AREP

A sensory map for Rennes railway station

01 Analysing extreme heat periods

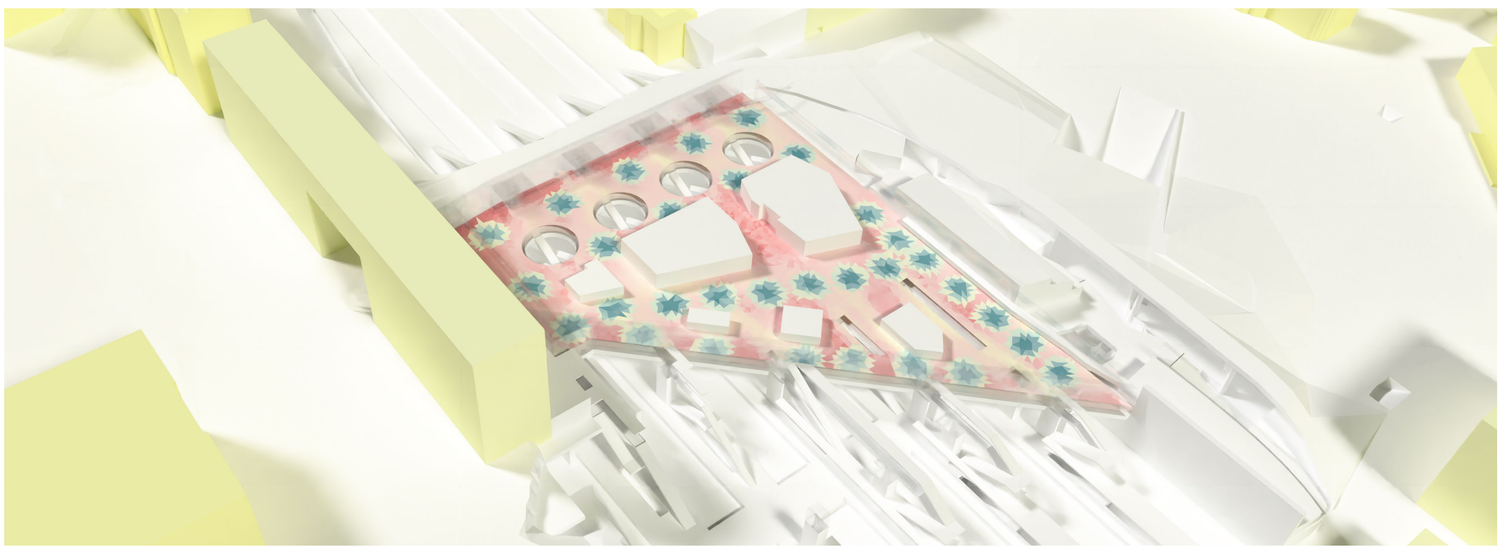
Context
In the summer of 2022, heat waves caused significant overheating in the hall of Rennes railway station, with temperatures reaching up to 45°C. These extreme conditions severely disrupted operations, leading to passenger discomfort, delays, and also difficulties for the retail businesses.
SNCF Gares & Connexions commissioned AREP develop adaptation plans for the railway station, in response to future heat waves. The approach is based on two complementary studies : a climate analysis conducted by AREP L'Hypercube and a sensory diagnosis carried out by AREP Design.

Project client : SNCF Gares & Connexions, Direction Régionale des Gares Bretagne – Centre – Val de Loire, Pays de la Loire and the CSR Department of SNCF Gares & Connexions

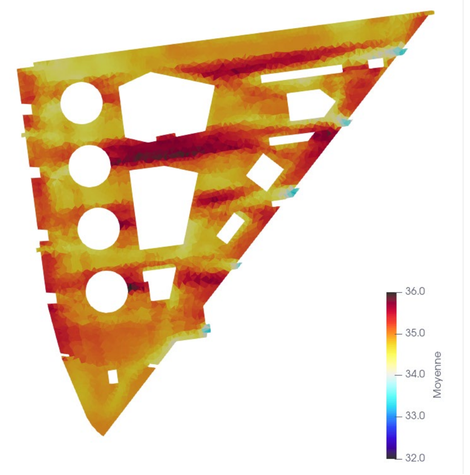
Project Management : AREP Design Departement & the Hypercube studio

Delivery : 2024

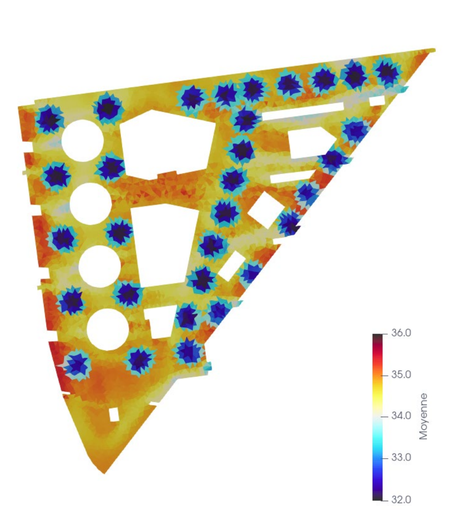
Climate analysis by AREP l'Hypercube
The climate study is based on a multiphysical diagnosis using a combination of digital tools to analyze thermal exchanges, solar flux distribution, and airflow velocity fields within the hall. This is achieved through the use of EnergyPlus, Radiance, OpenFOAM, and proprietary software. These simulations quantify the impact of overheating phenomena and evaluate various mitigation scenarios, such as optimizing natural ventilation, installing ceiling-mounted air circulators, or adding exterior solar shading. The approach also integrates a model of human metabolism, translating these data into perceived comfort levels based on physiological mechanisms of thermal regulation (sweating, vasodilation, shivering, etc.). The objective is to accurately map discomfort zones and periods, understand their causes, and test the effectiveness of mitigation strategies in a context of energy efficiency and climate change adaptation.



Perceived comfort - Scenario with air circulators (AREP l'Hypercube)[2]

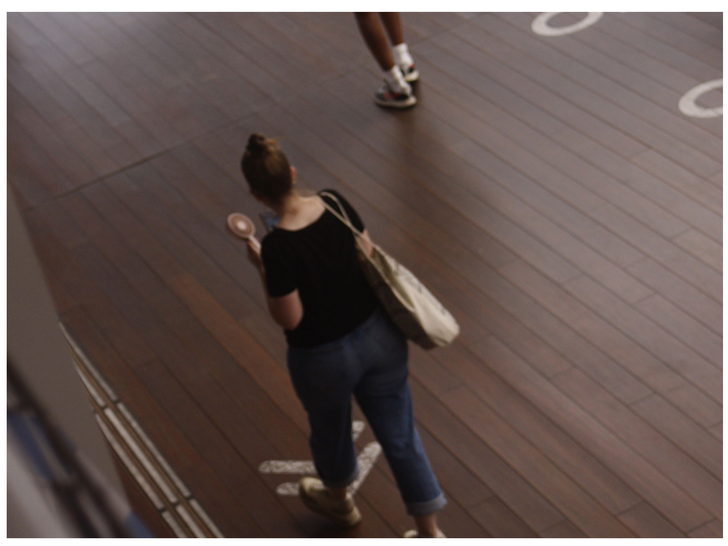


Perceived comfort averaged reword the hottest week of the year (AREP l'Hypercube)



Perceived comfort with the integration of air circulators (AREP l'Hypercube)

Additionally a sensory diagnosis
In parallel, the sensory diagnosis focuses on the subjective perceptions of users and staff. How do they experience heat in the station? Which areas are perceived as more or less bearable? What adaptation strategies do they spontaneously adopt? The sensory diagnosis was structured around several key areas : analyzing adaptation of practices and the use of spaces during periods of extreme heat, gathering perceptions through testimonies and subjective experiences, identifying the most vulnerable areas of the station, and proposing initial suggestions for improving thermal comfort. These suggestions explore possible action levers such as organizational adjustments, space design, cooling systems, and flow management.



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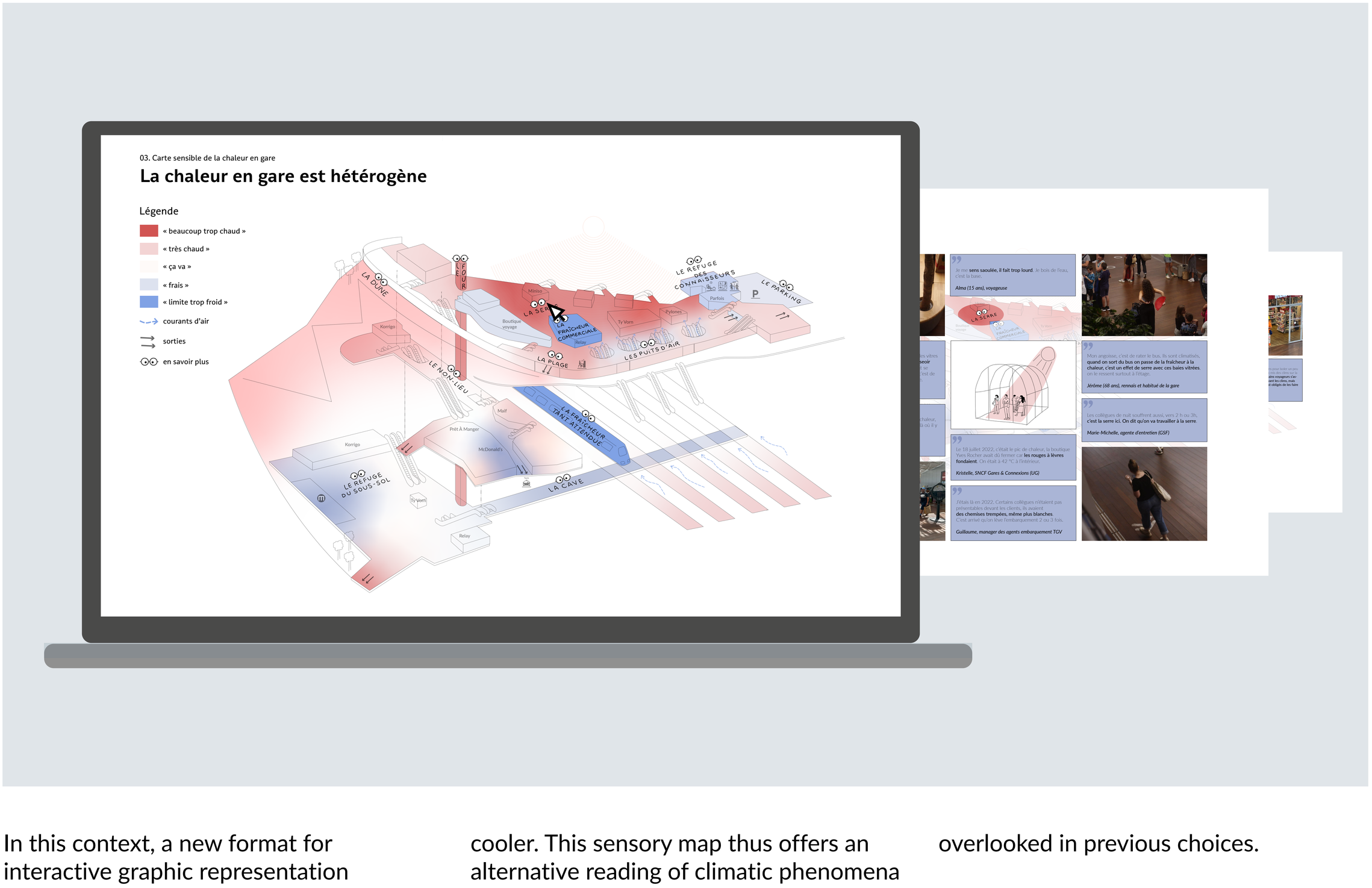
02 Representing perceptions during extreme heat periods

Methodology
To produce this deliverable, qualitative interviews were conducted with staff and service providers (maintenance, management, security, boarding, etc.), as well as semi-directive interviews with a panel of railway station users, both Rennes residents and regular passengers. We also immersed ourselves in the railway station during very hot weather, by organising a '*Station Office*': an open session for spontaneous exchanges of views and experiences with passengers.

A sensory map



In this context, a new format for interactive graphic representation was tested: the '*Sensory Map*'. This representation, in the form of an axonometric drawing, provides a subjective reading of comfort within the station and aims to reflect sensations, emotions, and experiences. The coloring of the axonometric drawing illustrates the overall perception of heat in various spaces. It is neither a factual representation nor a mapping of actual temperatures, but rather a graphic tool that qualifies thermal atmospheres and reveals the most uncomfortable areas, in contrast to others perceived as cooler. This sensory map thus offers an alternative reading of climatic phenomena in public spaces. It immerses the reader in the experience of users and fosters empathy to better understand the magnitude of the situation, going beyond a purely scientific framework and opening the door to a new way of showing perceived thermal atmospheres in the context of climate change adaptation.

This tool was particularly appreciated by the project's clients and partners due to its ability to represent sensory elements that are difficult to visualize but are essential for decision-making, often overlooked in previous choices.

This approach facilitates access to complex information, making it more understandable and actionable. Furthermore, this work provides a synthesis of data held by some but mentioned informally, without formal documentation to support it. It also helps create impactful mental images, such as 'the main hall is a greenhouse' or 'the forecourt is a dune that's difficult to climb'. Thus, these sensory data are made quickly and intuitively visible through a simple mouse hover over a single image.

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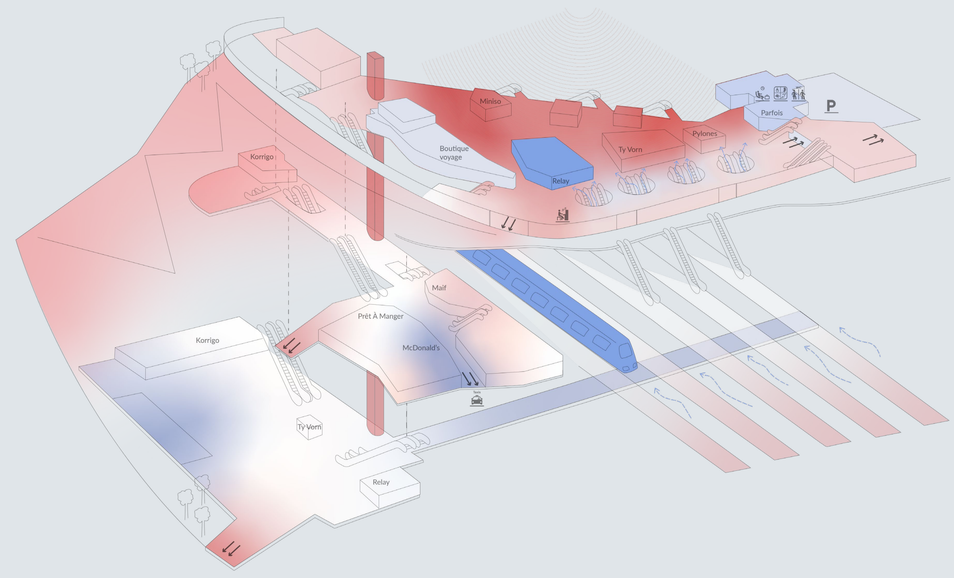
03 Graphic system used for the sensory map

Graphic ingredients



An axonometric map of the entire area
to make it more understandable for everyone.

« beaucoup trop chaud »

« très chaud »

« ça va »

« frais »

« limite trop froid »

A color legend of the axonometry that does not correspond to measured temperature but to perceptions, expressed in the form of quotes.

LE FOUR

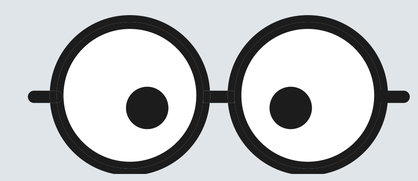
LA SERRE

LE REFUGE
DU SOUS-SOL

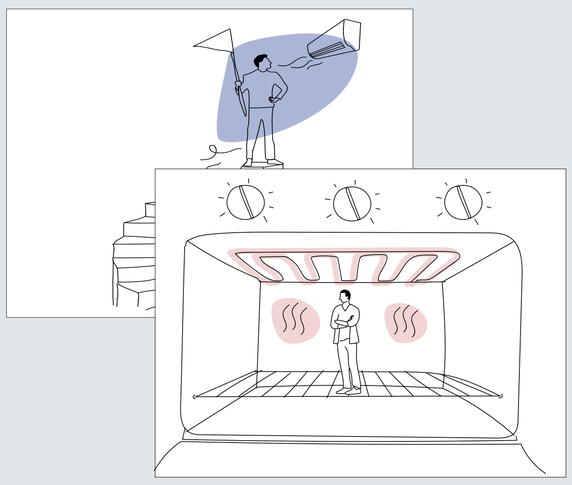
LES PUITS D'AIR

LE REFUGE
DES CONNAISSEURS

A handwritten script to enhance the sensory dimension of areas perception and the imagination it evokes, moving away from the technical and conventional toponymy of stations (hall, underground passage, forecourt…).



A glasses icon inviting the user to hover over and take a look.



Line drawings illustrating
the dominant feeling for each area.

Photos of travelers and spaces illustrating postures, attitudes, and space usage during periods of extreme heat.

> C'est la foule qui renforce la chaleur. Je fuis les vitres et les endroits ensoleillés. Je veux juste mon train.
>
> *Em*

> En 2022, en passant la porte, on était assommés, il faisait 40 °C au soleil. C'est comme s'il faisait 50 °C dès qu'on sortait.
>
> *Ma*

> Les collègues de nuit souffrent aussi, vers 2 h ou 3h, **c'est la serre ici. On dit qu'on va travailler à la serre**.
>
> *Marie-Michelle, agente d'entretien (GSF)*

Excerpts from interviews with travelers and staff, describing the areas through anecdotes, feelings, and emotions experienced during heatwaves.

This work is also informed by ongoing internal reflections on the representation of sensory elements using typically technical formats (such as plans, axonometric drawings, etc.) common in our field. We identified that within our deliverables, it is challenging to convey the feelings, emotions, and experiences of users, which are often central and significant in projects involving stations or public spaces. As a result, we had to reinvent the graphic system we typically use for station representation and create a language much closer to illustration and the world of comics, with the aim of telling the stories of the analyzed places.