

# “tactical urbanism to reduce heat islands in cities”

The street design challenge 2023 wanted us to think about how to use tactical urbanism to reduce the effect of heat islands in cities.

Tactical urbanism is about empowering local people to make meaningful changes to their environment as a grass roots movement instead of waiting on governmental change to happen.

# research

The city we will be working on, is the city of Curitiba in Brazil. Curitiba is the capital of the state of Parana in the south of Brazil. Relatively close to the ocean, high up and surrounded by jungle in a subtropical highland climate: This means there are cold, drier winters and hot wet summers. This climate makes it one of the coldest cities in Brazil, yet very humid.

This city is a great example for tactical urbanism, because it is known for its high civic engagement and environmental awareness. There are multiple running social projects regarding the environment and sustainability. As well as a state of the art public transport system and a vibrant downtown geared towards walkability and pedestrians.

Having such a big, diverse population, due to its multicultural history, there is an ongoing search for cultural identity.

The street we have been assigned is the Senador Alencar Guimaraes Street. It connects Rui Barbosa Square, Curitiba's biggest bus terminal with Osório Square, the heart of downtown. Over 30.000 people pass through this transit street on a daily basis. The street is separated in three zones, one pedestrian, one for vehicles and one for facilities. Windflow mainly originates from the east. It gets a lot of sun during the hottest part of the day.

The southern park is mainly paved and traps the heat of the busses, in contrast to the northern part which has a lot of vegetation and water elements. It's a lively park with lots of street vendors.

Cities are significantly warmer than surrounding rural areas. This is what's known as the urban heat island effect. It is a growing problem in our current environmental crisis, because over 56% of people worldwide live in cities and this number is expected to double by 2050.

Typically this is an issue with the use of heat storing materials like concrete and asphalt. Curitiba in particular has the issue of humidity, which functions as a greenhouse gas, further trapping the heat in the city. Which makes Curitiba's heat islands most noticeable at night. We want to focus on cooling this hot air. This would have a positive impact on sleep, mental health and general wellbeing.

Our solution will therefore try to incorporate a shading and even reflective aspect, to keep solar radiation from heating up materials. Cooling the air directly is hard, especially using plants, because the air is already saturated with water. Therefore we would like to let the air lose moisture by letting it condense against cool metals. Existing winds in the area aren't usually very strong, we should try to use them as effectively as possible.

We were inspired in our design by the busy street and city life as well as the architecture and history of the city. We would like to stay out of the way of the usual flow of the street.

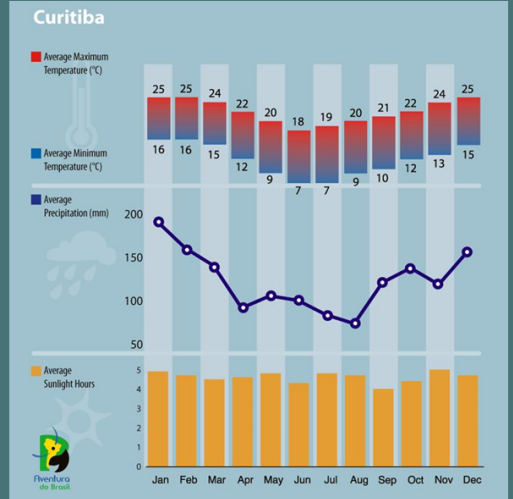
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• Brazil



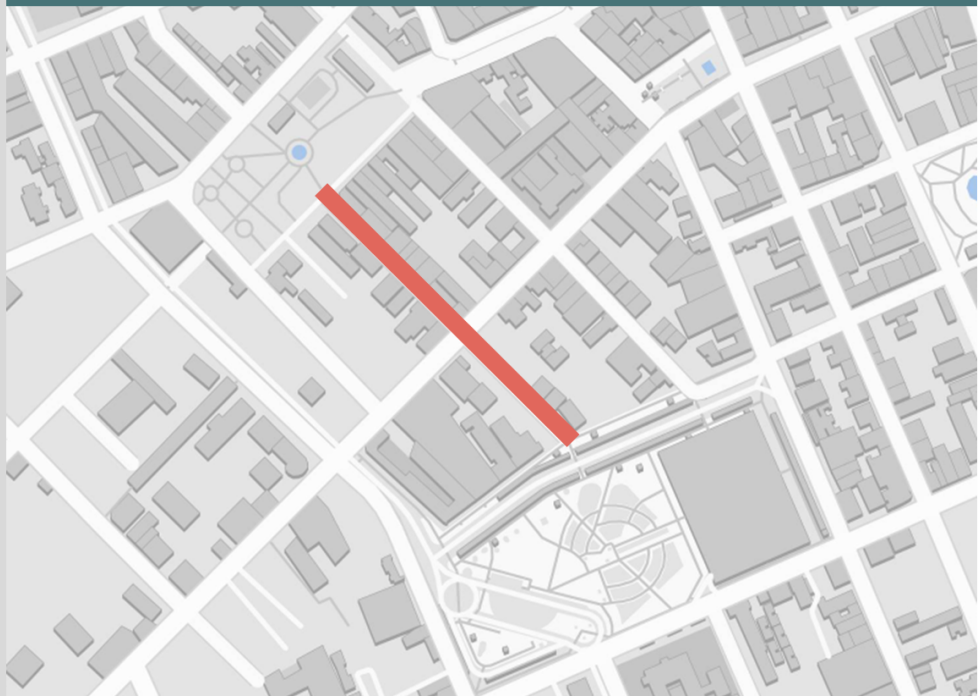
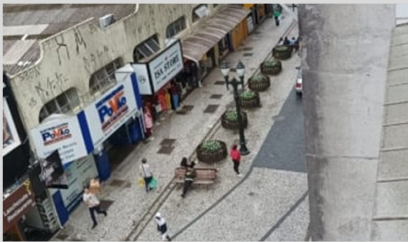
• Curitiba



- One of the coldest cities in Brazil
- Subtropical highland climate
- Cold, dry winters
- Hot, wet summers
- High humidity
- Morning fog
- 1.773.733 inhabitants
- Multicultural city
- "green city"
- Environmental awareness

# Senador Alencar Guimarães Street

- Open-air shopping mall
- 30.000 people circulate there every day
- Connection between Osório Square and Rui Barbosa Square, Curitiba's biggest bus terminal
- High concentration of commerces and services
- Mostly passed by elderly people, students and families without children
- Pedestrian walkway



We started our design with some general research of tactical urbanism and the urban heat island effect the evening before the brief.

At 10am, when we received our assigned location, we immediately went to work on figuring out more about Curitiba.

We divided the research into several bite sized chunks to effectively work in parallel.

After a short presentation of this heap of new information to each other, we brainstormed about what exactly our problem entailed and decided on a specific problem to solve, with a defined set of constraints. This is where we decided to focus on heat retention during the night and how to mitigate it best.

Several ideas came up and after delving into the venturi effect and how to implement it on street level, we decided to go back to the root of the problem.

We need to cool air that is already saturated with water. The idea of cooling towers came up in several variations.

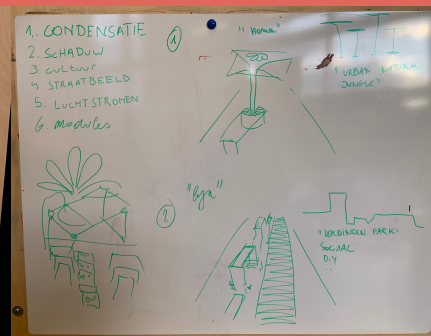
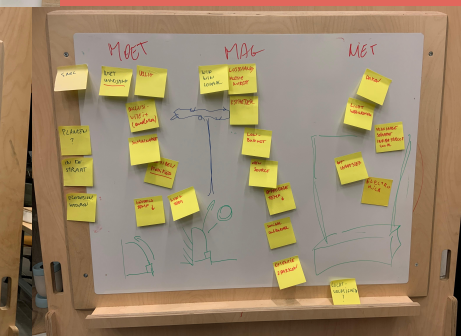
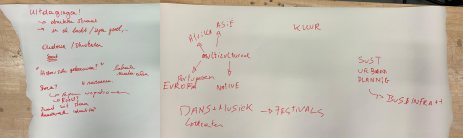
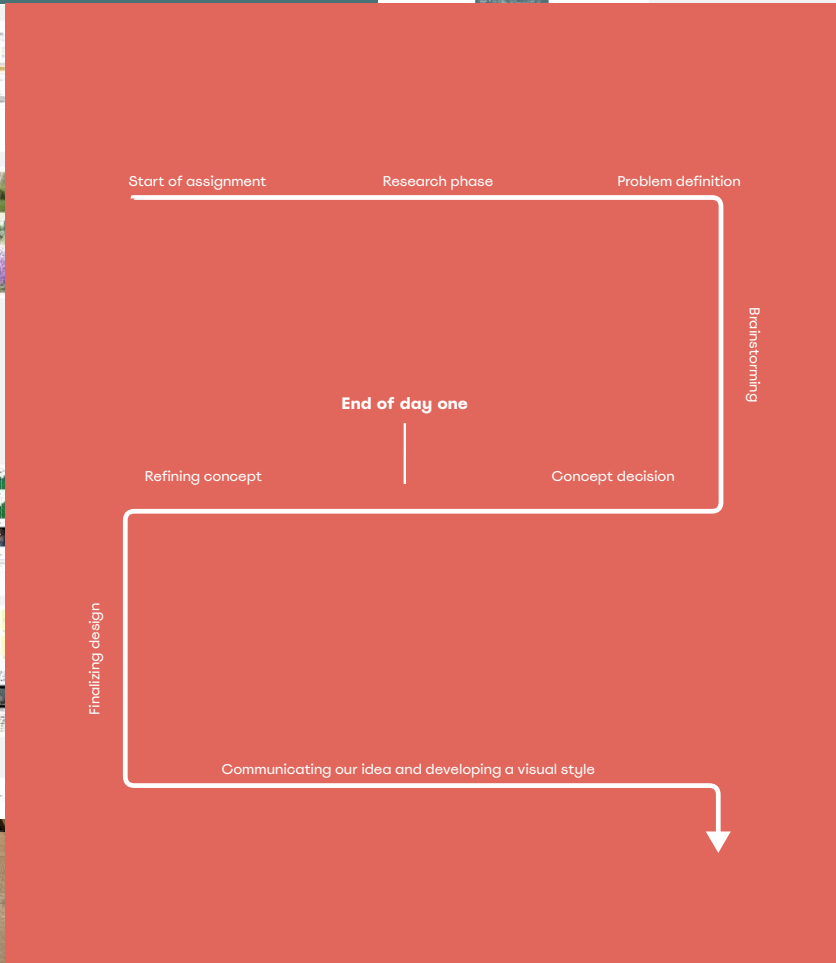
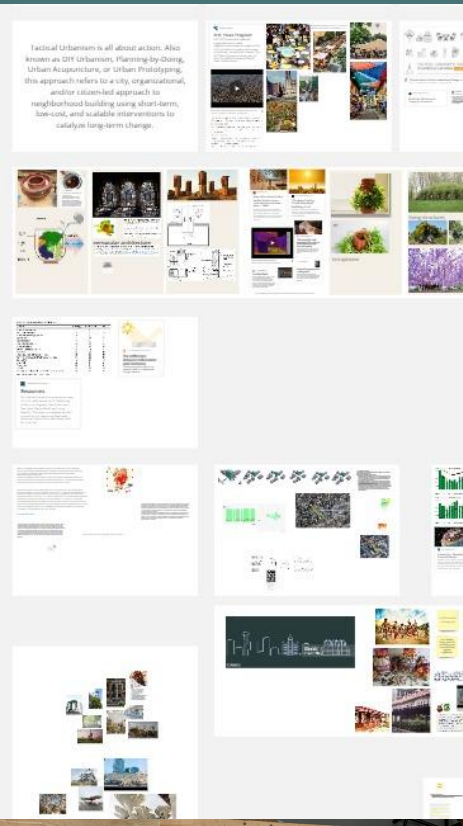
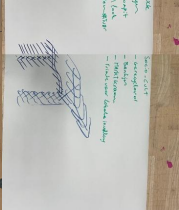
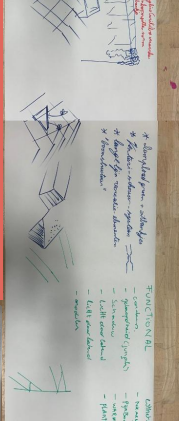
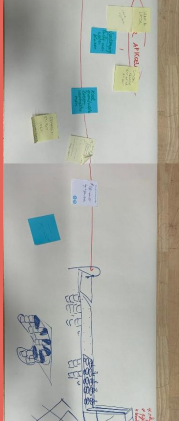
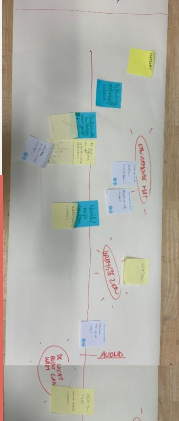
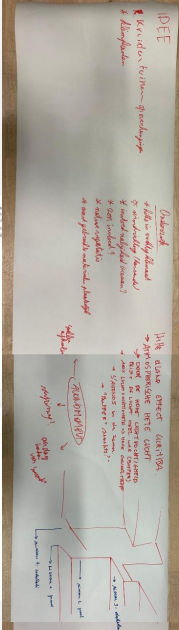
Narrowing these ideas down, we came to two concepts that all of us liked. Before the end of the first day, we decided on one and went to bed.

The second day of this challenge, we got to work immediately on refining the concept and making it visually appealing.

A render setup was made, we brainstormed about the details and the idea was finalized. We now got to work on communicating our idea.

We decided what visuals were needed, what information needed to be shared to understand the concept and again we split up and got to work.

With information selected, written down and some visual aids, we got together to work on a visual style and worked on finalizing all necessary documents.



# concept

We were inspired in our design by the busy street and city life as well as the architecture and history of the city. We would like to stay out of the way of the usual flow of the street. Our design should function as a bridge between the two natural and cultural hubs at both ends of the street.

Sprout is our proposed solution. It acts as a natural cooling system and provides shade. It incorporates street furniture, green spaces and other amenities. Considering the quality of public space for community use and interaction.

We were inspired by the pine nut, a symbol of this community in combination with the dynamic architecture of Oscar Niemeyer. We called it Sprout, because it ended up looking like a little newly developing plant. It resembles this city's energetic and hopeful community.

The relatively small parts to build it can be sourced locally out of scrap materials. The main structure is made of wood, with a metal core for stability and heat conduction to a surface level shaded pool of water.

Air is guided along the cool metal surface which draws the moisture out of the air by condensation. The metal is kept cool with a metal pin, like a root, connecting it to a small body of water increasing its overall heat capacity. The wooden structure protects this from heating up by providing shade and itself does not conduct heat.

The modules are flexible and in both their placement and height. They can be extended as needed. These modules combined, create an 'urban jungle' effect, that enhances existing airflow.

Our grid is slightly tilted, to keep the water from piling up on the structure. This place is intended for customizable modules.

These open source modules fit inside the grid and can add relevant functions to the 'Sprout'. It leaves room for local initiatives to adapt the street to their needs, present and future. This social aspect enhances spontaneous encounters.

We designed a few modules as examples. A birdhouse, a little table for coffee shops and some planters for urban green space. Some additional ideas are insect hotels, spaces for posters and community building initiatives.

# sprout

## model one with seat



Shading structure made of reclaimed wood. Coated to withstand the elements and to reflect the sun

Metal zone that acts as a cooling system

Conducting root for heat transfer from the cooling zone. And adding structure to the system

Space for water to accumulate

Tilted grid serves four functions

- Guides air in an upward direction
- Leaves visual line-of-sight intact
- Keeps water from piling up
- Provides space for customization

# sprout

## model two without seat



# function

- Tackling heat islands in Curitiba by working with condensation
- Promoting ventilation inspired by "jungle effect"
- Giving shadow
- No obstruction (transit street, shopping, ...)
- Modular, flexible
- Visual transparency

# aesthetic



# Social-cultural

- Sitting opportunities
- Adding green spaces in public street
- Flexible interpretation for extra uses
- Bridge between 2 green spaces
- Reference to the historical art movement of paranimism

# threats

- Captures heat between buildings
- The contribution of more green is less effective in humid climate
- High density of underground infrastructure
- Buildings are still being developed and under construction
- Allowed restrict circulation of vehicles
- Preservation of existing street aesthetics

# Curitiba's heat islands

## night heat islands



### radiation of materials

Materials store heat by day, release heat by night



### high humidity heat-buffer

Humid air easily stores heat and slowly cools off by night



### need for ventilation

Ventilation can help the cooling process of the air

# opportunities

- Connection between two important squares
- Large flow of pedestrians of all ages
- Calm street in a busy downtown area
- Pavement already optimized material and color to not absorb heat
- Economic valued transit street
- Architectural and geographical composition is ideal for captivating airflow



### adding shade

Protect materials from heating up by day & promotes shade for persons



### condensation

Cools down humid air by letting the air condens against metal material



### enhance airflow

Take advantage of existing airflow and enhance it





Sprout is a modular structure that tackles heat islands by providing a primitive cooling system throughout the street and enhances a buzzing street life.

It leaves room for local initiatives to adapt the street to their needs, present and future

It is designed with a lot of respect for existing flows and infrastructure and nature.

It boosts local economy and gives a sense of cultural identity

