

# Identifying 'Urban Void' Along the Shortest Path in the University Tramway and Walking Environment

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**Abstracts:** The New City of Ali Mendjli tram line is more than just a public transportation axis; it represents a new tourist product that strongly impacts the socioeconomic environment and the city's image. Since its inauguration in 2014, it has been catering to a student population estimated at 60,000. However, the layout of this dedicated line raises issues concerning the accessibility of the neighborhoods and the buildings it serves. Throughout its 400m corridor, we have identified accessibility constraints stemming from inadequate topography, indirect access to buildings within the central areas, and an unclear urban landscape, unfortunately, unqualified due to the city's design based on a network of vehicular traffic. In this quintessential university town, student housing can present an opportunity for sustainable development, especially when taking advantage of its proximity to the tramway. Therefore, the New City needs to craft a distinctive image worthy of its status and display its local identity. This article aims to identify the tramway as a means of public transportation concerning its practical, comfortable, and secure usage. Additionally, we seek to explore perspectives on optimizing university commuters' movements through walking. To achieve this, we present an experience that analyzes students' perception of their university environment, its strengths, and risks regarding circulation, pathways, and locations through the interpretation of visual diagrams. The conclusions drawn from this exercise will aid in designing "void frameworks" intended as markers to assist pedestrians in orienting themselves from the tramway, ensuring sustainable development for the New City of Ali Mendjli.

**Keywords:** Sustainable Development, Tramway and Walking, Traffic Risks, Visual Diagrams, University Socioeconomic Environment, Void Frameworks, Itinerary.

## 1. INTRODUCTION

The issue of sustainable development in urban fabrics is currently sharply highlighted for modern cities, as articulated by Jacques Lucan in 2022 [1]: "It will be interesting in a few decades to see if contemporary spatial and technical solutions in housing construction also lend themselves to evolutions." In this article, we propose a thematic approach related to this concept, which involves integrating pedestrian movements within urban spaces and requalifying the landscape through an "itinerary," which refers to the path to follow as mentioned by Ariane Devanthery, in 2011 [2], a designer of guides and itineraries: "It confronts objects (books, maps) and concepts (pathways), physical movements, and much more internal, intimate, or spiritual journeys."

The tramway, functioning as an itinerary, appears as a product of perceptual cartography designed to present the reality of places in a setting that highlights the most advantageous points. It has become a highly prosperous market due to its positive impact on the environment and its economic development stakes. This dedicated public transportation mode is currently implemented in several major urban areas. Notably, Constantine operates on its tracks. This project was undertaken during the event: "Constantine, Capital of Arab Culture (2015)." Moreover, it is within this same vision that European cities awarded the title of European Capital of Culture have forged new images using "city branding" techniques (Richards Greg & Wilson Julie, 2004) [3]. According to the project lead Laurent Vos (2016) [4], the tramway's route was planned with the objective of "allowing the residents of Ali Mendjeli to shorten their travel time to the center of Constantine from two hours to fifty minutes." This decision is justified because the most important arteries of the agglomeration, particularly the national roads (R.N.5, RN.3, RN.10, RN.79), that bear the heaviest traffic loads, have become congested.

Without reiterating the virtues of dedicated collective transportation and the drawbacks of other road transport means, particularly private vehicles, the tramway is designed to reduce the number of buses dedicated to transportation, especially for students, and to promote the economic sector, such as the ZAM (Mixed Activities Zone) and agricultural lands. Additionally, the tramway serves the most attractive zones, including major facilities and tourist attractions. According to a survey conducted by Harkat Imane and Benrachi Bouba (2018) [5] on the appeal of new public transportation modes in Constantine, it was revealed that the tramway is the most influential mode of public transportation shaping the city's image. Its positive impact on the environment and landscape has encouraged the perception of the local territory's identity through symbols associated with this infrastructure, such as the beekeeping farm and honey production called "Miel tram" (Harkat, 2023) [6], as well as buildings like the paramedical training school, the urban security center, the Al Khalifa cultural center, and the Faculty of Architecture in Constantine. Identifying high-potential locations while imbuing the landscape's role reflects the work of Fortin, Marie José (1999) [7] on "the construction of local identity and its potential contribution as a mobilizing place to stimulate the process of local development." Ensuring sustainable urban development through architectural elements effectively defines the city's image and promotes the economic sector. As cited by Jean-Francois et al. (2004) [8], "the act of architectural creation, whether expressed in terms of buildings, landscape, or urban composition," lies within the architect's responsibility.

If a certain coherence is visible in the landscape of the New City. In that case, we find, at a minimum, the moldings, the shape and dimensions of openings, and the number of loggias as the most distinctive elements of the dominant residential buildings. Apart from these architectural differences, the void represents a considerable land opportunity, also estimated in terms of air volume, yet unfortunately polluted by intense vehicular traffic and blurred by the diffusion between private and public properties, creating labyrinthine environments within large housing complexes that residents describe as "sugar cubes," "squares and circles" referring to the built volume, the plot, or elements of the facade. Furthermore, the void gives rise to urban environments that are difficult to manage, as cited by Guillaume Pouyanne in 2010 [9]: "policies for the development of large complexes, generating NIMBY effects (Not In My BackYard) and residential sorting practices aimed at selecting the type of population in the neighborhood." The role of the architect, mentioned by Jérôme Boudon et al. in 1998 [10], "first appears as a sculptor of the void, molding it in the way of furnishing and filling it," cities should allure their residents by offering the best collective transportation networks both by public transport and walking (Montreal Metropolitan Regional Transit Authority, 2023) [11]. Additionally, because Le Corbusier [12] stated that "walking naturally follows the principle of least action (energy)," to ensure better development for the new city, it is necessary to combine walking with the tramway as a means of public transportation and consider avenues for designing situations that facilitate the learning of "wayfinder" strategies (Boumoud Abdelhakim, 2012) [13].

Our objective is to create a socio-economic student environment where we can diversify the housing types in an image that attracts visitors because it corresponds to what is described in orientation plans, particularly GPS, as Bertho Lavenir (1998) mentioned. [14]: "The image creates the tourist; they only go to check on-site if it told the truth." From this standpoint, we have pondered the study question: What should be considered in the urban landscape of the New City tramway line to emphasize its identity as a sustainable university town? If the location is identified by the mode of transportation, how can we assist transport users in recognizing the place with its local specificities? Indeed, orientation plans, mainly via GPS, often favor the shortest routes, which might not necessarily align with reality. These paths are sometimes obstructed by physical barriers such as fences or are in poor condition, rendering them impassable.

This article aims to share an experience focused on understanding students' perceptions of the surrounding landscape within the context of Saleh Boubnider University in Constantine, situated along the tramway corridor. Our experience with the students, entitled "void frameworks," draws inspiration from CO exercises (Martin Mottet, Jacques Saury, 2013) [15]. It is justified by the prevalence of voids in the context of Saleh Boubnider University. The objective is to test the participants' recognition of landmarks, their types, and locations compared to data concerning the shortest path (Nicolas Hayer, 2015) [16].

### 1.1. Description of the Constantine Tramway Route

The directly accessible area within a 400-meter radius around each tram stop (Gerson Antoine, 2011) [17] mainly consists of residential buildings and educational facilities (see Figures 1 and 2). It is structured by two bus terminals and a multimodal station. Additionally, it facilitates connectivity among the three universities in Constantine and two activity zones. However, we observe that functional accessibility is not optimal in all areas.

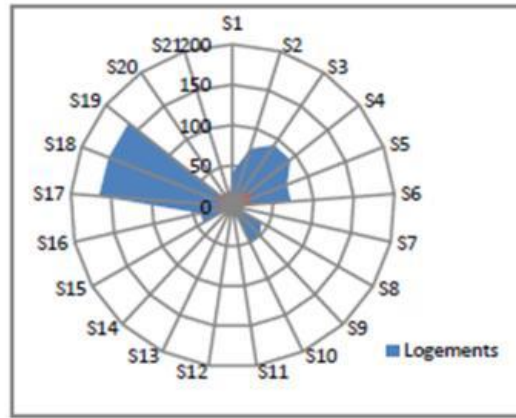


Figure 1. Housing densities in the Constantine tramway corridor.

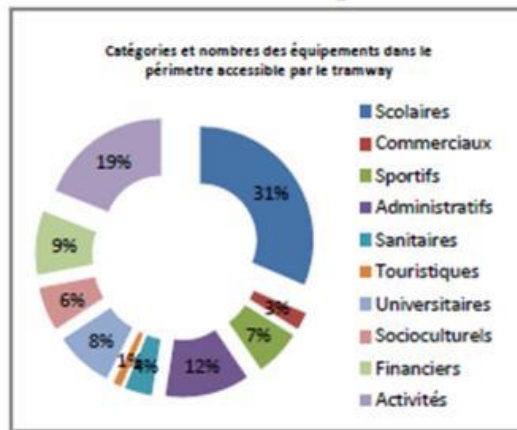


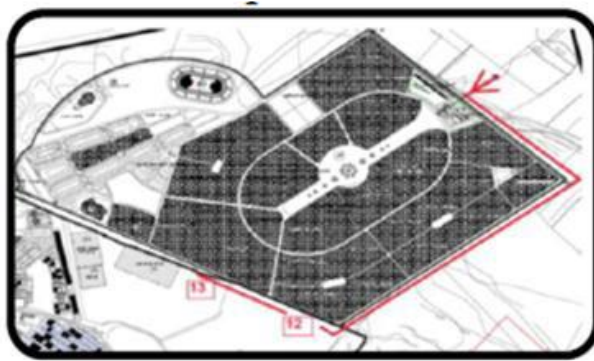
Figure 2. Equipment by type in the Constantine tramway corridor.

Except for the section connecting the New City bus terminal to Abdelhamid Mehri University-Constantine 2 (S20 and S21), the poor placement of certain stations leads to extended pedestrian feeder distances, making sites and buildings challenging to access. This is evident at stations S12 and S13 located at Saleh Bounider University Constantine 3 (see Figure 3), where the lack of interconnection between different modes of public transportation makes accessibility to the university town difficult.

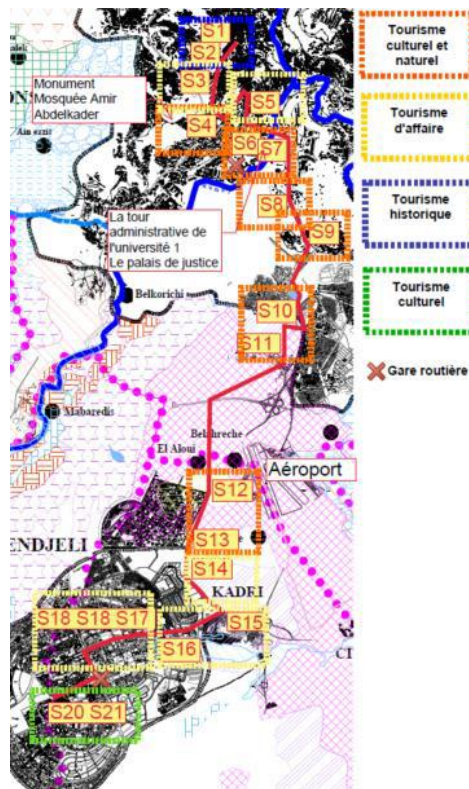
Furthermore, consulting videos published by the company responsible for the construction of the Constantine tramway (CITAL, 2021) [18] helped us identify tourist sites (see Figure 4) falling into two categories: business and leisure centers located in the lively New City hosting shops (like Mal Ritej), hotels, and natural sites starting from University 1 and extending to the entrance of the New City, Ali Mendjli. These sites offer captivating views of the landscape, comprising hills and greenery. At the last two stations serving Saleh Bounider University-Constantine 3, the airport and the Zenith, a contemporary building serving a cultural purpose, can be seen from a distance. Accessibility to the Zenith via public transportation is challenging despite its prominence. Situated along the East-West highway, it will soon be served by the tramway but currently needs more visibility. Moreover, the city's challenging topography significantly influences the New City tramway route. As a result, several costly infrastructure

works have been executed (see Figure 5), including multiple underpasses, viaducts, and an overpass (Algeria Press, 2021). By analyzing slopes, we assessed pedestrian accessibility at each station. The findings revealed that these sites are challenging to reach from the tramway, with slopes exceeding 5% and reaching up to 25% in the northern part.

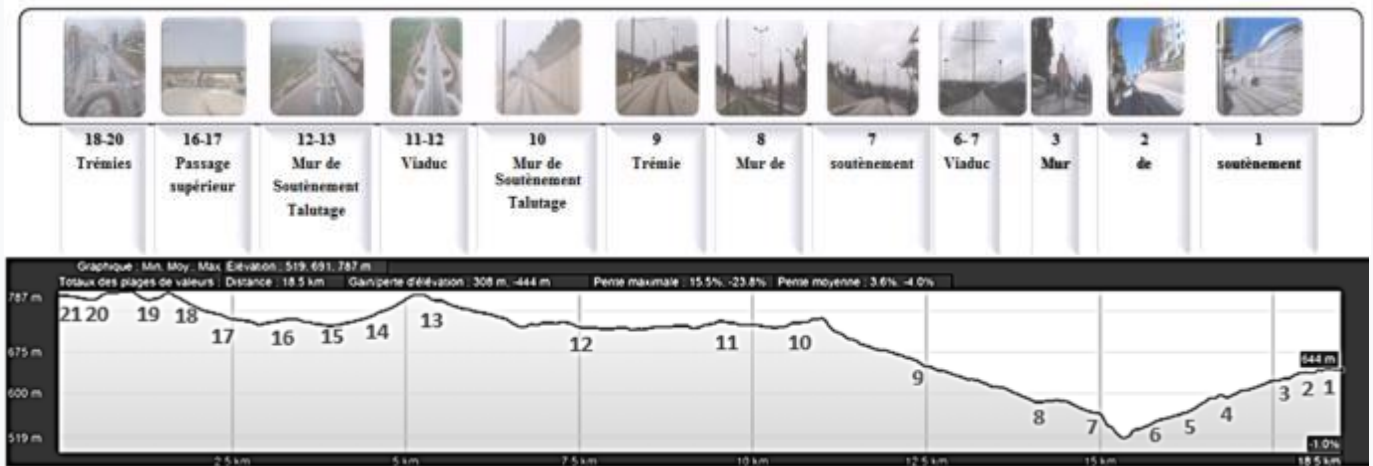
Furthermore, the surroundings do not cater to pedestrian needs, lacking proper amenities and greenery. Sidewalks are left unfinished, resembling unpaved terrain, and traffic flow is hindered within the medians due to aligned trees and signage panels in the middle.



**Figure 3.** Poor accessibility to University 3 from stations S12 and S13, in New Town.



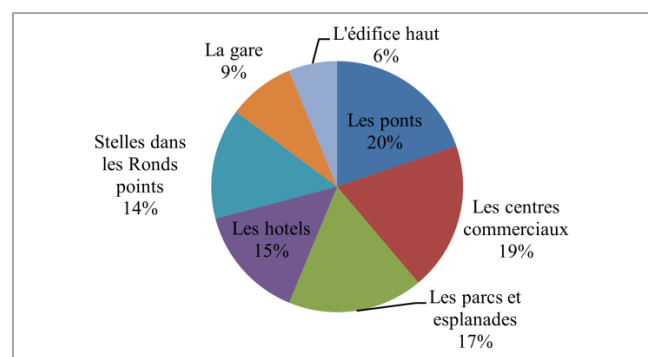
**Figure 4.** Identification of tourist sites and their categories on the Constantine tramway axis.



**Figure 5.** Topography of the land crossed by the Constantine tramway and types of engineering structures carried out in the project.

### 1.2. Influence of the Environment on Students' Preferences in Urban Planning, Places, and Modes of Transportation

In response to the questions above, we surveyed students from the three major universities directly served by the tramway to assess the influence of this environment on their preferences regarding urban planning, places, and modes of transportation. The results indicated that students acknowledge the risks associated with road traffic in the university environment and prefer pedestrian-friendly amenities (228 cases), including green spaces and fountains (226 cases). They express a preference for pedestrian pathways to reduce pollution from vehicular traffic (103 cases), facilitate social gatherings with friends (73 cases), and have bicycle parking facilities (129 cases). They also desire increased availability of shops (143 cases). They prefer landmarks such as bridges, shopping centers, parks and promenades, hotels, and monuments at roundabouts for orientation purposes. However, train stations and tall buildings were mentioned less frequently, as depicted in Figure 6.



**Figure 6.** Landmark elements in the university environment.

To understand how university students perceive their environment, we selected a sample of 35 architecture students to obtain improved visual representations of this space in diagrams, as explained by Ellouze Karray, H. (2006) [19]: "Understanding landmarks situated within the environment" and "Representations characterizing the pathways between different landmarks."

## 2. MATERIEL AND METHODS

To conduct this experiment, two teams of students—one composed of final-year students and the other in foundational years—were supervised. The author guided the first team during the visit to familiar locations for the students, who experienced difficulty articulating their actions and sensations. In contrast, the second team underwent the visit without guidance, serving as a comparative group. The outcome for both cases was in the form of visual diagrams and observations. Our objective in this exercise was to compare the learning of the environment between architecture students in foundational years and those in their final year. It aimed to determine the most suitable level to effectively represent orientation elements in the university environment and assess the importance of environmental learning, a task successfully executed by the students in the first team. However, the students in the second team failed in this aspect, as we will see in the results.

## 3. RESULTS AND DISCUSSIONS

### 3.1. Students' Perception of their Environment

The results revealed that final-year students depicted the diagrams in a structured sequence, focusing on the main destinations: the university campus restaurant and private restaurants opposite the university entrance. Landmarks along this route were not considered nodes but prominent landscape elements. The visual diagrams illustrate that the environment comprises five sequences and numerous landmarks classified into four types: 1. Ground landmarks, 2. Built landmarks, 3. Natural landmarks, and 4. Architectural landmarks. Their distribution is represented in Figure 7. Additionally, we observed that walking activities occurred under favorable conditions due to flat ground within the university's pedestrian area and sidewalks. However, the narrowness of the sidewalks, lack of green spaces and amenities, and other constraints hindered walking activities, such as the absence of directional signs, benches along the sidewalks, and shade (Figure 8). Participants found certain aspects of this environment remarkable, including the university's monumental entrance, the mausoleum, specific façade details on certain buildings, and easily expressing directions due to symmetrical treatment and the regular layout of the plan represented by rectangular plots arranged on either side of the symmetry axis, accentuated by the presence of two circular squares called roundabouts and fountains. However, they did not depict the natural landscape, the highway, the tramway, the Zenith, or the international airport, which are situated further away in the background of the landscape.

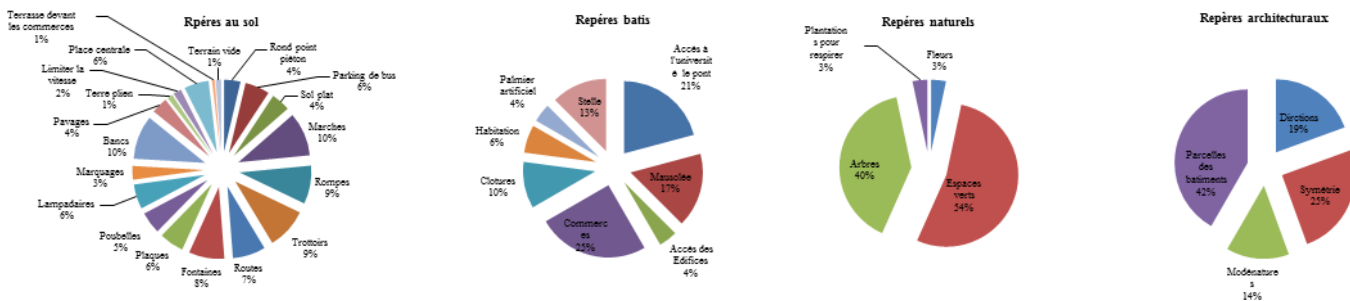


Figure 7. The types of landmarks cited by the students.

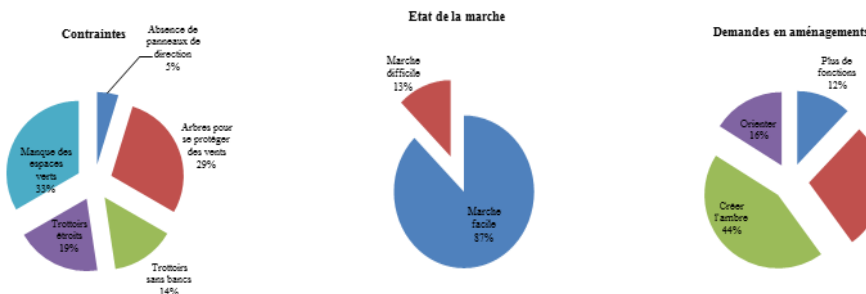


Figure 8. De

On the other hand, students' perception of traffic densities, hence the attendance at places, revealed that the most crowded spaces were justified by the presence of the university's main entrance, faculties, the girls' university campus, the bus station, and private restaurants. Meanwhile, less crowded spaces were depicted in the pathways between the faculties and the university restaurant, often referred to as streets due to the narrow spacing between buildings compared to other areas where buildings are more distant from each other, creating a sense of emptiness expressed in phrases like "big boulevard, big roundabout, big square" (Figure 9) and diagrams such as the one in Figure 10.

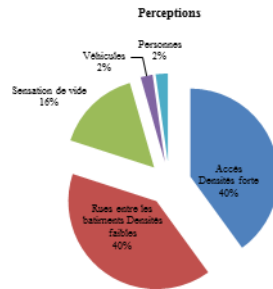


Figure 9. Perception of emptiness by the participants of the first team.

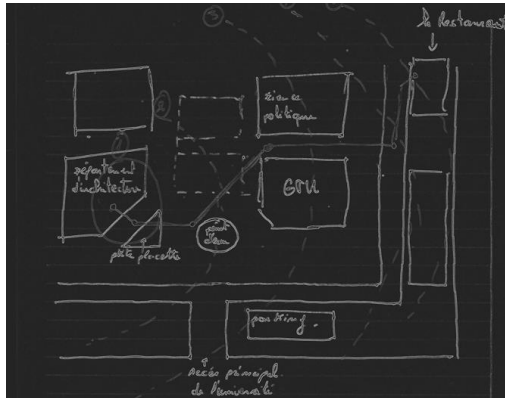


Figure 10. Patterns in which the participant discussed the feeling of emptiness.

For the second team, their urban reading focused on describing movements between two significant destinations: interior spaces and shops, highlighting the prominent elements of university access and the plaza in front of the architecture faculty entrance. In their case, these students from the foundational years, less informed about these methodologies, completely overlooked the external physical environment. Their representation mainly reflected their perceptions of the unfavorable microclimate due to the lack of trees and vegetation, making interior spaces more appealing than outdoor ones (Figure 11). This is evident in their diagrams (Figure 12), where several instances indicated the drawing studio layout, essential destinations such as restaurants and shops, and the university entrance. This indicates that the students expressed the external environment through movement, while interior spaces were depicted for relaxation, emphasizing cleanliness, privacy, and tranquility.

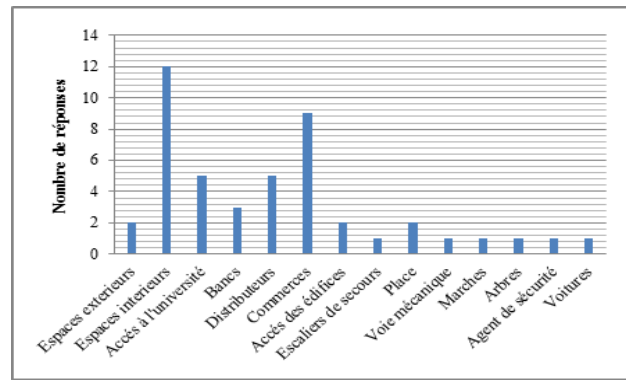


Figure 11. Rate of representation of remarkable elements of the environment by the second team.

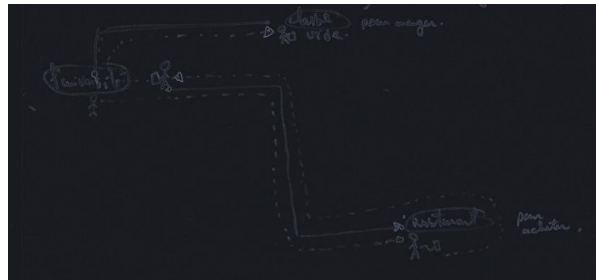


Figure 12. Diagram presented by a student to show the importance of interior space compared to exterior space.

### 3.2. Disagreement between the shortest path plan and the real context which increases the travel time

As a result of these analyses, we tried to select the most relevant landmarks cited by all the students participating in the survey, numbering 335. It turned out that the word roundabout with a stele has been the most cited even to qualify circular places where there is an element of the same type. So we chose the roundabout located at the university corridor at the intersection of the main boulevards of the New City because it was very visible. We also chose it for its proximity to the multimodal station, Mal Ritej, Abdelhamid Mehri University and student accommodation. Then we connected it to the university by a shortest path provided by GPS as shown in Figure 13.

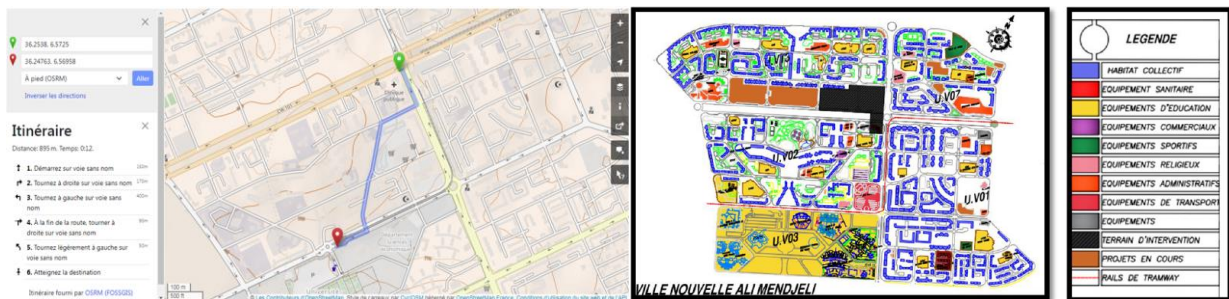


Figure 13. Left: Route of the shortest path between the roundabout and the university using the Diskra algorithm. Source. <https://www.openstreetmap.org/#map=14/36.2783/6.5943>. Right: the unsuitability of the environment for walking. Source. Zibouche Ismahane, March, 2023.



## CONCLUSIONS

In conclusion, ground landmarks made the most significant impression on the participants within the study context. However, they were represented as constraints that did not facilitate swift walking, as the students only had a little free time. Inadequate infrastructure, such as intricate pathways, lack of shade trees, and the absence of benches on sidewalks, made quick movement challenging. Furthermore, the buildings of the faculties were prominently represented due to the surrounding open spaces and the urban layout of a regular grid governed by a symmetrical organization, aiding in efficiently interpreting directions, whether left or right. The circular ground treatment reminiscent of roundabouts is also a prominent element in the landscape. It should be used to position orientation devices, enhancing pedestrian comfort and safety. Also, the visibility issues in the landscape mean that pedestrians only need a few representations of the natural backdrop surrounding their environment. This is due to the dominant verticality in the context of large complexes that the New City represents. Through our experience, we attempted to redefine the various elements that can characterize and influence interactions between individuals and their environment by establishing efficient pedestrian networks of high quality and in line with GPS plans. This involves framing the voids similarly to the streets in ancient city contexts, where the central role of the street was to delineate space and guide circulation.

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