system as the connecting node between the proximity railway, new tram line, existing metro line and non-preferent bus lines we think its relevant to examine where these lines will be connecting, their extension and future expansions that should affect the design outcome.

The city has faced difficulty in developing new metro lines due to the sharp incline of its topography in a longitudinal axis in relation to the Medellin river, because of this it has prioritized cable-car lines that have the ability to reach places that would be unreachable before, dutifully so it has prioritized marginal neighborhoods but now after 28 years of public transport infrastructure development and with 8 cable car lines already built and over 4 more lines planned the city is focusing on expanding the capacity of the network and making it more appealing to the middle to high class population of the city that still prefers cars or motorbikes.

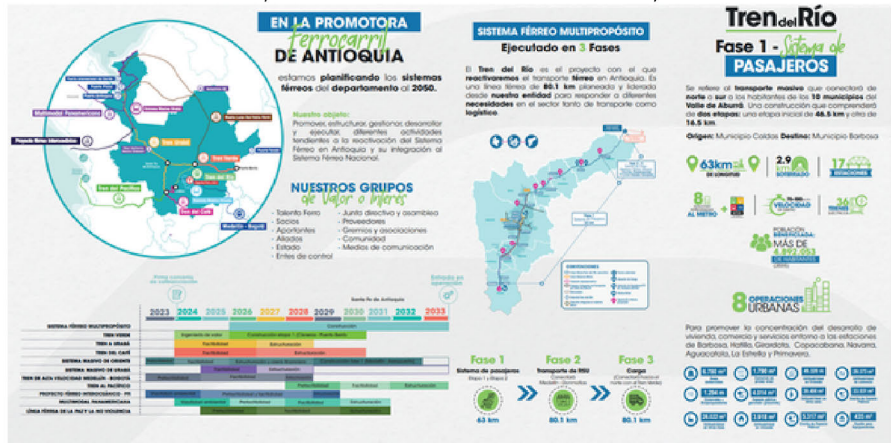
this push to make its means of transport capable of handling higher capacities of passengers in a more efficient way has resulted in looking back at railway-based means of transport, the first tram line was built inside of the city center in the past years and currently the city is focusing its efforts on building the 80th Av Tram which would venture into creating a new connection between La Aguacatala Station and Caribe Station which currently serve the main metro line. This transport system has changed through the planning faces, going from a traditional tramline, and turning into a light-load metro system. The planning department has given the system priority over car transit and included segregated circulation for it, removing the chances of it sharing space with ongoing traffic, a problem the existing tram line has met.

This separation from existing traffic would only take place on the main intersections of the 80th Avenue and would take advantage of existing bridges that allow for undisturbed transit to car traffic, this will be destined exclusively to the Light Metro line.

The third stage of the new 80th Av Light Metro line will connect with La Aguacatala station, which, in turn, is planned to be the main station for the new proximity railway system.



Scheme for future layout of the new national railway infrastructure.



First development stage for the new national railway infrastructure.



General information for the new national railway infrastructure.



Layout for the new railway infrastructure as it crosses the city of Medellín.

# PROXIMITY TRAIN

## NATIONAL RAILWAY INFRASTRUCTURE PLANNED FOR THE FOLLOWING YEARS:

The region of Antioquia was an important promoter and builder of railway infrastructure since 1874 as one of the industrial centers of the country, it had a healthy railway infrastructure until the 1950s in which it was sold to the national government and it slowly deteriorated and lost maintenance, investment and in the end became just a touristic route connecting the city of Medellin with the town of Cisneros until 1999 when it ceased service.

With a renewed interest in rebuilding and expanding railway infrastructure as part of a national effort to build more efficient transport infrastructures for goods and passengers, Medellin becomes the center once again for this initiative as it is the city with the more complex system of public infrastructure in the country and still a powerhouse of economic development for the country.

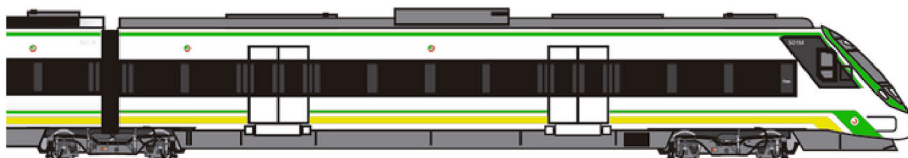
### Upcoming Lines:

- The railway lines purposed for varied economical, freight, population density and national relevance are the following:
- Uraba Train: Connecting Medellin with one of the most important ocean ports of the region.
- Green Line: Connecting Medellin with one of the agricultural regions and population centers.
- River Train: Intermunicipal suburban railway system.
- Train of the Pacific: Connecting to an isolated rea of the country due to geographical challenges.
- Train of Coffee: Connecting to one of the main touristic region destinations of the country.
- Medellin - Bogota intercity high speed train line.
- Pan-American intermodal connection.

Dimensions: No specific model of train has been chosen but its expected to fit the standard railway width and the trains to go up to 140m in length to be able to share the existent metro infrastructure as platforms and parking areas.

Frequency: Stops will be spaced over 2km between each other within the urban area and they will increase their separation as they connect surrounding municipalities..

Speed: 120-140km/h top, 80-100km/h average service speed.



# METRO

## MAIN ARTERY OF URBAN TRANSPORTATION SYSTEMS

The subway is an underground railway system designed to transport numerous passengers in urban and suburban areas efficiently. Typically constructed beneath city streets for ease, subways may also include tunnels under rivers and occasionally use shortcuts. In some cases, portions of the system extend above ground, transforming into regular railways or elevated transit lines. Subway trains consist of multiple cars that operate using the multiple-unit system.

Metro systems tend to have stations or stops every kilometer at most and a frequency of arriving trains of 4-5 minutes between them and carry 20,000 approx passengers per hour in each direction on average, but this can be higher depending on rush hour, the frequency of the trains arriving to the station or out of the ordinary circumstances which increase the load factor.

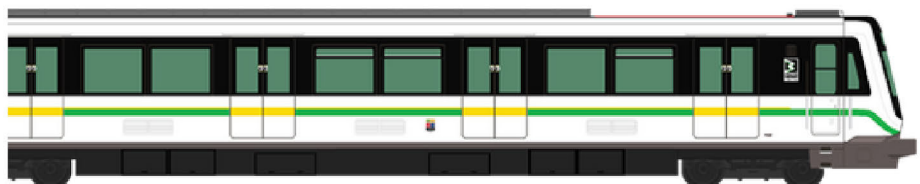
Max capacity = (seated + [seated\*LoadFactor])

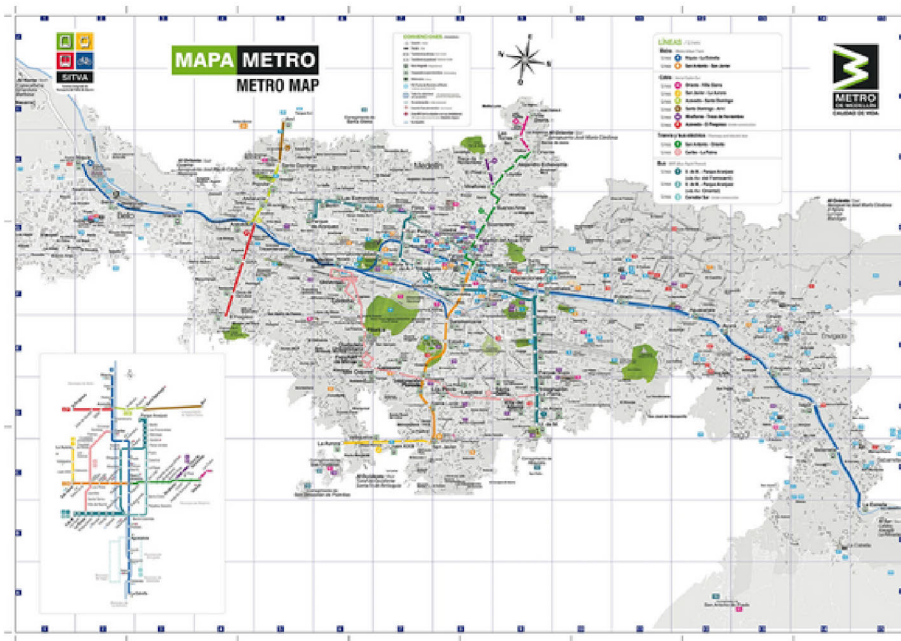
In Medellin the Metro was the first rapid-transit system built along the Aburra river in the early 90s and has been the backbone of the mass transport system of the city for the past 25+ years.

The system has the following characteristics:

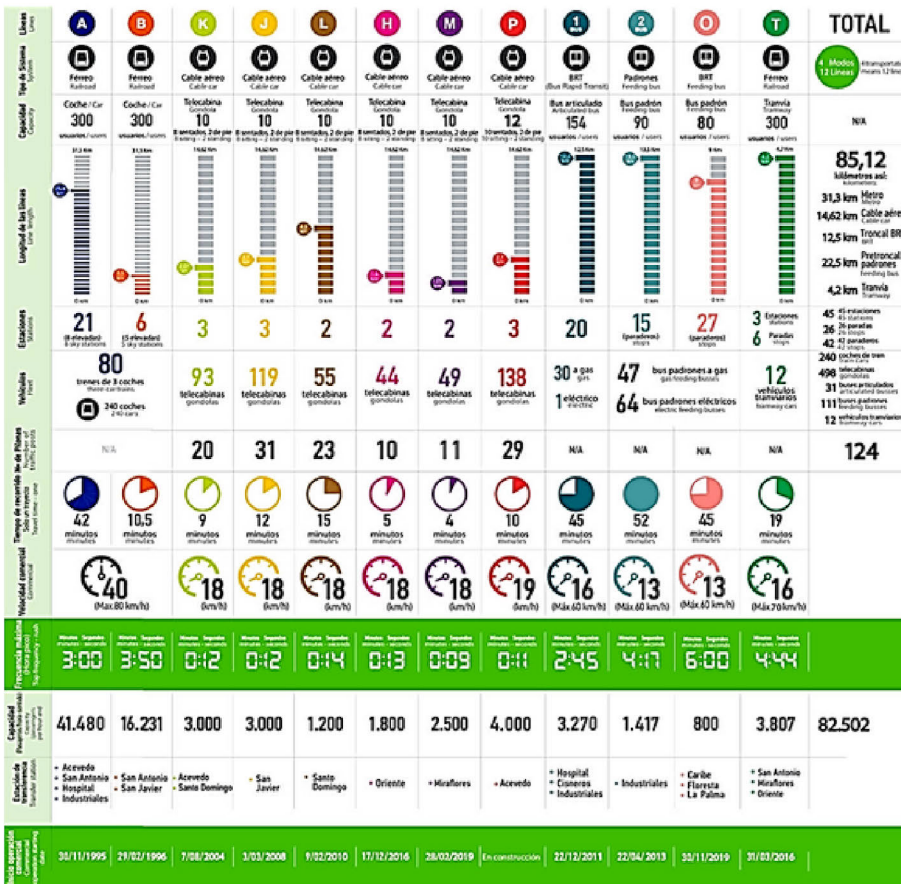
- **Dimensions:** L= 140m divided in two sets of 3 coaches together, H- outside = 3.8m H-inside = 2.20m
- **Capacity:** max 120 seated passenger + 1021 standing passengers (max capacity with a load factor of 8,5+), **Average** = 300 passengers per coach (load factor of 1.2).
- **48653** passengers every hour each way (Sustainability report 2022).
- **Frequency:** during rush hour one train every 2:50 min

As it the challenges of expanding the current metro infrastructure across an already densely built city the path forwards is providing more efficient and convenient means of transport to feed the existing infrastructure such as light rails, trams, BRT, traditional buses and bike ways are utilized.





Topographic map for the citywide mass transport system.



General statistics for the mass transport system of Medellín.

# LIGHT RAIL

## SECONDARY TRANSPORT SYSTEM INSIDE URBAN REGIONS

Light rail transit is a railway system commonly powered by overhead electrical wires, serving as a medium-capacity mode of local transport in urban areas. Light rail vehicles (LRVs) have evolved from streetcars (trams). Light rail transit routes are more separated from street traffic compared to trams, especially in busy city centers, yet less isolated than heavy rail rapid transit lines.

Light rail systems can carry 90 passengers per vehicle \* 3 vehicles per train \* 30 vehicle sets per hour = 8,100 passengers per hour on average but this can vary depending on the conditions.

Medellin is currently building the Light Metro system of 80th avenue, one of the incidents triggering the transformation of the chosen site, its planned to be of higher capacity in comparison to the existing tram line of the city which has the following conditions:

**Dimensions:** L= 39m divided in 5 modules, H-outside = 3.8m H-inside = 2.20m, Width = 3.2m total with monorail.

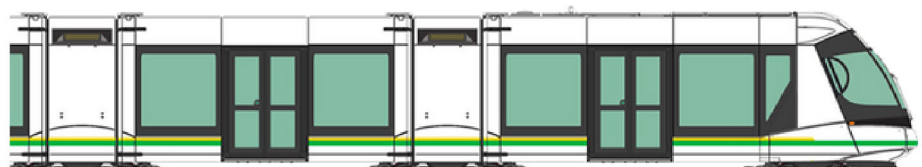
**Capacity:** max 311 passenger (seated+standing), 3807 passengers per hour each way.

**Frequency:** During rush hour one every 4:40 min.

**Speed:** 70km/h top, 40km/h average system speed.

In Medellin, there is an existing tram line running through the city center, ascending the mountainside from San Antonio station. Due to the steep slope, a modified tram system was implemented, using a tire-traction system guided by a monorail.

At Aguacatala Station, the Light Metro of the 80th avenue and the future 34th road Tram system will link with Metro Line A, necessitating an efficient and safe method for transferring passengers.





Visualization for the future Light Train going along the 80th avenue.



Visualization for the future Light Train going along the 80th avenue.



# EXECUTION

## THE IMPORTANCE OF PUBLIC PARTICIPATION IN PUBLIC INFRASTRUCTURE DEVELOPMENT

One of the most significant challenges facing the new development of rail infrastructure is effectively communicating and gaining unified political support for the new transport system. This challenge has intensified as economic interests push back, worsened by the physical challenges posed by the drastic topography of the Andes Mountain chain and local security threats stemming from the historical internal conflict the country has endured since the 1960s. Despite these obstacles, it is remarkable that the new expansion initiative has advanced to the point it is now and construction has already begun.

Some of the benefits the new railway infrastructure will bring to the passenger and freight transport landscape of the region and country are unprecedented. It decreases commuter travel times within the city and connects it to the coastal region of Uraba while creating jobs. Additionally, it decreases CO2 emissions by an equivalent of 567,809 tons per year and disincentivizes personal car use, reducing traffic congestion and the mortality on the streets.

## IMPORTANCE OF URBAN SCALE PROJECT IN URBAN GROWTH

When the Metro system was being developed, the city was going through one of its darkest eras with drug cartels and a deteriorated urban fabric. Even if the project went through, the expected success and adoption by people was in doubt. In light of this, local authorities saw an opportunity to take advantage of a paradigm-altering city-wide change that the new metro system would bring and came up with a solution.

Facing challenges during construction due to security concerns and lack of funding, the construction was halted between 1989-1992. An opportunity was identified in using the new transport infrastructure as a framework to build a new sense of belonging and individual ownership for people towards the Metro System and the city it runs through. A program called "Metro Culture" was created.

Metro Culture is understood as the result of the social, educational, and cultural management model that the Metro as an entity has built, consummated, and delivered to the city. Starting in 1988, the Company set out to generate a new social program targeting the inhabitants of the Aburra Valley. first, relationships of trust were established with the future neighbors of the Metro stations, by interacting and talking directly to them, generating a sense of belonging and a feeling of care and preservation towards the transport system. (Metro De Medellin 2024).



Visualization for the future Light Train going along the 80th avenue.



Planned layout for the Light train.



Proximity train integrating itself to existing railway infrastructure.

“After 1994, the strategy was strengthened with a school car located in the convention center, now known as Plaza Mayor, and even a school-station in the Alpujarra. Deliberate actions of instruction were taken, such as not crossing the yellow line, knowing how to use the red button and the blue lever on the doors, and becoming familiar with the old Edmonson ticket or the door closing whistle” (Ortiz Jimenez, 2018).

By giving people the opportunity to take part in the design, planning and construction process an attachment was created towards it and the project had a smoother adaptation with the public.

This type of strategy is necessary even today to strengthen the feeling of belonging to the upcoming expansion of the system and the connection of multiple transport systems. Throughout their construction process, these systems will inevitably disrupt and alter the daily life of the local inhabitants of Medellin and public support is necessary.

A takeaway from past initiatives and expansions is that the system is both a physical element of the city and a scenario for urban life and human interaction—a place of equal footing for a very unequal society unaccustomed to confronting this harsh truth.

Because of this an ongoing campaign of divulging and sharing the benefits of the project are ideal, here are some of the first infographics used to highlight them:



Photo of the Medellin Metro.

# HISTORY

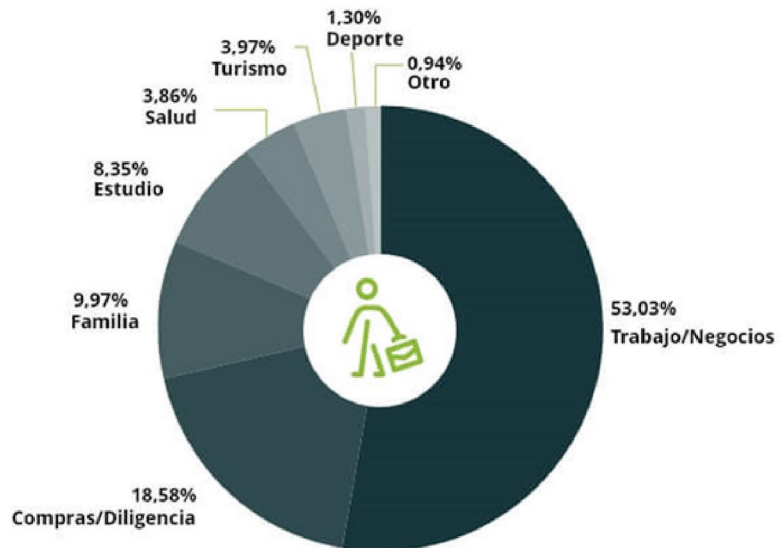
## METRO SYSTEM (1995-NOWADAYS)

Medellin, Colombia's second-largest city, stands as an example to the successful evolution of a sophisticated mass transportation system, playing a transformative role in addressing not only the city's transportation needs but also broader societal challenges. Catering to a growing population exceeding 3 million within the metropolitan area, the city's integrated transportation network seamlessly blends diverse transit modes. Ranging from 2 main metro lines, 1 tram line, 6 cable car lines, 3 segregated lanes articulated buses lines and more expansions planned for the system provides plenty of challenges and opportunities for the future.

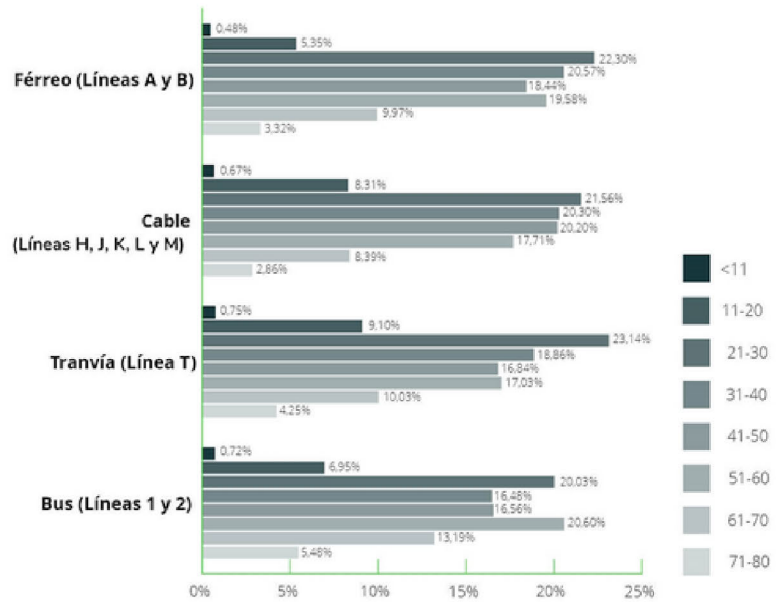
The birth of the metro lines dates to 1979 when feasibility studies were conducted to prepare what was presented to the national government to get the necessary funding to start building the public transport infrastructure. Starting in 1984 and finishing in 1995 when the first wagon began its service between Niquia and Poblado station, other lines started to be planned and constructed, the first cable car line K started operation on august 7 in 2004 providing service to the areas of the northeast of the city, J line came 4 years after and due to their high efficiency and ideal adaptability to the complex topography faced by the cities location inside of the Aburra Valley they became the preferred type of public transport infrastructure to be built in the following years.

The metro system in Medellin has a transport network with seventy-six stops, encompassing twenty-seven train stops, eleven cable car stations, nine tram stations, and twenty-eight articulated bus stations. Over its 28-year life, the system has expanded its coverage to include six municipalities, fostering proximity connections with neighboring rural towns. Medellin's international acclaim for its advancements in public infrastructure and a thriving tourism industry is a testament to the city's remarkable turnaround from societal and cultural challenges faced in the late 80s and 90s. In a country with a centralized economy based in Bogota, Medellin has appeared as a reference for public transport infrastructure. The city now looks ahead to further expanding and enhancing this transformative system.

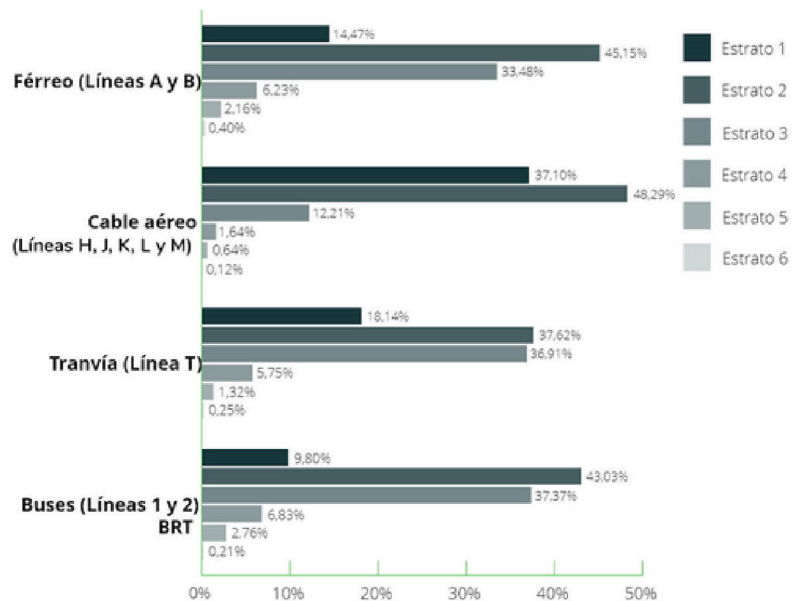




Travels divided by destination.



Metro lines users classified by age.



Metro lines users classified by socioeconomic group

# SUSTAINABILITY

## MEDELLIN'S PATH TO SUSTAINABLE URBAN MOBILITY

Thanks to insights provided The sustainability report (2022) and documents published by Medellín Como Vamos, a public initiative dedicated to monitoring and assessing the city's quality of life and urban development, it is evident that Medellín is committed to creating inclusive, safe, and sustainable urban environments, with a specific emphasis on improving transportation accessibility and quality. The 2017 Origin-Destination Survey (Encuesta Origen-Destino) sheds light on the current transportation landscape and its evolution. The survey indicates a significant increase in daily trips from 2012 to 2017, with walking, collective transport, and private cars dominating. Despite a rise in metro usage to 12%, achieving a more balanced and sustainable transportation mix is still a challenge.

Zonal preferences highlight the necessity for tailored strategies. In the southern part of the city, specifically around the Aguacatala Station, where private car usage is high, and public transport adoption is low, there's an opportunity to address this imbalance. By modifying Aguacatala Station and integrating it with the 80th Avenue Light Metro System and the planned proximity train by Tren del Río, we anticipate a significant increase in the adoption of public transportation in this region.

Medellín's pursuit of sustainable urban mobility necessitates a strategic focus on public transport adoption. Addressing regional disparities, expanding metro infrastructure, ensuring accessibility, promoting sustainability, and utilizing data-driven insights are key components of the city's vision for a more sustainable and inclusive transportation future. The proposed modifications and interconnections align with this vision, marking a proactive step towards achieving a comprehensive and interconnected public transport network.

## Passenger Capacity of different Transport Modes

Passengers per hour  
on 3.5m wide lanes in the city

 = 1,000 average passengers / hour

 = 1,000 potential passengers / hour

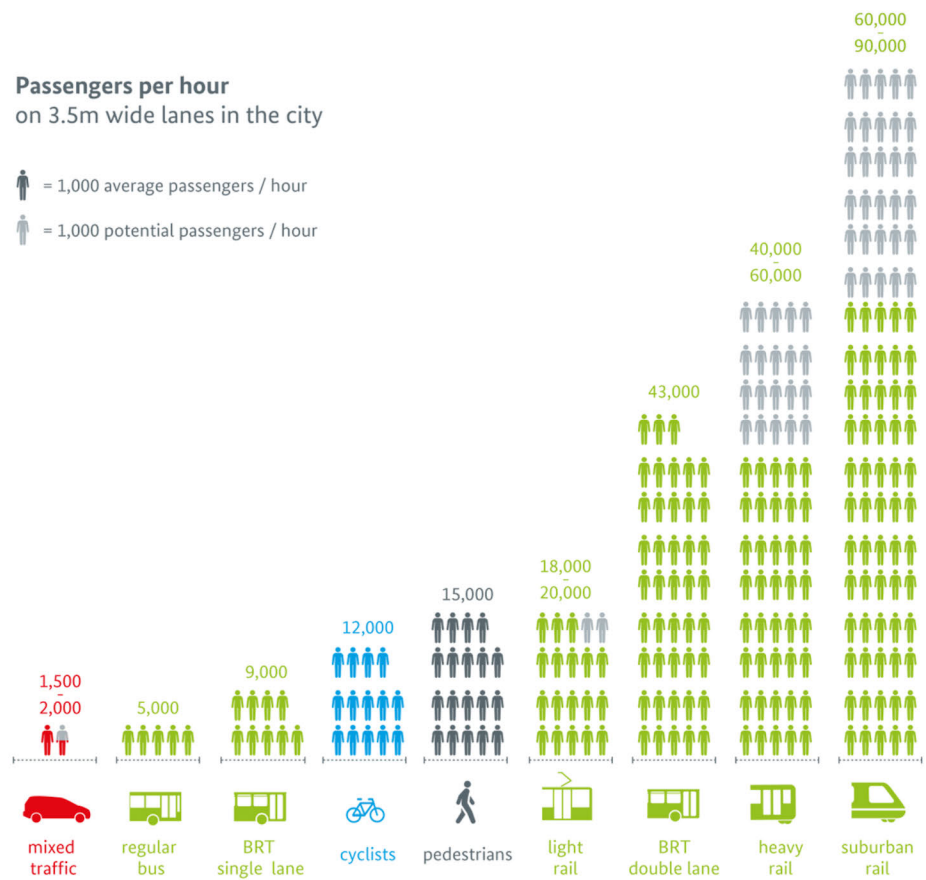
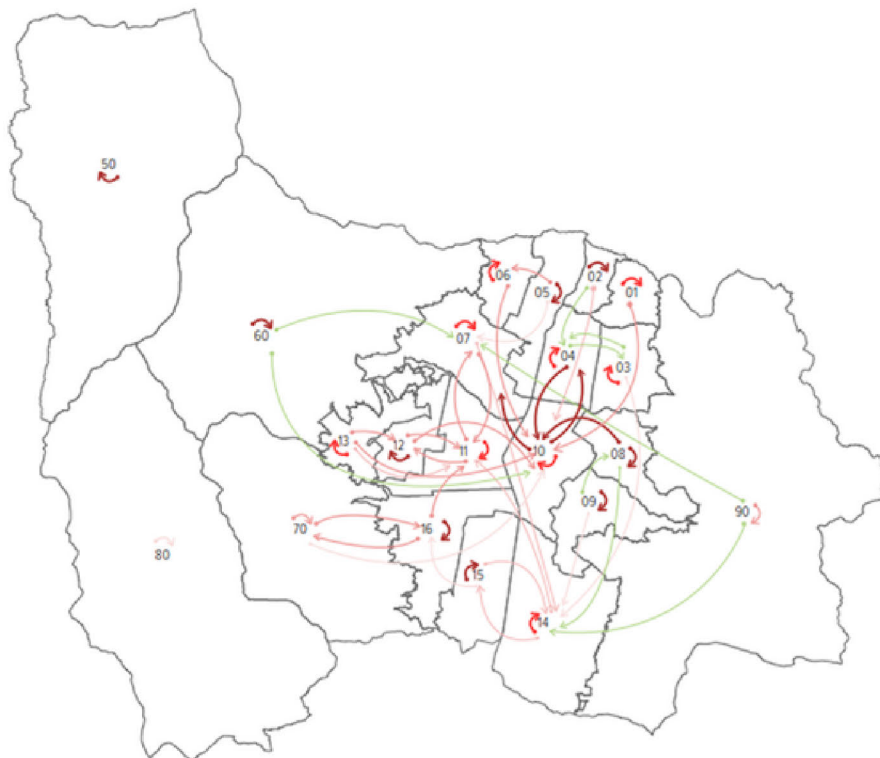


Illustration based on: Breithaupt based on Bötting & Papendrecht (1991). Traffic operation of bicycle traffic. TU Delft. <http://www.umcrd.or.jp/content/documents/5594Presentati-on%201%20-%2010%20duur%201%20-%2010%20M%20Breithaupt.pdf> (accessed 29.09.2018)



@TUMInitiative  
transformative-mobility.org

Average passenger/hour classified by different transport modes.



Fuente: elaboración de Medellín Cómo Vamos con base en Encuesta Origen Destino – AMVA 2017

Origin-destination graphic for the city of Medellín.



Fuente: elaboración de Medellín Cómo Vamos con base en Encuesta Origen Destino – AMVA 2017

Origin-destination graphic for the metropolitan area.





SITE ANALYSIS

03

# WHERE IS IT HAPPENING?

## ITS ROLL AS A PUBLIC SPACE CREATOR

La Aguacatala Station is found towards the lowest part of the commune of El Poblado, the southernmost commune of the city and shares a border with the following municipality of Envigado. Placed along the Aburra River, known locally as Medellín River, it shares the riverbank with the highway system, the sum of the river, the metro system and the highway create both a physical and mental barrier for the inhabitants of the city.

This barrier can be shown not only from anecdotal perceptions from users but from measurable data as you compare statistics from both sides of the river.

Healing this divide is no simple task and after several years of urban planning policies and changing the priorities of the Master plan some advancements can be seen in other areas of the city, from these cases we will try to apply what worked and learn from what didn't. Currently the system handles around 1.536.377 passengers daily on a regular weekday, and even with the high demand it has it has been only 15,7% of daily commutes of urban users. [1]

Enhancing the adoption of a comprehensive transportation system stands as a key focal point for future initiatives, with the overarching goal of establishing a more sustainable transportation ecosystem within the city. The municipality is actively pursuing various strategies to achieve this objective. These include the expansion of cable car networks, with several projects currently in discussion and exploratory stages. Additionally, efforts are underway to augment the capacity of existing metro wagons, refurbish the current fleet, and implement the construction of the Light Metro System along the 80th Ave. Moreover, plans are in motion for the development of the future River Train—a proximity railway system linking the city to satellite municipalities along the Rio Aburra. This system will extend both north and south, ultimately connecting industries in Medellín to the coastal freight port in the Uraba region.

[1] Metro de Medellín, Sustainability Report (2022).



Current conditions for the station, author generated information.

Through the implementation of these strategic initiatives, the transportation system aspires to enhance its attractiveness while concurrently discouraging the preference for private modes of transportation, such as cars and motorcycles, among individuals.

While implementing these strategies, it is important to focus on the enhancement and modernization of various transportation nodes. A pivotal aspect of this initiative is the renewal project for the Aguacatala Station, which serves as the inaugural station within the municipality of Medellin connecting existing metro lines, the 80th Ave Light Metro Lines, the River Train, and other urban entities.

Situated near the Aburra River, the Aguacatala Station presents a unique opportunity to systematically address both the physical and mental barriers that the river has inadvertently posed in the city's landscape. By strategically intervening this station, not only can it integrate diverse transportation modes, but it can also serve as a transformative catalyst in redefining the city's relationship with the Aburra River, turning what was once perceived as a barrier into a significant opportunity for urban connectivity and cohesion.



Alcaldía de Medellín, Author generated info.

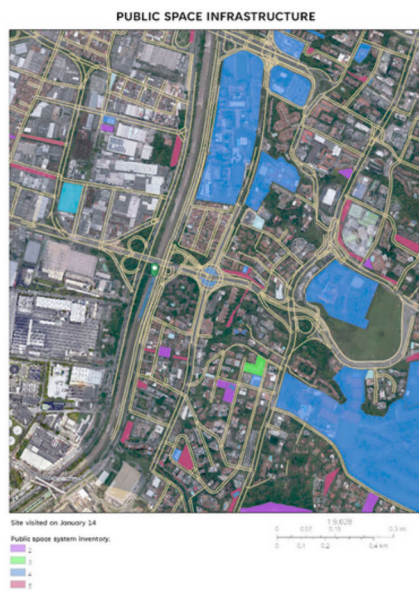
# SITE ANALYSIS

## INFORMATION GATHERING

Thanks to receiving help from the Metro of Medellin it was easier to have access to current, accurate and relevant information, once this information was processed it was possible to identify future plans for upcoming projects, the current conditions of the state and official generated information about the law frame corresponding the site in question.

Some of the most relevant conclusion about the accessed information is how there's a clear divide in housing density between both side of the river, the west bank currently houses several industries, factories and warehouses which condition the block typology, creating a limited reach for pedestrians as they move from and to their destinations.

Moreover, there's a clear difference in hierarchy between cars and pedestrians when it comes to reaching the river, this due to the fact that the highway (av regional) goes parallel to it and most of the crossings are car-based.



Adjacent public infrastructure to the relevant project area.  
Author generated info.

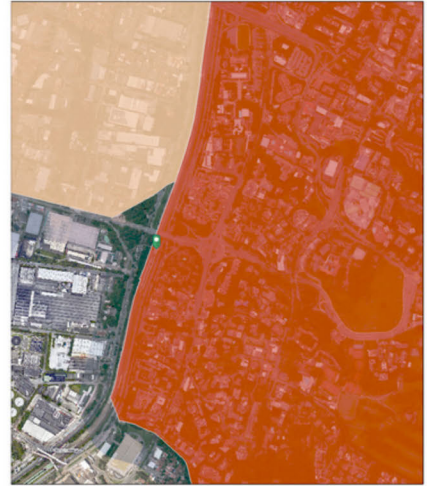
ADMINISTRATIVE LIMITS



Site visited on January 24  
 Legend:  
 - Administrative borders for the municipality of Medellín  
 - Neighborhoods and administrative areas  
 Scale: 0 to 0.3 km (0 to 0.3 mi)

SOURCE: Alcaldía de Medellín

PROJECTED HOUSING DENSITY



Site visited on January 24  
 Legend:  
 - Projected Housing units for (2018-2030) by Comunas and Townships  
 - 9,270 - 31,364  
 - 44,304 - 68,823  
 Scale: 0 to 0.3 km (0 to 0.3 mi)

SOURCE: Alcaldía de Medellín

ROAD ARTERIES HIERARCHY



Site visited on January 24  
 Legend:  
 - Highway system  
 - Main artery  
 - Minor artery  
 - Feeder road  
 - Service Road  
 Scale: 0 to 0.3 km (0 to 0.3 mi)

SOURCE: Alcaldía de Medellín

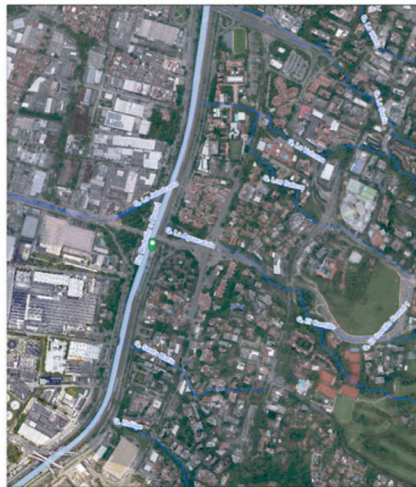
SOCIOECONOMIC STRATIFICATION



Site visited on January 24  
 Legend:  
 - Socioeconomic Stratification:  
 - 2  
 - 3  
 - 4  
 - 5 - 6  
 The Colombian Estrato system is a social stratification system with six levels (1-6), classifying neighborhoods based on their neighbors' socio-economic conditions. It determines the allocation of public services and subsidies, with lower levels receiving more assistance and higher ones contributing more for utilities.  
 Scale: 0 to 0.3 km (0 to 0.3 mi)

SOURCE: Alcaldía de Medellín

URBAN WATER WAYS SYSTEM



Site visited on January 24  
 Legend:  
 - Medellín River (Abasco river)  
 - Water basin feeder creeks and waterways  
 Scale: 0 to 0.3 km (0 to 0.3 mi)

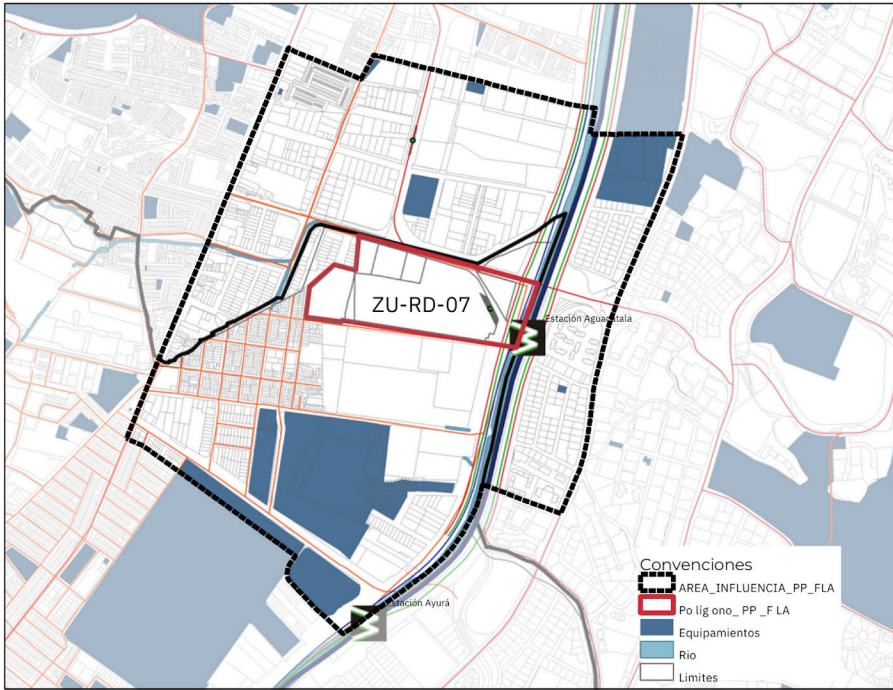
SOURCE: Alcaldía de Medellín

LAND USES



Site visited on January 24  
 Legend:  
 - PCTAB-2014: General assigned land uses:  
 - Existing Public Space  
 - Projected Public Space  
 - Public infrastructure areas  
 - Low mixture areas with predominant housing character  
 Scale: 0 to 0.3 km (0 to 0.3 mi)

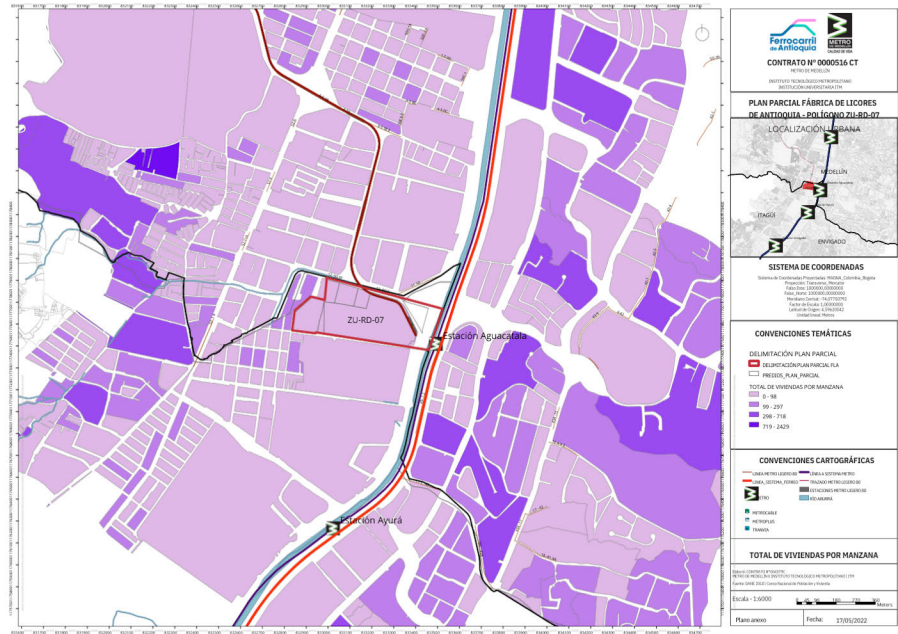
SOURCE: Alcaldía de Medellín



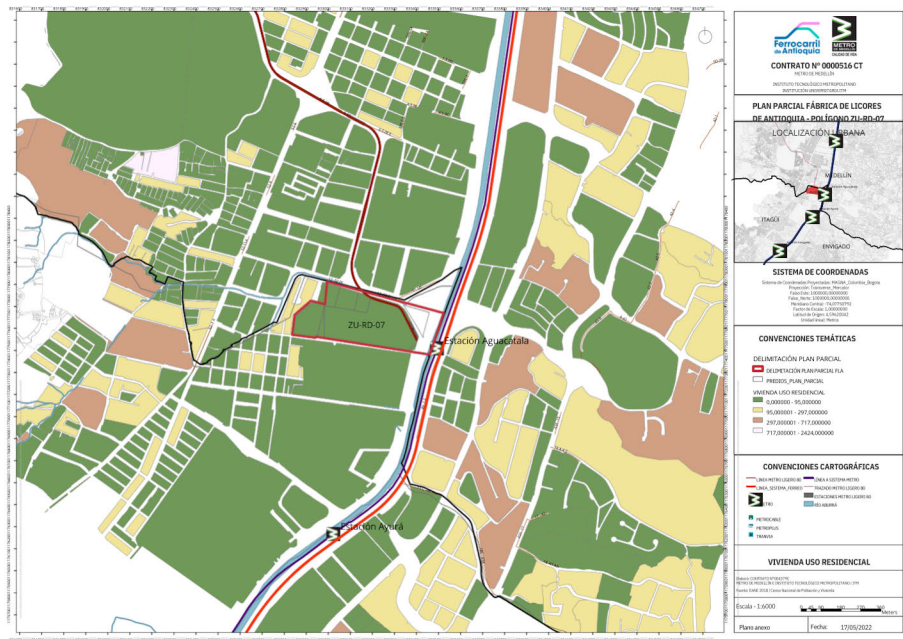
Adjacent public infrastructure to the relevant project area.  
Metro de Medellín.



Adjacent public transport lines to the relevant project area.  
Metro de Medellín.

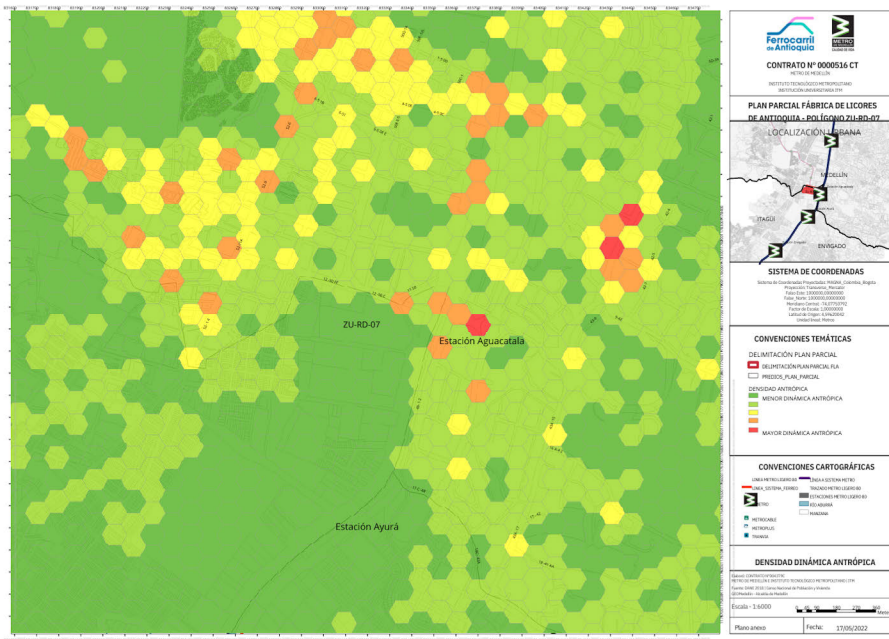


Total housing units by city block.  
Metro de Medellín.

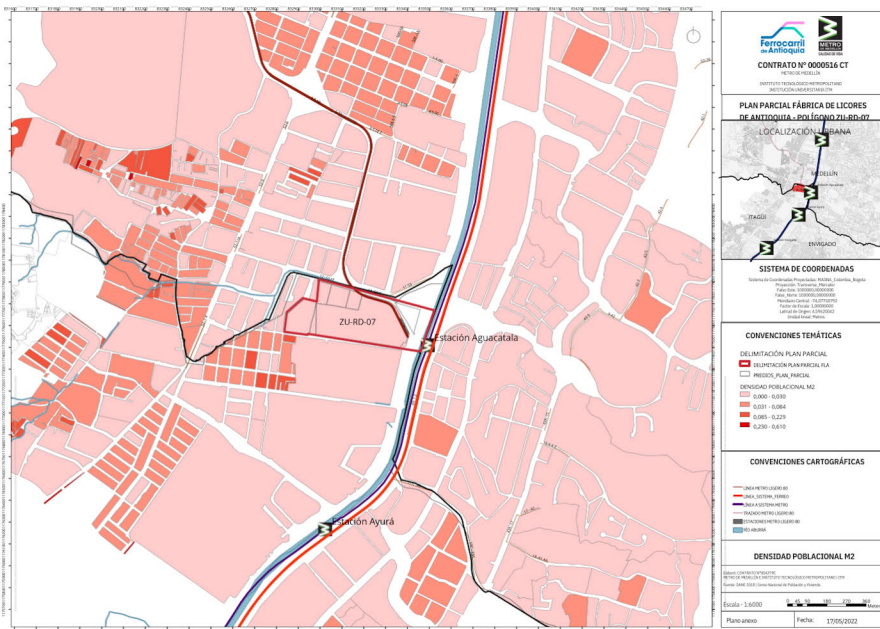


Housing units for residential use.  
Metro de Medellín.

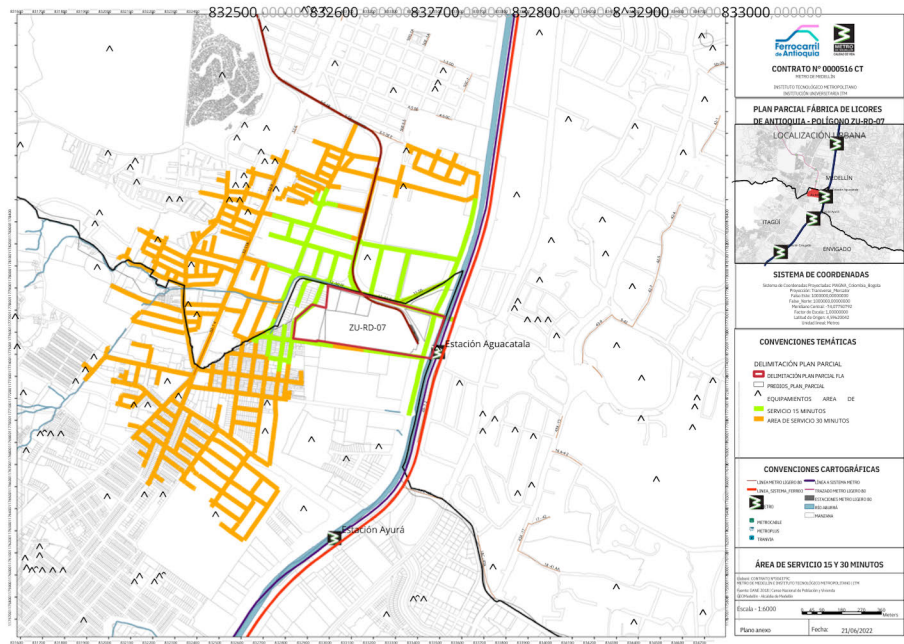




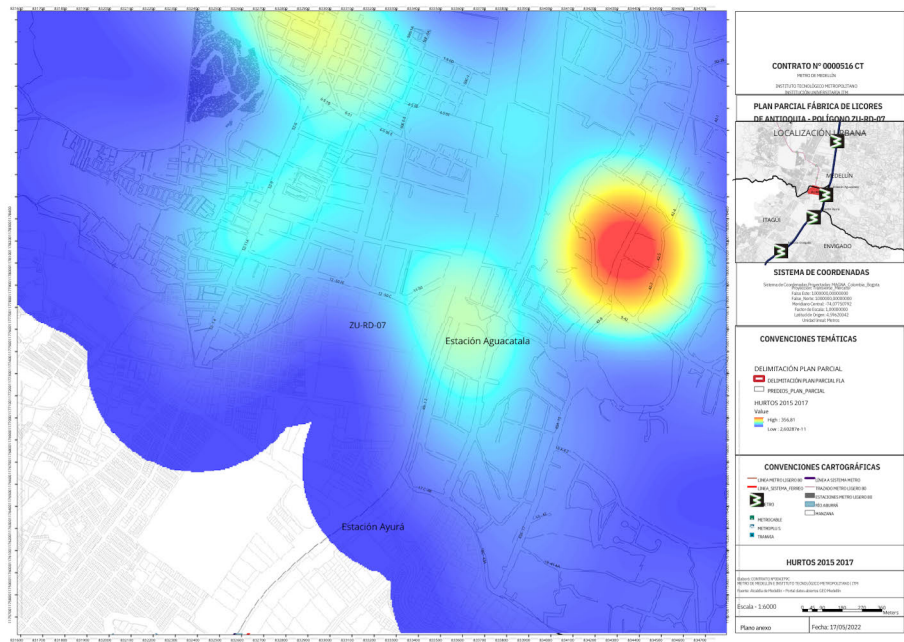
Dynamic anthropic density of the surrounding the area. Metro de Medellín.



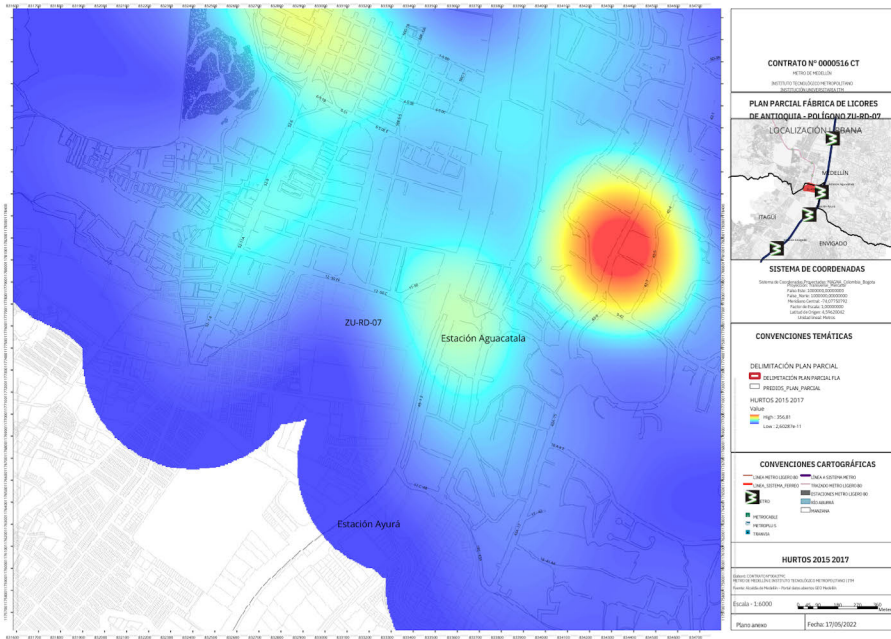
Static social density surrounding the area. Metro de Medellín.



User reach on walking pace (15-30 minutes).  
Metro de Medellín.



Violent crimes on the area (2015-2017).  
Metro de Medellín.



Theft on the area (2025-2017).  
Metro de Medellín.



Violent crimes resulting in death in the area (2025-2017)  
Metro de Medellín.



STUDY CASES

04

# CASE STUDY

## POBLADO STATION RENEWAL PROJECT

El Poblado Station, a pivotal hub in Medellín's metro system, faced challenges due to increased economic activity and population growth. To address this, a significant revitalization initiative was undertaken, focusing on the station's main issue—high passenger traffic.

A strategic decision was made to enhance functionality by constructing a new entrance to the south, a new pedestrian bridge and a new bus bay across the highway. These architectural interventions were not only aesthetically pleasing but also aimed at practical purposes. The new entrance efficiently manages increased foot traffic, creating a seamless experience for commuters arriving from previously uncommunicated directions, such as the INEM Public School or Guayabal Av.

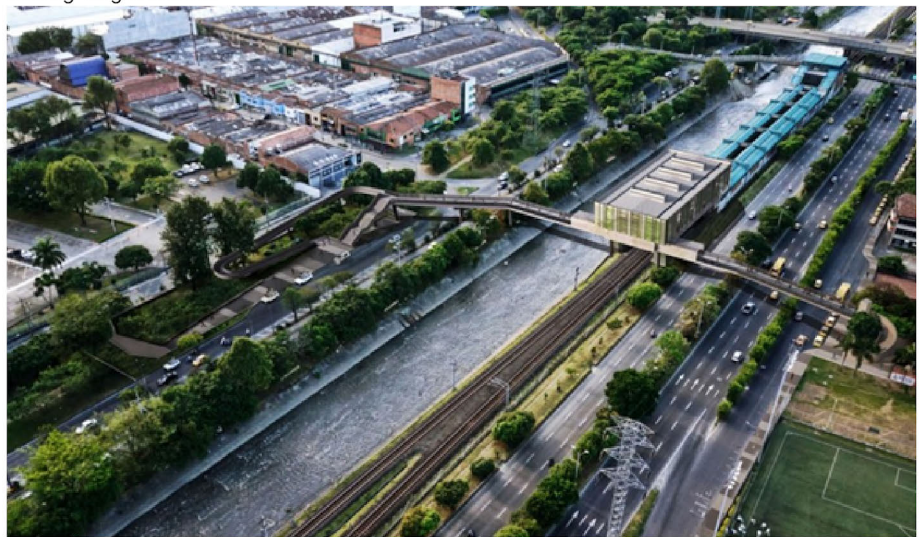
The pedestrian bridge, a key part of the revitalization, serves a dual purpose. It facilitates convenient crossing of the Medellín River, connecting different parts of the El Poblado zone, and improves access to nearby academic institutions for students, faculty members and workers.

Moreover, the intervention provides direct access to a strategically located bus bay along the river, streamlining transportation options for the community. This well-thought-out design enhances convenience for residents and commuters.

In essence, the El Poblado Station revitalization is a proactive measure to modernize and optimize transportation hubs, driven by an awareness of the city's evolving needs. The initiative ensures the station remains functional and aligned with contemporary urban demands.



Visualization of the El Poblado station reform  
Doing Ingenieria.



Visualization of the El Poblado station reform  
Doing Ingenieria.



La Aguacatala Station as it stands today.  
Ferrocarril de Antioquia.

# SIMILAR PROJECTS

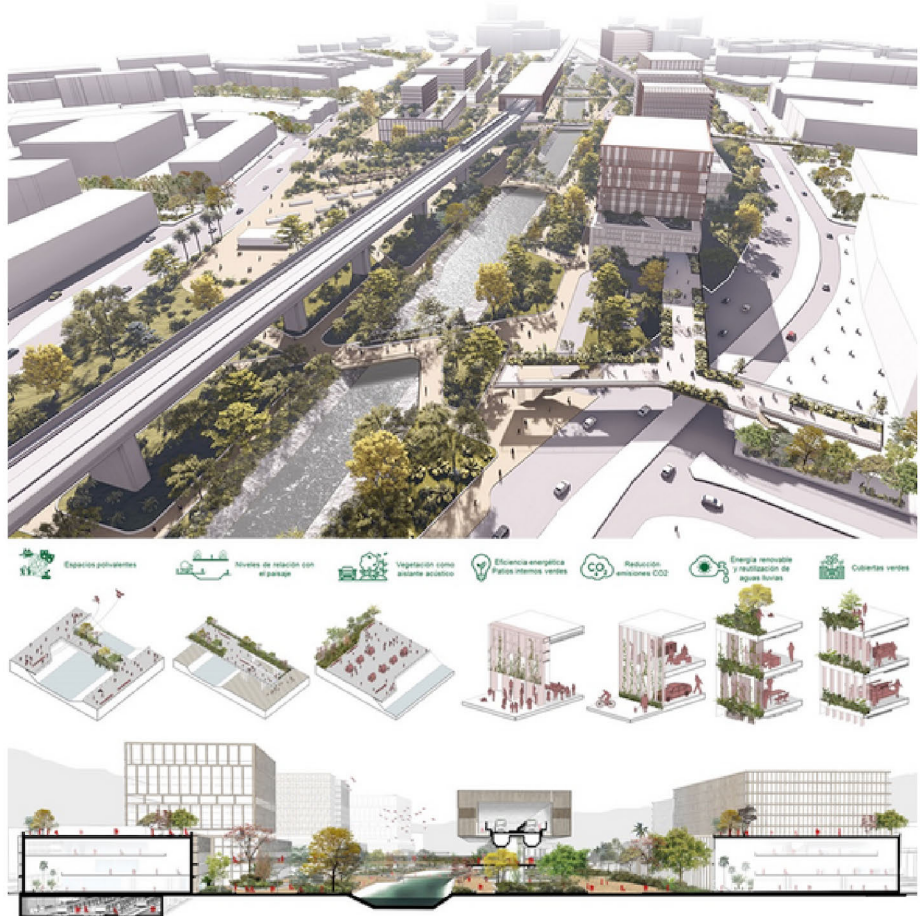
## INTERMODAL STATION IN LA ESTRELLA

La Estrella will host the first intermodal station within the metropolitan area of the Aburra Valley. The proposed design, recipient of the prestigious Leopoldo Rother Prize for Architecture and Urbanism in the Urban and Regional Ordinance category, envisions a facility that addresses the demands of proximity rail lines within the metropolitan area of the Aburra Valley.

Drawing parallels with the proposed intermodal Aguacatala Station, La Estrella faces comparable challenges. These challenges include integrating Tren del Rio trains into the existing station, accommodating increased passenger traffic, revitalizing the station surroundings, and effectively integrating into the greater mass transport system of the Aburra Valley.

The proposed design incorporates various elements to overcome these challenges. It introduces multiuse adaptable spaces and employs multilevel spatial configurations to optimize the use of available space. Greenery and vegetation are strategically integrated to serve as sound buffers, mitigating noise pollution. Additionally, the incorporation of vegetation aids in enhancing thermal control, thereby contributing to a reduction in the overall environmental impact of the project. These design features collectively aim to create a comprehensive and efficient intermodal station that aligns with the specific environmental and transport needs of the Aburra Valley.

As this is the first architectural intervention to existing stations to address the upcoming integration of the Tren del Rio to the Metro system is the most relevant reference to identify where the system is trying to go. Utilizing the Metro system as a catalyst of urban revitalization and development by integrating the stations into the urban fabric, making the surrounding area more attractive for housing and commercial developments and decreasing the presence of industrial uses within the city.



Intermodal Transport HUB in La Estrella.  
Metro de Medellín.



Intermodal Transport HUB in La Estrella.  
Metro de Medellín.





Intermodal Transport HUB in La Estrella.  
Metro de Medellin.



Intermodal Transport HUB in La Estrella.  
Metro de Medellin.

## SIMILAR PROJECTS

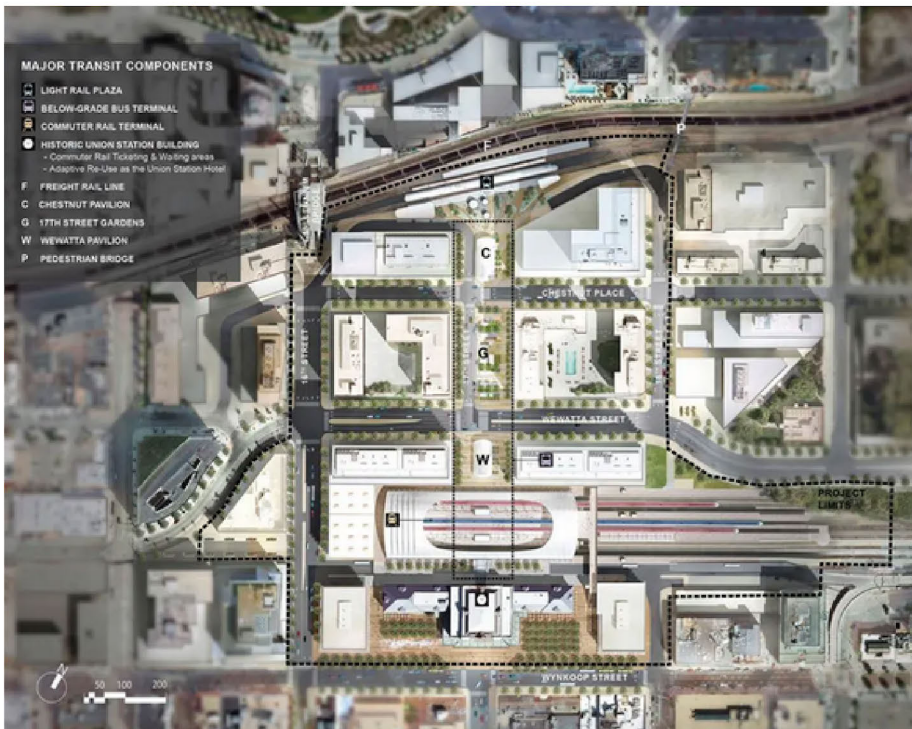
### UNION STATION, DENVER:

"A 14-block scar in the city's urban fabric, the rail yards, track sidings, and service areas of Denver's historic Union Station were underutilized for decades. In 2004 voters approved a tax increase to fund a regional transit plan with Union Station as the hub of the system. The redevelopment plan for the former rail yards involved master planning, urban design, and architectural design work to knit together light rail, commuter and intercity rail, regional and local buses, downtown shuttle buses, taxis, shuttles, vans, limousines, bicycle routes and pedestrian networks into an intermodal transportation hub and urban transit district." SOM.

Union station was transformed from an underutilized railway park and was converted into a neighborhood defining urban reference building. While the main canopy with its open-air atmosphere claims the stage the other aspects of how it integrates underground access to connecting buses, a pedestrian driven plaza across the railway that connects it to the river and the hierarchy of transport systems being interconnected are the interesting aspects to be taken away from the project.

Utilizing a mix of multilevel public spaces and new/old building interaction with future developments in mind the Union Station in Denver has a lot of things that can be applied to the Transport Hub in La Aguacatala.

Union Station is an interesting reference at it uses a single intervention to the existing railway infrastructure and existing passenger station and uses adjacent interventions to interconnect different buildings for pedestrians and passengers to follow, creating a new self-sustaining destination for resident and allowing for a better experience to all the involved actors. It is conscious about future urban growth and prepares itself for it allowing future expansions, while the scale may be bigger the type of interventions and design decisions taken for it apply to the Aguacatala Station.



Union Station.  
SOM.



Photography of Union Station.  
SOM.

DESIGN PROPOSAL

05



# LA AGUACATALA TRANSPORT HUB

## WHAT SHOULD HAPPEN

In the near future, significant changes are expected in the La Aguacatala area. The construction of the river train and the light train will alter the area's dynamics. However, the most substantial transformation will occur with the relocation of the FLA from this location and the conversion of the land into a mixed-use development plan. This plan will include residential and commercial buildings, along with the division of the area into smaller, pedestrian-friendly city blocks.

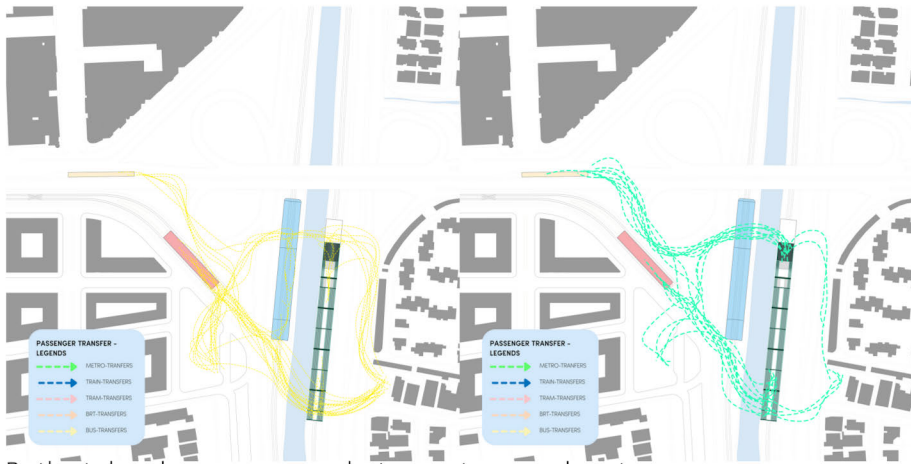
In order to change accordingly with the area a greater transport hub will develop, serving the new residents and visitors of the area, not a single building but a series of adjacent infrastructures which will allow for user to transfer between transport modes and reach their destinations in an easier manner.

Currently the station serves as the main river crossing for pedestrians, and it falls awkwardly towards car focused areas and it does not treat pedestrians as the main actor, mirroring car infrastructure and increasing friction, by rearranging the way the users flow from one transport to the other and adding urban life triggering uses we can enhance the user experience, urban life quality enhancement and allow for strengthening for the Metro system by providing new avenues of sustainability and revenue from the infrastructure, by which service quality can be improved.

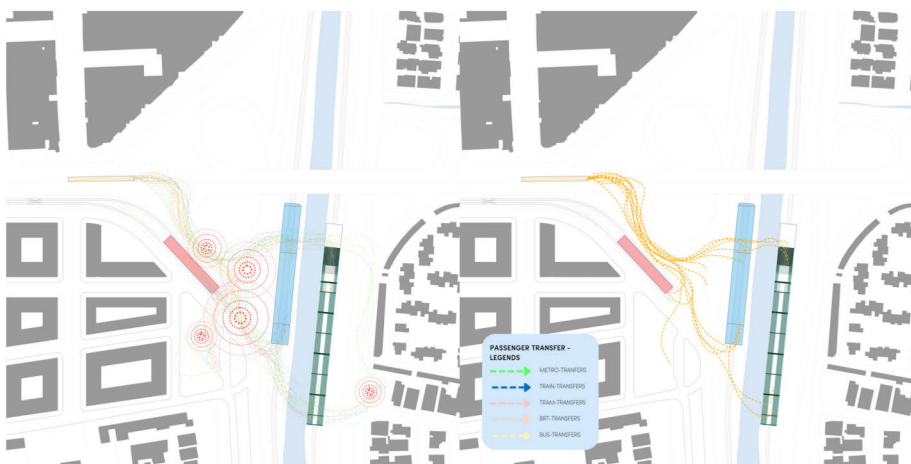
One of the challenges and questions presented by this developing project was the location of the new River Train railway, be it going parallel to the metro on the east bank or along the west bank opposite to it. Each option presents its own set of challenges and opportunities, by feasibility studies and consultation with professional its agreed upon that the west bank is the preferable option.

Thanks to these considerations, a proposal to integrate the river train and metro station into one connected building which will allow for direct passenger transfer without leaving the controlled area and provide waiting areas and adjacent services such as food areas, commercial spaces and a tourism office for people traveling in and out of the city, with a kinetic facade adaptable to the changing weather conditions and a solar energy generator roof to take advantage of the building location in the middle of the valley, making this a prime location for a more sustainable metro system.

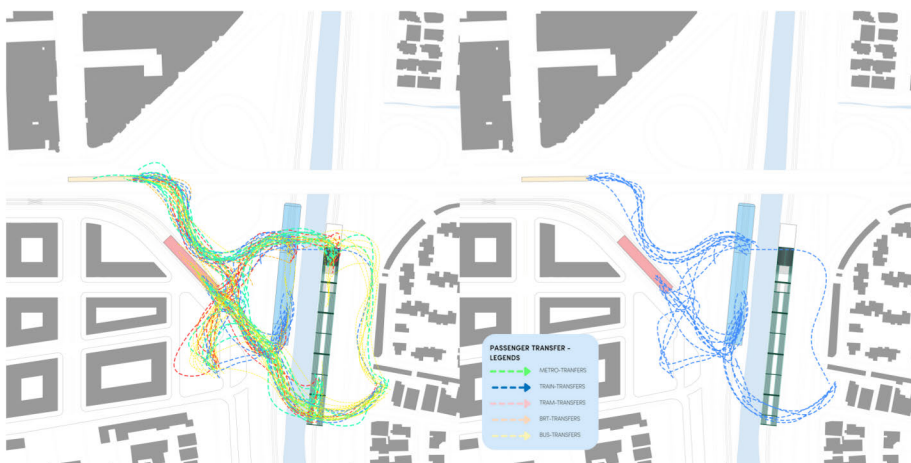
# PASSENGER TRANSFER BETWEEN MEANS OF TRANSPORT



Paths taken by passengers between tram and metro.  
Authors graphic.

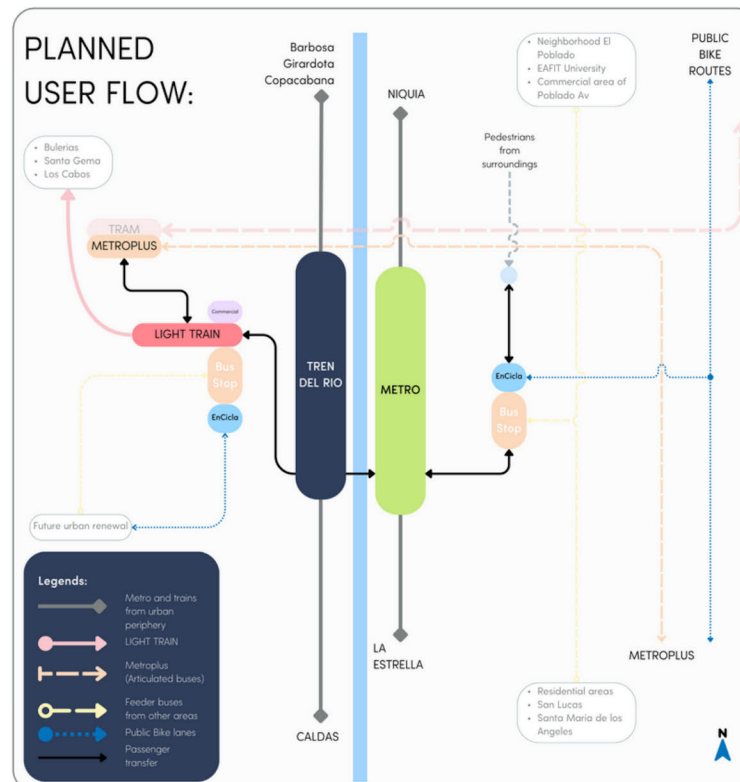
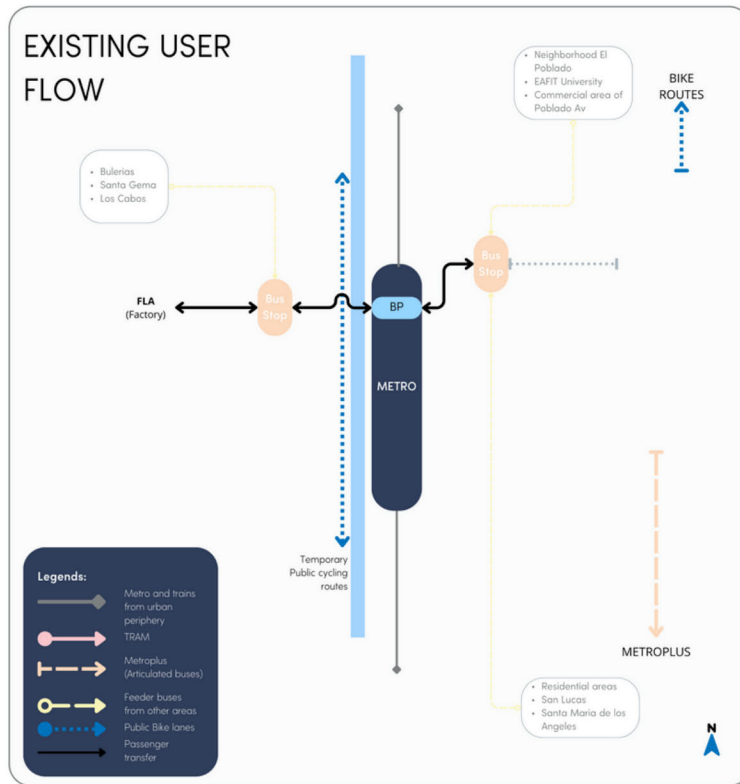


Paths taken by passengers between articulated buses and metro.  
Authors graphic.



Paths taken by passengers between articulated buses and metro.  
Authors graphic.

# PASSENGER TRANSFER BETWEEN MEANS OF TRANSPORT

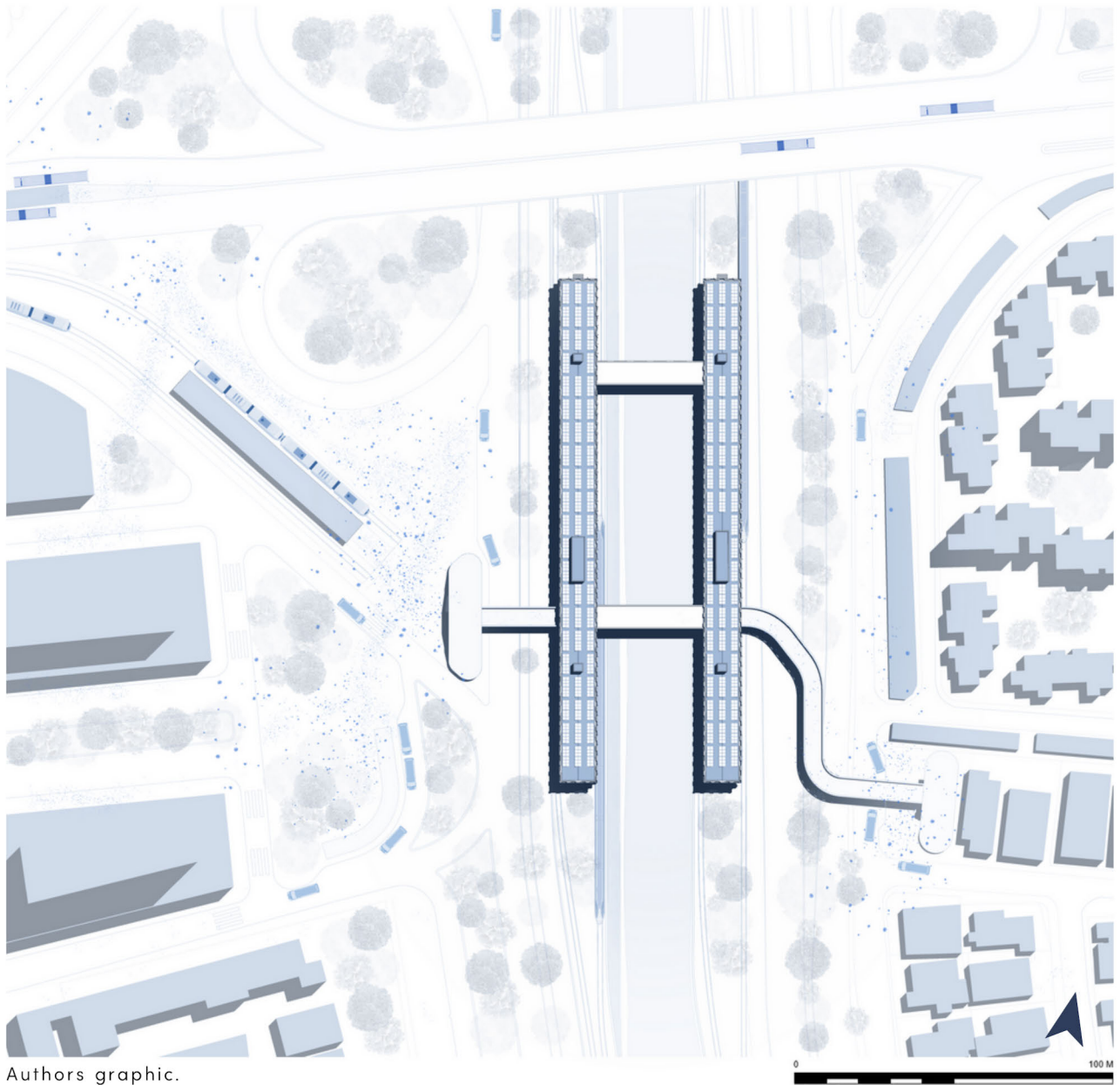


Authors graphic.



# DRAWINGS

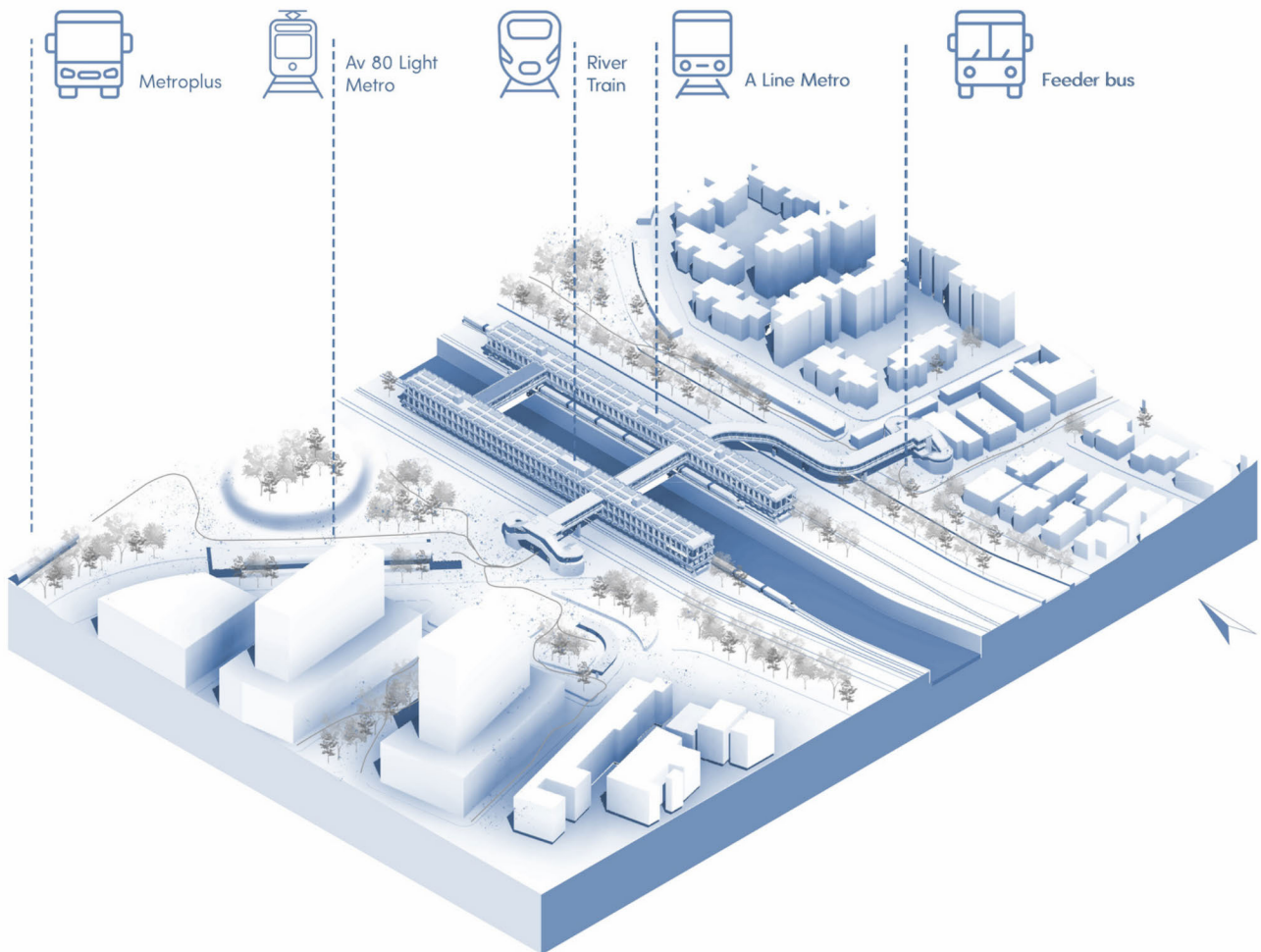
## SITE PLAN



Authors graphic.

# DRAWINGS

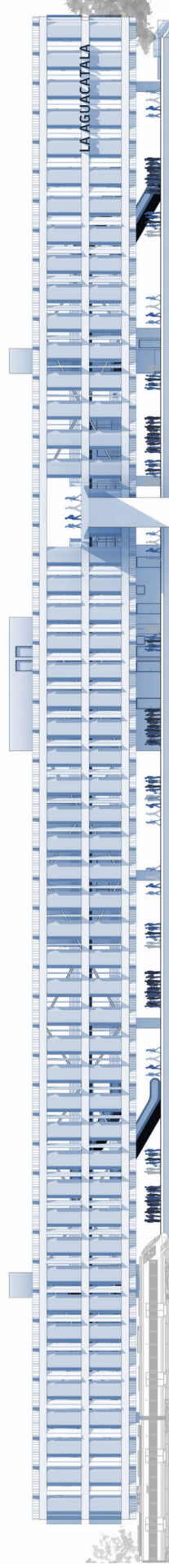
ISOMETRIC



Authors graphic.

# DRAWINGS

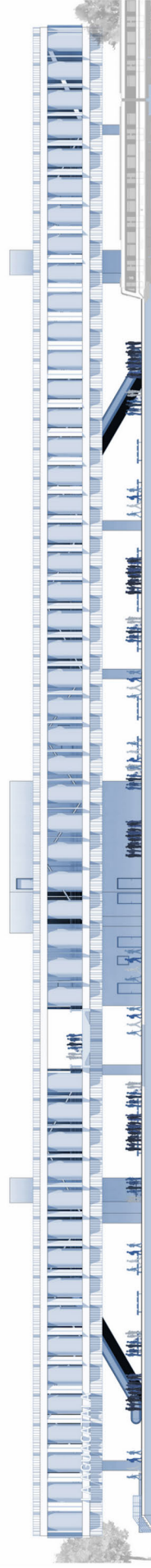
## WEST FACADE



Authors graphic.

# DRAWINGS

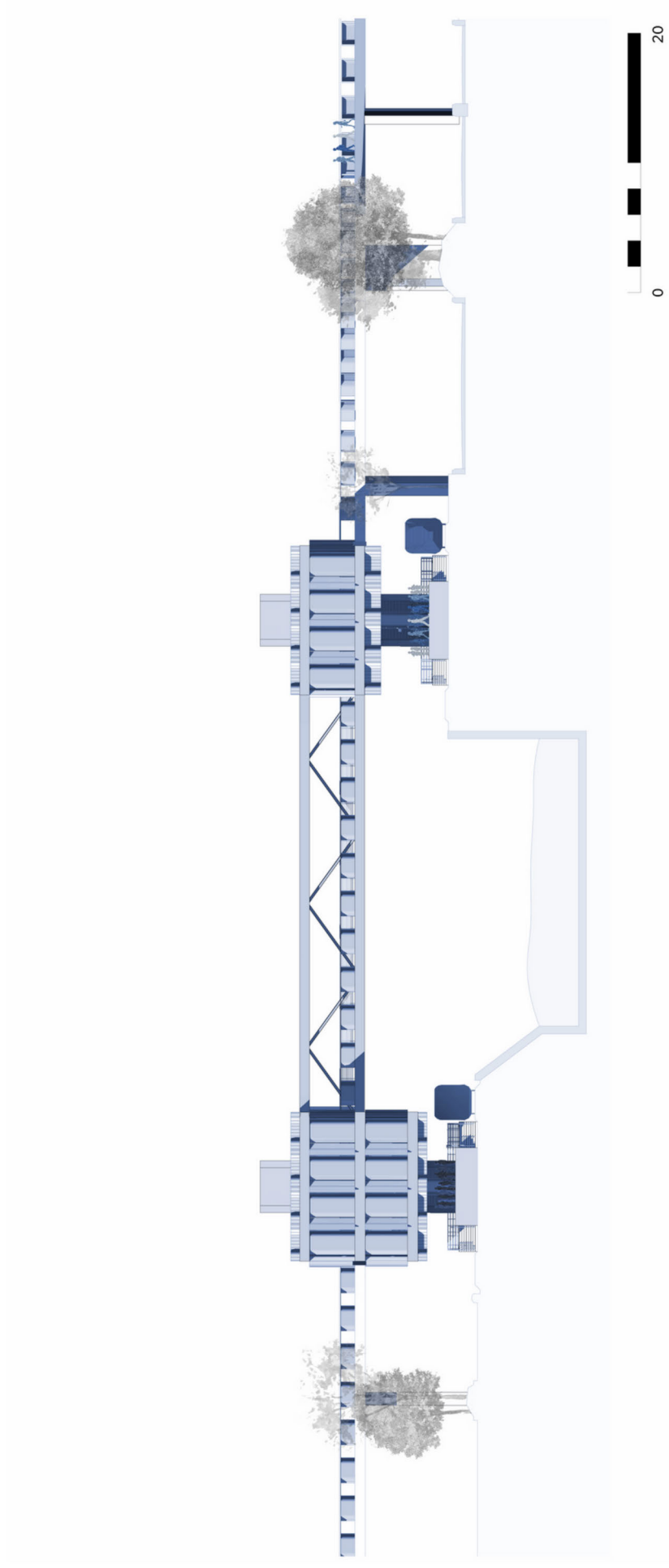
## EAST FACADE



Authors graphic.

# DRAWINGS

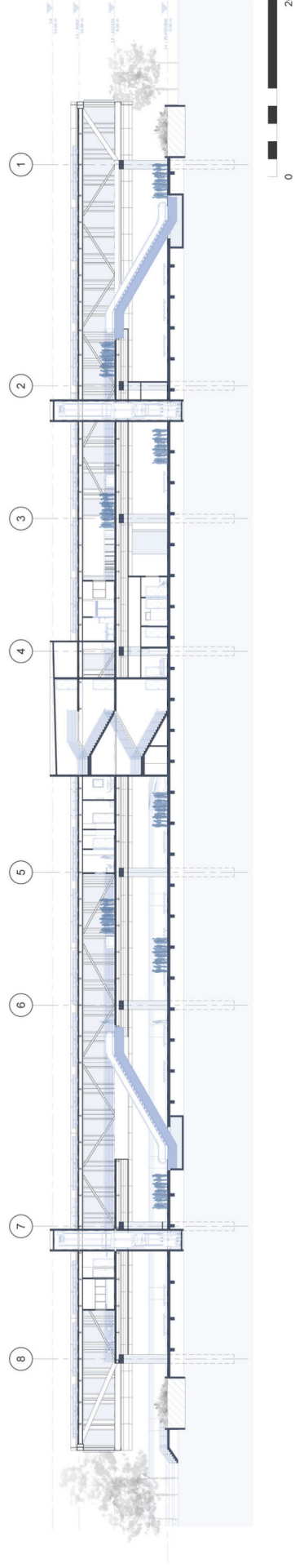
## SOUTH FACADE



Authors graphic.

# DRAWINGS

## SECTION 1

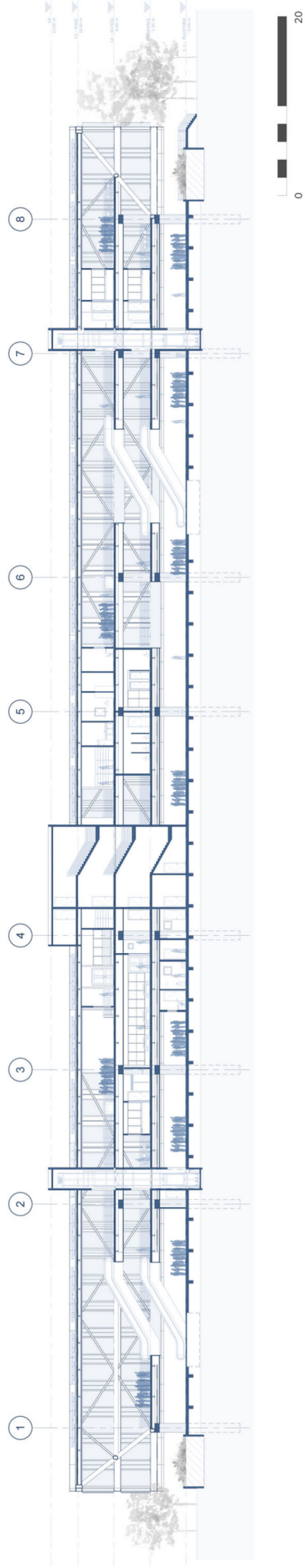


Authors graphic.

# DRAWINGS

## SECTION 2

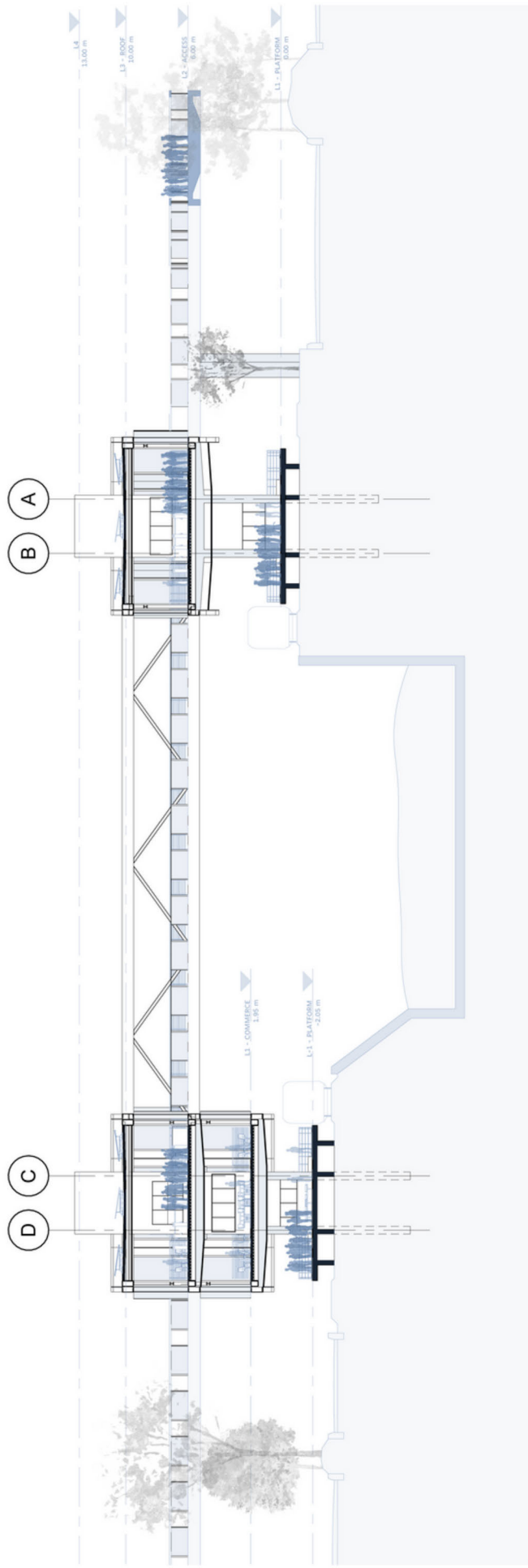
Authors graphic.



Authors graphic.

# DRAWINGS

## SECTION 3

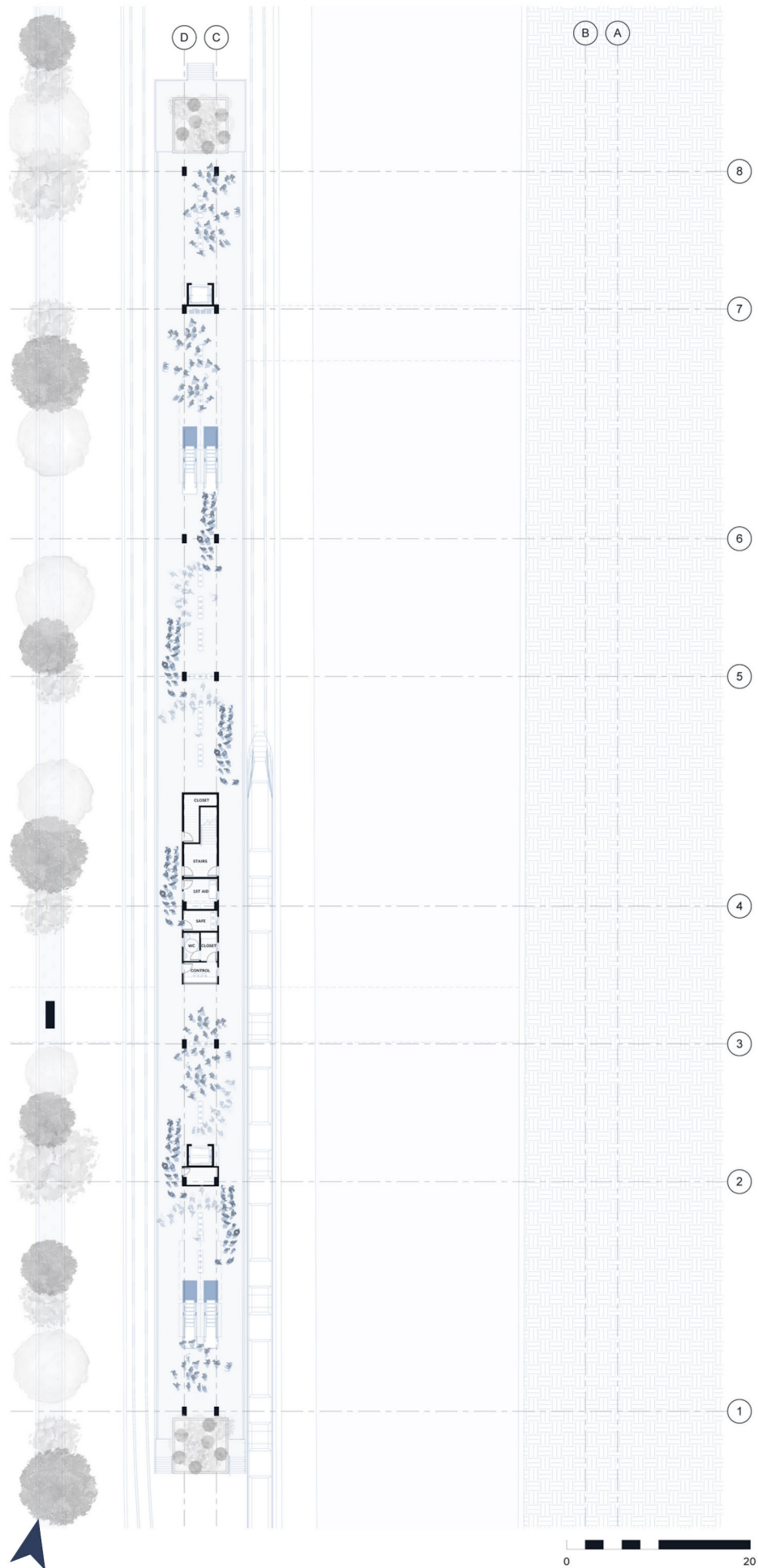


Authors graphic.



# DRAWINGS

L1

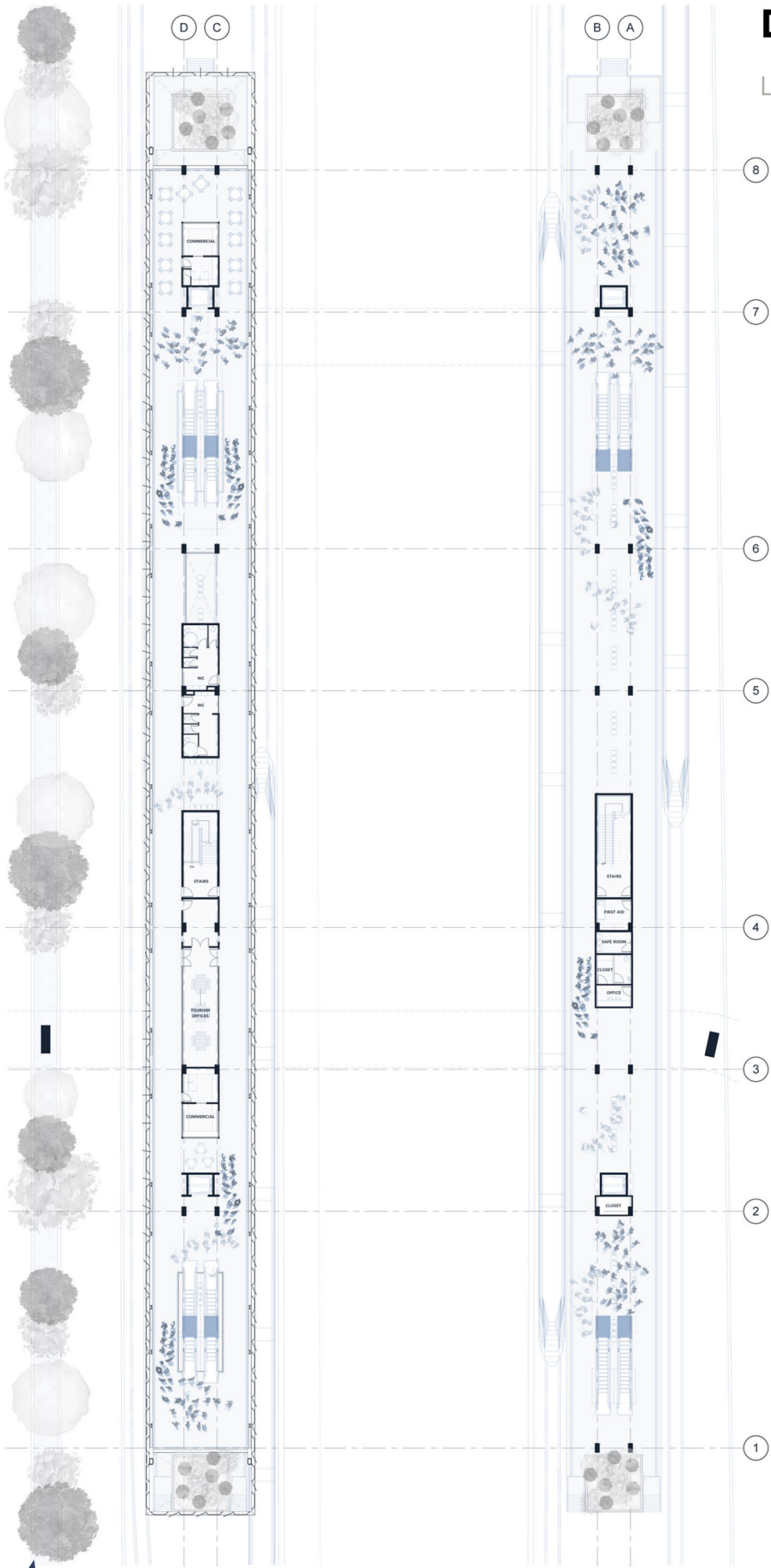


Authors graphic.

0 20

# DRAWINGS

L2



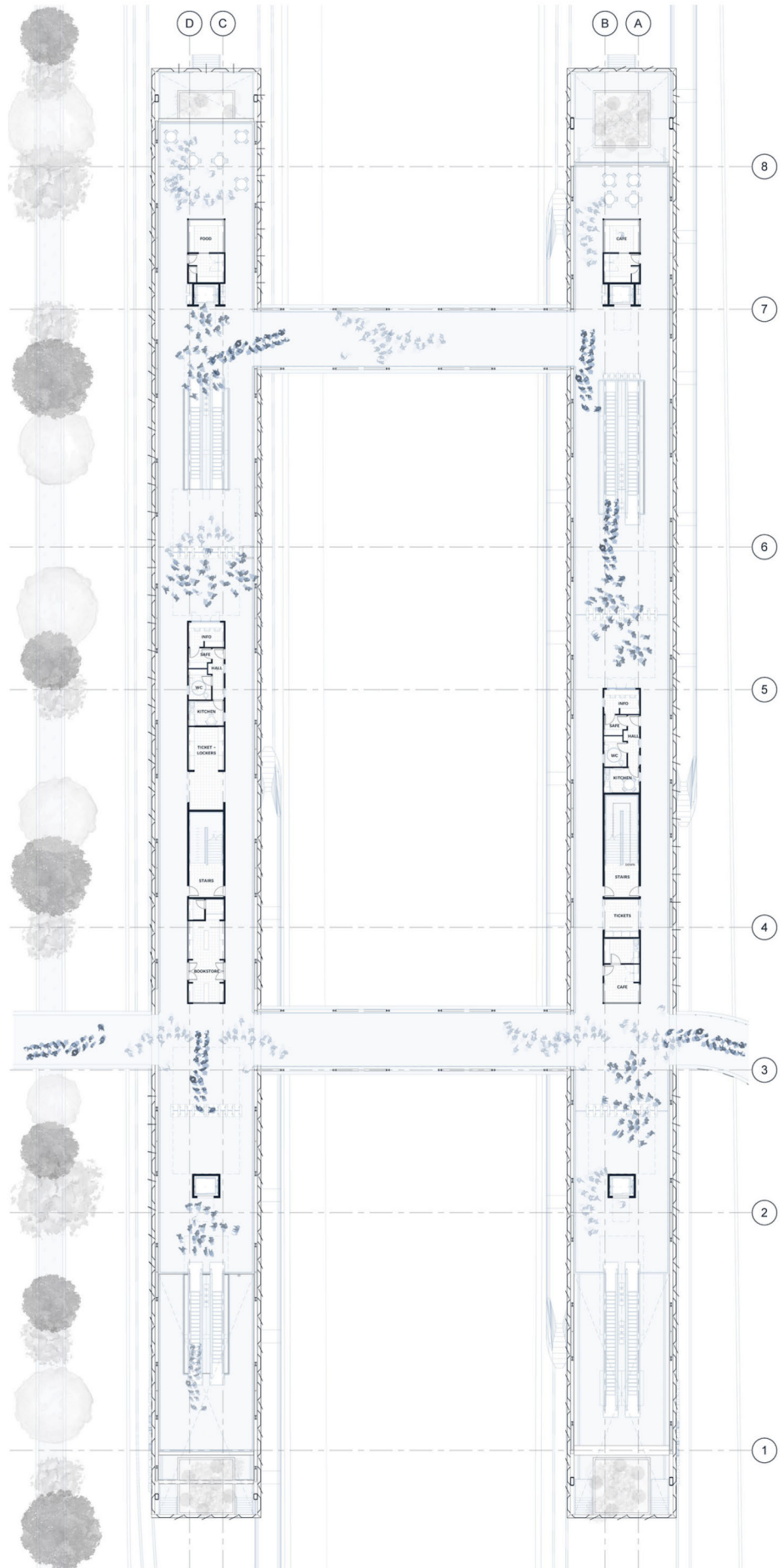
- 8
- 7
- 6
- 5
- 4
- 3
- 2
- 1

0 20

Authors graphic.

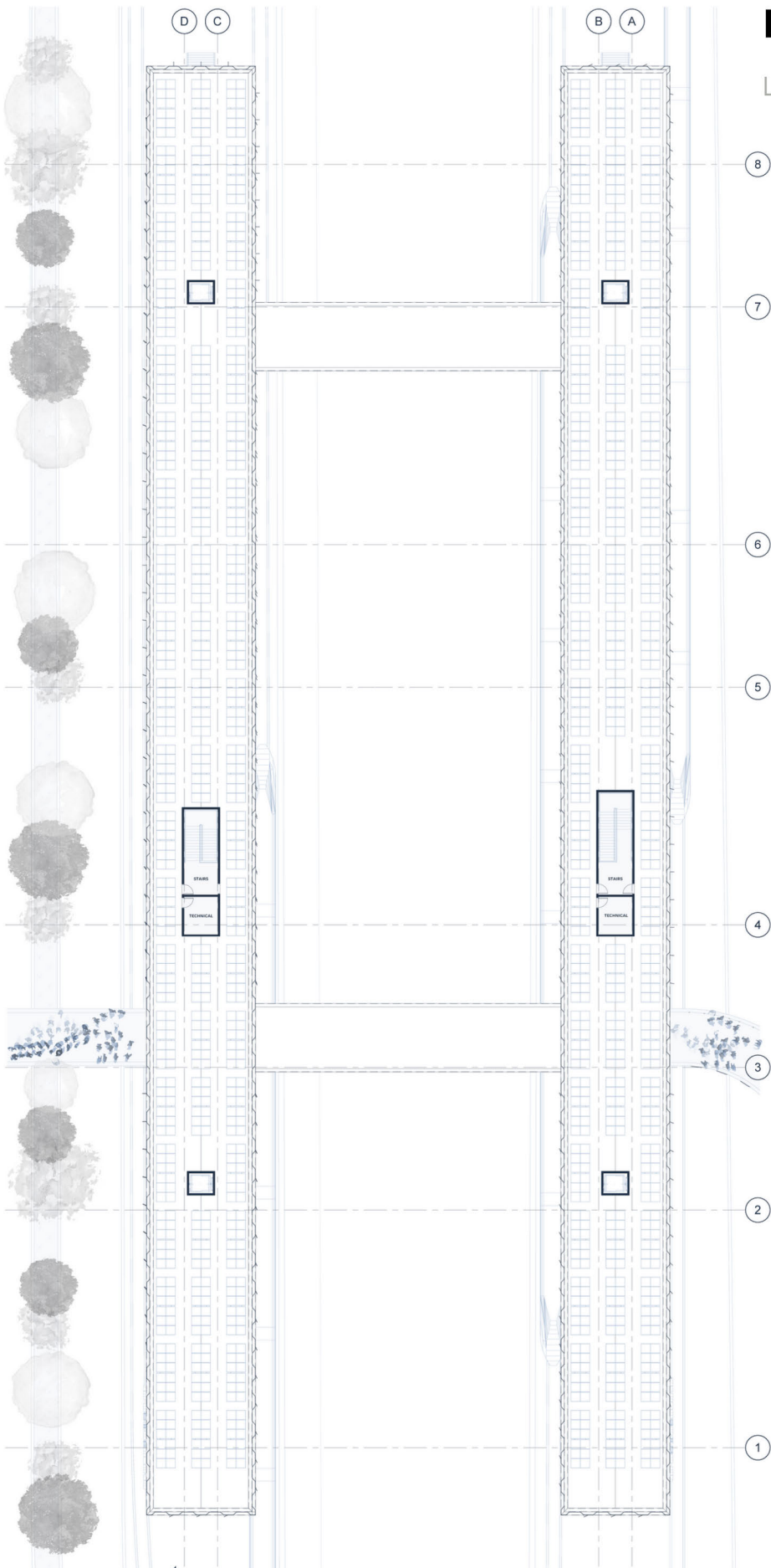
# DRAWINGS

L3



# DRAWINGS

L2

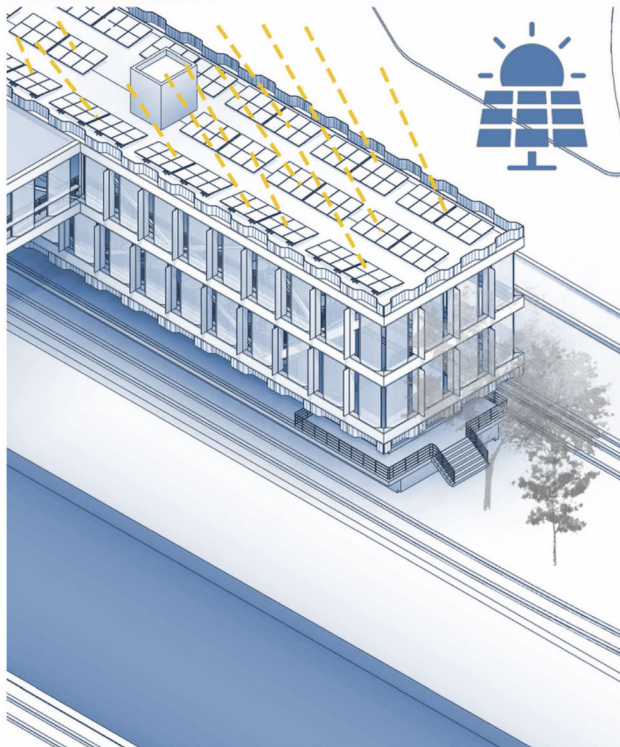


Authors graphic.

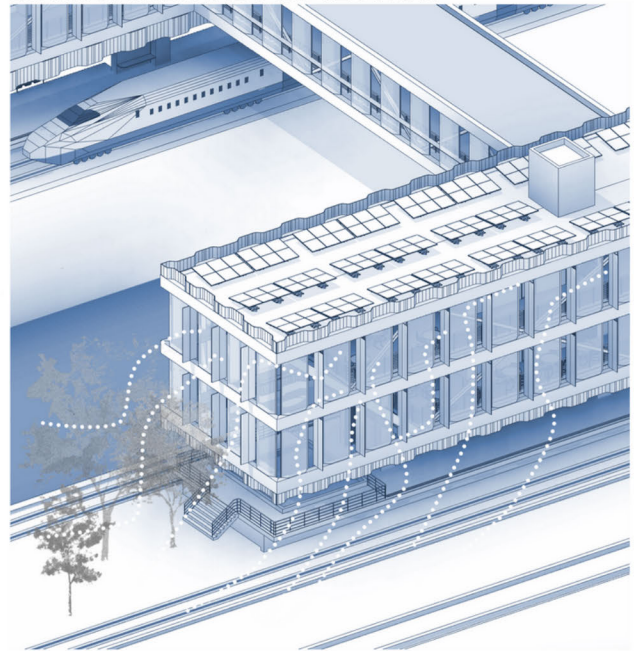
# DRAWINGS

## PASSIVE/ACTIVE MEASUREMENTS FOR THERMAL CONTROL

### SOLAR ENERGY



### ENVIRONMENTAL PROTECTION



Movable facade elements allow for protection over direct sunlight and the elements.



When closed, the polycarbonate elements allow for light to still enter the building.

# VISUALIZATIONS

FLYOVER VIEW OF THE SOUTH HEAD OF THE STATION



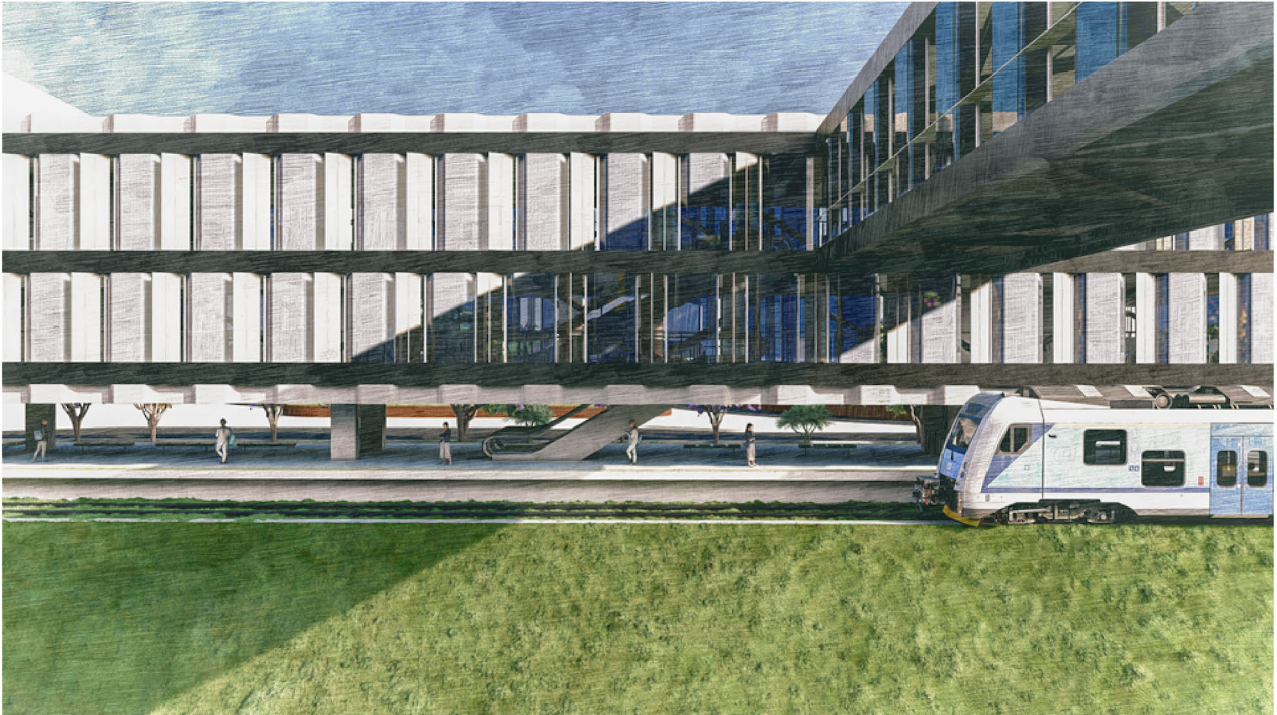
VIEW COMING FROM THE METROPLUS TOWARDS THE RAILWAY STATION



Authors graphic.

# VISUALIZATIONS

VIEW TOWARDS THE RIVER AS PEOPLE ARE WAITING FOR THE METRO



VIEW FROM THE TRANSFER BRIDGE COMING FROM THE METRO TOWARDS THE TRAIN SIDE



Authors graphic.

# VISUALIZATIONS

VIEW FROM THE ACCESS STAIRS AS PEOPLE ARRIVE TO THE STATION



VIEW AS PEOPLE ARE ARRIVING THE METRO PLATFORM



Authors graphic.



Special thanks to the Metro of Medellin for accompanying this process, providing the required information and being helpful all throughout.

## REFERENCES

### SOURCES:

- TPRC. "Multimodal Transportation Centers." Transportation Policy Research, August 3, 2016. <https://policy.tti.tamu.edu/strategy/multimodal-transportation-centers/#:~:text=Description,are%20built%20around%20rail%20lines>.
  - "Historia Del Metro de Medellin." Metro de Medellin, 2024. <https://www.metrodemedellin.gov.co/quienes-somos/historia/>.
  - "Servicio de Transporte Publico de Pasajeros." Metro de Medellin, 2024. <https://www.metrodemedellin.gov.co/memoria-informe-sostenibilidad/servicio-de-transporte-publico-de-pasajeros>.
  - Metro de Medellin. "El Metro de Medellin Repite El Premio Leopoldo Rother En La Bienal Colombiana de Arquitectura y Urbanismo." Metro de Medellin, 2020. <https://www.metrodemedellin.gov.co/al-dia/noticias/el-metro-de-medell%C3%ADn-repite-el-premio-leopoldo-rother-en-la-bienal-colombiana-de-arquitectura-y-urbanismo>.
  - Metro de Medellin. "Metro de Medellin: Sistema Integrado de Transporte Masivo." Metro de Medellin, 2022. <https://www.metrodemedellin.gov.co/hubfs/memorias-de-sostenibilidad/2022/Memoria-de-sostenibilidad-2022.pdf>.
  - Metro de Medellin. "Servicio de Transporte Publico de Pasajeros." Metro de Medellin, 2019. <https://www.metrodemedellin.gov.co/memoria-informe-sostenibilidad/servicio-de-transporte-publico-de-pasajeros>.
  - Metro de la 80. "Sobre El Proyecto." Metro de la 80, 2023. <https://metrode80.gov.co/sobre-el-proyecto>.
  - Jimenez, Juan Diego Ortiz. "30 Anos de La Cultura Metro: ¿Como Nacio y Que Significa?" [www.elcolombiano.com](http://www.elcolombiano.com), September 2, 2018. <https://www.elcolombiano.com/antioquia/cultura-metro-de-medellin-cumple-30-anos-CC9260325>.
  - Metro de Medellin. "¡Conoce La Cultura Metro!" Metro de Medellin, 2024. <https://www.metrodemedellin.gov.co/cultura-metro/>.
  - Medellin Como Vamos. "Movilidad y Espacio Publico." [Medellincomovamos.org](http://Medellincomovamos.org), 2021. <https://www.medellincomovamos.org/system/files/2021-09/docuprivados/Movilidad%20y%20espacio%20p%C3%BAblico%20Informe%20de%20Cali%20de%20Vida%20de%20Medell%C3%ADn%2C%202020.pdf>.
  - Prolego. "Estudio de Ingenieria - Diseno Estructural E Interventoria de Centros Comerciales, Grandes Superficies, Proyectos Institucionales, Proyectos de Vivienda y Proyectos de Infraestructura Como Puentes, Puertos y Pequeñas Centrales Hidroelectricas." DOING, 2023. <https://doingenieria.com/proyecto/97>.
  - Henning Larsen. "Prague Central Station." Henning Larsen, 2023. <https://henninglarsen.com/en/projects/featured/prague-central-station>.
  - SOM. "Denver Union Station." SOM, January 29, 2024. <https://www.som.com/projects/denver-union-station-hub-transit-oriented-development/>.
- [What Is the Capacity of Different Modes of Transit? \(liveabout.com\)](https://www.liveabout.com/What-Is-the-Capacity-of-Different-Modes-of-Transit/)
- MAPS:
- Taken from MapGIS. (<https://www.medellin.gov.co/mappgis9/mapa.jsp?aplicacion=1&css=css/appmapasmedellin.css>)

# ASSIGNMENT

## DOCUMENT:

CZECH TECHNICAL UNIVERSITY IN PRAGUE

Faculty of Architecture

International Office

Thákurova 9, 166 34 Prague 6, Czech Republic



Czech Technical University in Prague, Faculty of Architecture

**ASSIGNMENT of the Diploma project** Transport HUB in La Aguacatala

Master degree Architecture and urbanism

Date of Birth: 07 / 12 / 1997

Academic Year / Semester: 2023/2024 Summer Semester

Department Number / Name: 15116 Department of Architectural Modelling

Diploma Project Leader: Prof. dr. ir. Henri Achten

### Diploma Project Theme:

See the Application Form for DP

### Assignment of the Diploma Project:

1/description of the project assignment and the expected solution objective

2/description of the final result, outputs and elaboration scales

3/list of further agreed-upon parts of the project (model)

To this list further attachments can be added according if necessary.

1.

After identifying pertinent legal frameworks, examining comparable references, and conducting a thorough analysis of the site, it can be argued that the La Aguacatala intermodal station has the potential to evolve into a crucial transportation hub for the city of Medellín. This development could play a pivotal role in the ongoing initiative to boost public transport usage, thereby reducing dependence on private cars and motorcycles in the southern region of the Aburra Valley and Medellín.

Because of this I aim to develop an architectural proposal which integrates several upcoming transportation systems with the existing metro station, creating an interconnected system of buildings which allow for passengers to transfer between them in a safe and efficient manner, while benefiting the public space system of the area allowing for further growth in the future.

2.

- Drawing of wider relations. 1:10 000 - 1:25 1000
- Design Situation wider urban plan. 1:500 - 1:1000
- Plans, sections and views. 1:100 - 1:500
- Details (structures, Facades or any other required drawings). 1:25 - 1:50
- Interior & exterior visualizations.

3.

All parts of the diploma project will be submitted in accordance with the decree - i.e a portfolio in two copies, a CD with the project, the diploma students declaration, the assignment, A1 sheets for the exhibition of diploma thesis. scales of drawings and models will be specified with the diploma project leader during work.

Date and Signature of the Student:

Date and Signature of the Diploma Project Leader:

Date and Signature of the Dean of FA CTU:

*Pablo Pelaez*  
15.2.2024  
*Henri Achten*  
*J. Kucera*



Czech Technical University in Prague, Faculty of Architecture

**DIPLOMA PROJECT APPLICATION FORM**

Name and Surname: Pablo Peláez Pérez

Date of Birth: 07/12/1997

Academic Year / Semester: Summer semester 2023-2024

Department Number / Name: 15116 Department of Architectural Modelling

Diploma Work / Diploma Project Leader: Prof. dr. ir. Henri Achten

Diploma Work / Diploma Project Theme – title in English language:

Transport Hub in La Aguacatala

Signature of the Diploma Work / Diploma Project Leader:

The Student's Declaration:

I declare that I have fulfilled all the diploma work / diploma project initiation requirements stipulated by the "Study Plan" and "Study Rules" at the Faculty of Architecture, CTU in Prague.

In Prague on 15.2.2024

Signature of the Student .....



<b>CZECH TECHNICAL UNIVERSITY IN PRAGUE</b>	
<b>FACULTY OF ARCHITECTURE</b>	
<b>AUTOR, DIPLOMANT:</b> <b>AUTHOR OF THE DIPLOMA WORK / DIPLOMA PROJECT</b> Academic Year ..... 2.0.2.3 ..... 2.0.2.4 ..... Semester	
<b>TITLE OF THE DIPLOMA WORK / DIPLOMA PROJECT</b> (IN CZECH LANGUAGE) <b>LA AGUACATALA TRANSPORT HUB</b>	
<b>TITLE OF THE DIPLOMA WORK / DIPLOMA PROJECT</b> (IN ENGLISH LANGUAGE) <b>LA AGUACATALA TRANSPORT HUB</b>	
<b>LANGUAGE OF THE DIPLOMA WORK / DIPLOMA PROJECT:</b>	
<b>Diploma Work / Diploma Project Supervisor</b>	Ústav: Department of Architectural Design III  Achten Henri H, Prof. Dr. & Pavlíček Jiří, Ing. Arch., Ph.D.
<b>Diploma Work / Diploma Project Opponent</b>	<b>Martin Kaftan</b>
<b>Key Words (Czech)</b>	
<b>Annotation (Czech)</b>	La Aguacatala ma projít velkými proměnami přidáním říčního vlaku a lehkého vlaku 80th Avenue. Přemístění FLA připraví půdu pro strategii rozvoje se smíšeným využitím zahrnující obytné a komerční struktury, stejně jako městské bloky vhodné pro pěší. Bude zřízen dopravní HUB, který bude sloužit jak obyvatelům, tak návštěvníkům a zlepší celkový zážitek z městského života. Začleněním říčního vlaku a stanice metra do jednotné struktury na západním břehu, cestující budou těžit z přímých transferů, čekacích zón, možnosti stravování a udržitelné výroby solární energie. Zřízení dopravního uzlu dále pozdvihne přitažlivost oblastí nabízející pohodlí a dostupnost všem, kteří procházejí korytem, a to bezproblémovou integrací různých druhů dopravy a vybavení.
<b>Annotation (English)</b>	La Aguacatala is set to undergo major transformations with the addition of the river train and the 80th Avenue light train. The relocation of FLA will pave the way for a mixed-use development strategy incorporating residential and commercial structures, as well as pedestrian-friendly city blocks. A transport HUB will be established to cater to both residents and visitors, enhancing the overall urban living experience. By integrating the river train and metro station into a unified structure on the west bank, passengers will benefit from direct transfers, waiting zones, dining options, and sustainable solar energy generation. The establishment of a transport hub will further elevate the areas appeal offering convenience and accessibility to all who pass through. By seamlessly integrating different modes of transportation and amenities.

**The Author's Declaration**

I declare that I have elaborated the submitted diploma work / diploma project independently and that I have stated all the used information sources in coherence with the "Methodological Instruction for Ethical Preparation of University Final Works".

*(The complete text of the methodological instruction is available for download on <http://www.fa.cvut.cz/En>)*

In Prague on .....  ..... Signature of the Diploma Project Author

*This document is an essential and obligatory part of the diploma project / portfolio / CD.*

