

Intelligent Transport and Road Safety in Algeria, Requalifying an Urban Centre by Introducing the Concept of a Walkable Station

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To cite this article:

Imen Hassani, Abderraouf Zgheilet. Intelligent Transport and Road Safety in Algeria, Requalifying an Urban Centre by Introducing the Concept of a Walkable Station. *Urban and Regional Planning*. Vol. 8, No. 3, 2023, pp. 41-47. doi: 10.11648/j.urp.20230803.12

Received: June 15, 2023; **Accepted:** July 6, 2023; **Published:** July 21, 2023

Abstract: In this article, we present a multimodal station project located in the north-eastern region of Algeria. A multimodal station project in the context of Chalhough Laid was proposed by a team of researchers as part of an agreement between the two faculties of architecture and NTIC (2022). Using a mobile application that provides information to customers in real time and gives them data on bus routes, we set out to redefine a facility as complicated as a railway station into a public place with the vocation of an urban centre. Our aim was to create, through the project, a new centrality with built environments that are interactive (validation of journeys), safe and more comfortable to integrate walking as an active mode of transport. Based on a feasibility study of a multimodal station project with a special architecture offering a small footprint and creating user-friendly underground environments, in the context of the urban centre of the medium-sized town of Chalhough Laid in Algeria, and thanks to an artistic simulation, we concluded that intelligent transport makes it possible to optimise the station infrastructure and its services. This is an effective way of managing traffic and multimodal mobility. It can also be used to eliminate ticket offices during periods of pandemics such as COVID 19. Its use can also improve road safety by reducing the use of vehicles and encouraging walking.

Keywords: Intelligent Transport, Walking, Road Safety, Multimodal Station, Urban Centre

1. Introduction

The World Health Organization (WHO, 2018) [1] estimates that road traffic injuries will be the 5th leading cause of death by 2030. These injuries are currently the leading cause of death among children and young adults aged 5-29, highlighting the need to change the current child and adolescent health agenda, which has so far largely neglected road safety especially in developing countries. According to Crnjanski, Ntacha and Darracq Vicent. (2014) [2], road safety in emerging countries "is often considered a poor relation in the understanding of travel risk. However, this risk is anything but marginal, particularly in emerging countries where 90% of fatal accidents worldwide are concentrated".

As mentioned by the National Statistics Office, ONS, (2022) [3], in Algeria, these risks are attributed first and foremost to the increase in the vehicle fleet, which numbered more than 6.5 million vehicles at the end of 2019, against

more than 6.4 million in 2018, an estimated increase of 2.47%. According to the National Road Safety Delegation, RNSR, (2020) [4], cars are involved in 66.46% of accidents and contributed to the death of 1.191 people in 2020, including 13.38% among children.

The development of road infrastructure is another risk factor. The RNSR, (2020) shows that at the level of the EO motorway the number of victims is more important; it recorded 581 victims. The national road RN5, linking Constantine to Algiers, is another black spot in road traffic, ranked third, with 143 victims in 2020. This road crosses the urban agglomeration of Chalhough Laid whose intensive use of the road network is the main cause of traffic problems.

Indeed, the use of the car is particularly important in the travel patterns in Chalhough Laid. The city's plan is part of an inter-municipal development perspective and provides for the launch of a new activity zone on the southern outskirts of the city, near the Boukarana housing estate and as far as the

Mechta Larbi station. The revision of the plan by the APC technical service (2016) [5] revealed a situation of great anarchy that is more perceptible through the appearance of enormous structural defects and deficiencies (accumulated over nearly a quarter of a century). The report attributes this situation to three causes: the absence of a traffic master plan, the crumbling of the road network and the inexistence of a reliable flood control system.

According to Fleury, Dominique, (2004) [6]: «The hypothesis on which the culture of safety is based is that improving the coherence between travel behaviour and the activities generated by the urban environment has an overall favourable impact on safety: prevention should therefore involve seeking coherence between urbanisation and mobility management». There are also several studies that have shown the positive effect of active transport on health, Doctor Juneau, Martin, (2019) [7] found that «people who live in cities where distances are reduced, streets are well connected, shops are easily accessible and areas for walking or cycling are well defined and safe are more physically active and in better cardiovascular health. It is hoped that this type of built environment will become the norm in the near future. ».

Walking, including its combination with other modes of transport, is widely encouraged. The multimodal station thus has the task of strengthening the compact and mixed city, where it is currently fragmented. It is therefore a question of reinventing the station project so that it brings more urban value affirming its structuring role in the city, by strengthening and diversifying its functions in order to discourage the use of the car.

The next decade will undoubtedly see a complete upheaval in urban, suburban and interurban mobility, with a growing share of public transport on rail lines and a decrease in individual transport. The "Smart Station" project is currently being deployed in 7 pilot stations, with the integration of dozens of connected systems by ENGIE Solutions' Vertuoz teams, specialised in the digital transformation of buildings and industrial sites. Thanks to the sensors installed on the electricity and gas meters, the application will also make it possible to monitor the stations' energy consumption.

Eventually, this centralised supervision will result in a visualisation of the connected stations, reflecting the state of the equipment in real time and with accuracy. The aim is to ensure optimal operation of priority equipment (boarding gates, lifts, escalators, etc.), by creating short information circuits for station staff and very rapid processing in the event of a breakdown.

A multimodal station project in the context of Chalhoun Laid has been proposed by a team of researchers in the framework of a convention between the two faculties of architecture and NTIC (2022). In this article we discuss the feasibility analysis of the project and its architectural aspect.

2. Description of the Project

Chalhoun Laid is a medium-sized town with an agricultural character. It is also the seat of an important industrial platform and a commercial centre. In spite of these potentialities and its important demographic weight (estimated at 82 000 inhabitants in 2008 and 120 000 inhabitants in 2019), this locality had not developed. Its privileged location in the region, between two metropolises of the East: Constantine and Setif, was not in its favour because the route of the East-West motorway, the vital artery of the national economy, bypassed it in favour of other localities of the same rank but better connected to the major cities such as Oued El Atmania and Tadjent.

The master development plan (PDAU) of Chalhoun Laid, (2007) [8], shows that the city has progressed in the direction of the RN5 road towards the North-East. Currently, the pressure on residential land has reconfigured the linear city, and a new axis of North-South expansion is becoming more decisive. It has favoured the creation of a secondary agglomeration, of 1800 inhabitants, named Djamaa Lakhdar, located two kilometres from C. Laid, on the national road RN 100. The sharing of space between agricultural activity and housing is therefore an essential issue that must be taken into account, since it is in this over-consumption of space that the fragmentation of agricultural land is expressed.

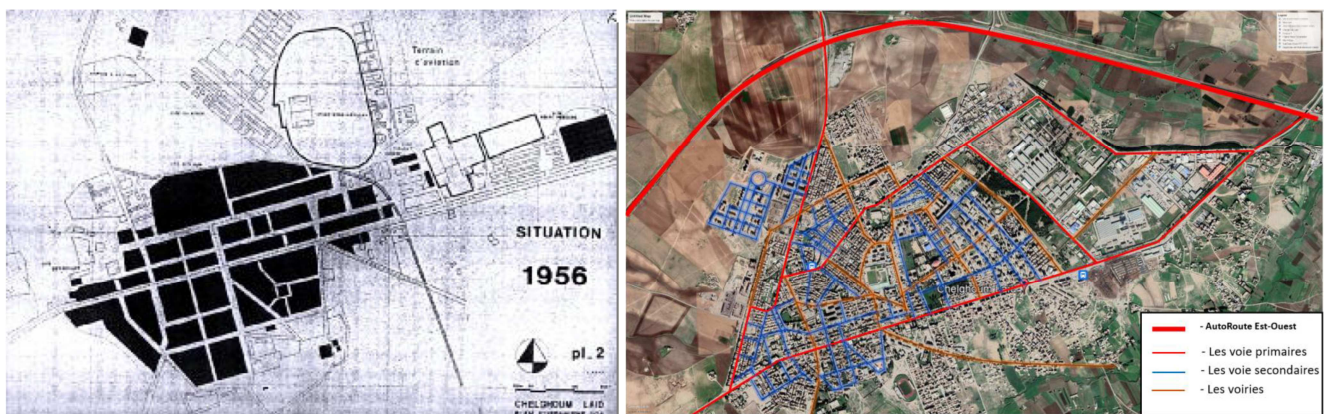


Figure 1. The urban road network that characterises the historic urban centre of the town of Chalhoun Laid.

The lack of public transport is also felt in inter-urban mobility characterised by arbitrary stops, the unsuitability of

the dimensions of the roads for the current mechanical flow, which causes traffic jams at peak times, traffic accidents and nuisances such as noise and smoke. The intense commercial activity, permanently in the two main roads RN5 and RN100, around the wholesale fruit and vegetable markets, car dealerships and industrial zones, require land areas for container truck parking and storage, so they exploit the open spaces between residential buildings (Figure 1). This mode of transport adds to the long-term environmental degradation, to the nuisances immediately perceived by residents: noise pollution, road congestion, traffic accidents, landscape degradation, etc.

The many issues involved in the choice of a station location, the interface between the rail network and the area, leads us to

question the logic of the service and the quality of accessibility. It is a question of determining the location that offers the populations and the main traffic generators of the territory concerned the most effective accessibility, in terms of the size of the high-speed offer, access time to the station and intermodality. This compromises a choice of location that favours the best possible integration of the station into the spatial dynamics and territorial projects of the areas concerned by limiting the nuisances generated by the station's location.

Our choice of location for the project targeted an urban wasteland in the city centre, a former stadium currently occupied by informal trade. The site benefits from a good location in relation to the road network, which favours its connection to public transport (figure 2).

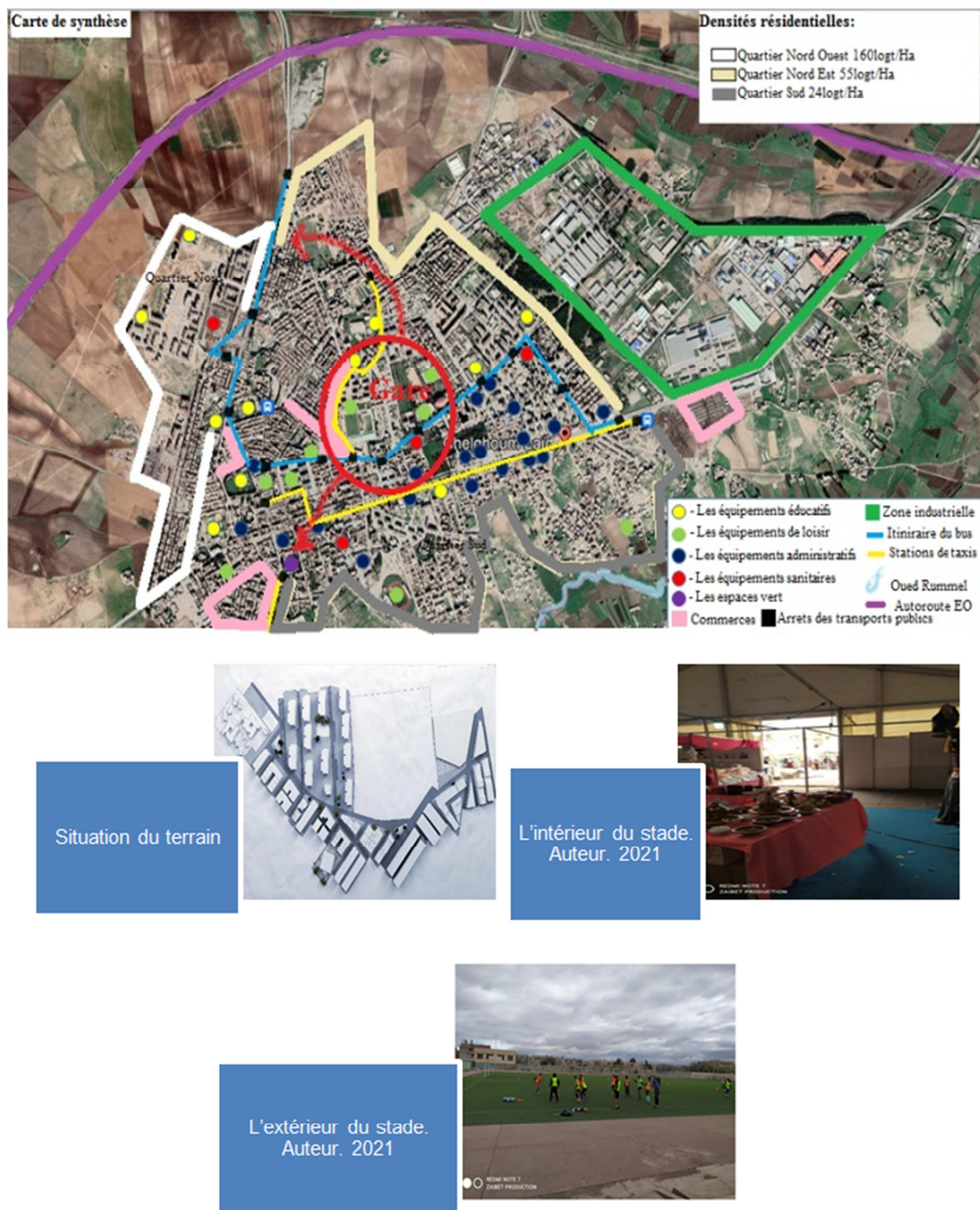


Figure 2. Location of the proposed multimodal station at Chalhoun Laid.

3. Methodology and Tools

In according to O'Shaughnessy, Wilson, (1948) [9], the feasibility of a transport infrastructure consists of a comprehensive analysis of its environment in order to understand its potential issues and constraints. The smart station project (Figure 3) is also captured in the objective of creating more walkable urban environments by two means:

3.1. If the E-payment System Is Deployed in Algeria

There will be the possibility of using an NFC-based card emulator available in Smartphone allowing travellers to buy, validate and control their ticket. The traveller then brings his or her phone within a few centimetres of a reading terminal. The ticket is validated even if the phone is switched off.

The elimination of the use of paper tickets reduces the time it takes to issue and obtain a ticket and eliminates the common problems encountered by passengers and ticket inspectors, so there is no need to queue at the kiosks to buy tickets. In addition, passenger identification is automatic and information such as purchase history, ticket balances and validity limits are available through a dedicated application. It is thus possible to identify the passenger, consult his account and deduct the fare from his account. The creation of a database facilitates efficient filtering of items and gives firm assurance to passengers and the public transport system (PTS) about the transaction. The web and/or mobile

application is used to send notifications and for RFID card renewal as well as access to a passenger's basic information for authentication.

3.2. In Relation to the Criteria That Make an Environment Walkable

Inspired by the work of Daniella Do Amaral. Mello Benatto and Fernando, Brandao Alves, (2022) [10], and based on the data available for the case of C. Laid (PDAU Report and State of Play), we estimated the pedestrian potential in the urban area defined by the walkable perimeters around the Smart Station: Safety, Comfort and Diversity (Hassani, Imen, 2022) [11]. Satellite imagery is an efficient tool for this kind of approach; it gives a vivid appreciation of the study context. In this respect, we used a geoprocessing tool, Arc GIS 2021, to try to analyse their accessibility on foot (pedestrian potential). This infrastructure will have a positive impact on the environment, will improve accessibility by public transport and will intensify the signalling for better road safety. The railway line placed parallel to the RN 100 will follow the current urban trend from north to south in order to link the two new stations and the Si Larbi station, thus contributing to serving the suburbs by an environmentally friendly means of public transport and requalifying their surroundings.

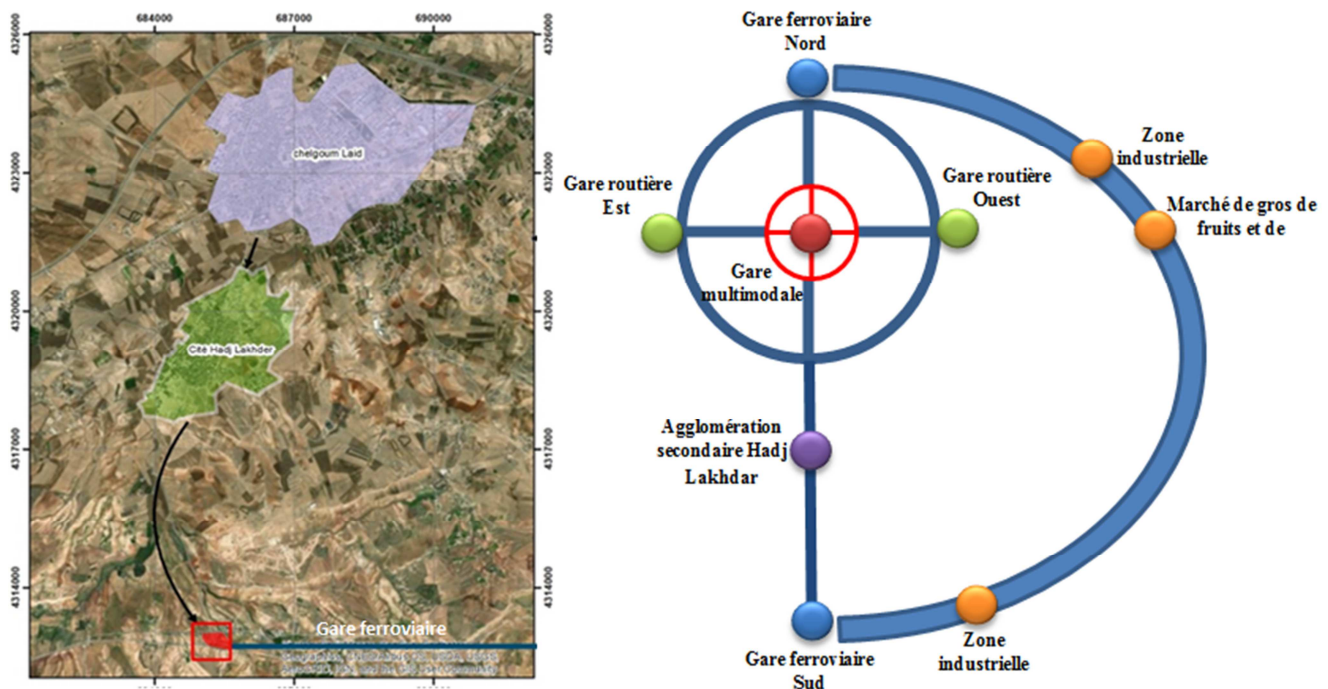


Figure 3. Proposed new public transport networks in C. Laid driven by the Smart Station (Abderraouf Zgheilet Hassani, Imen 2022).

4. Results

The feasibility of the railway infrastructure project in the context of C. Laid highlighted two of the densest

neighborhoods in the city with rates varying between 55 dwellings/ha and 160 dwellings/ha, located north of the RN5. These are the collective housing area to the northwest and the old quarter to the northeast. We also identified a large number of schools (44% of the total number) in these

neighborhoods.

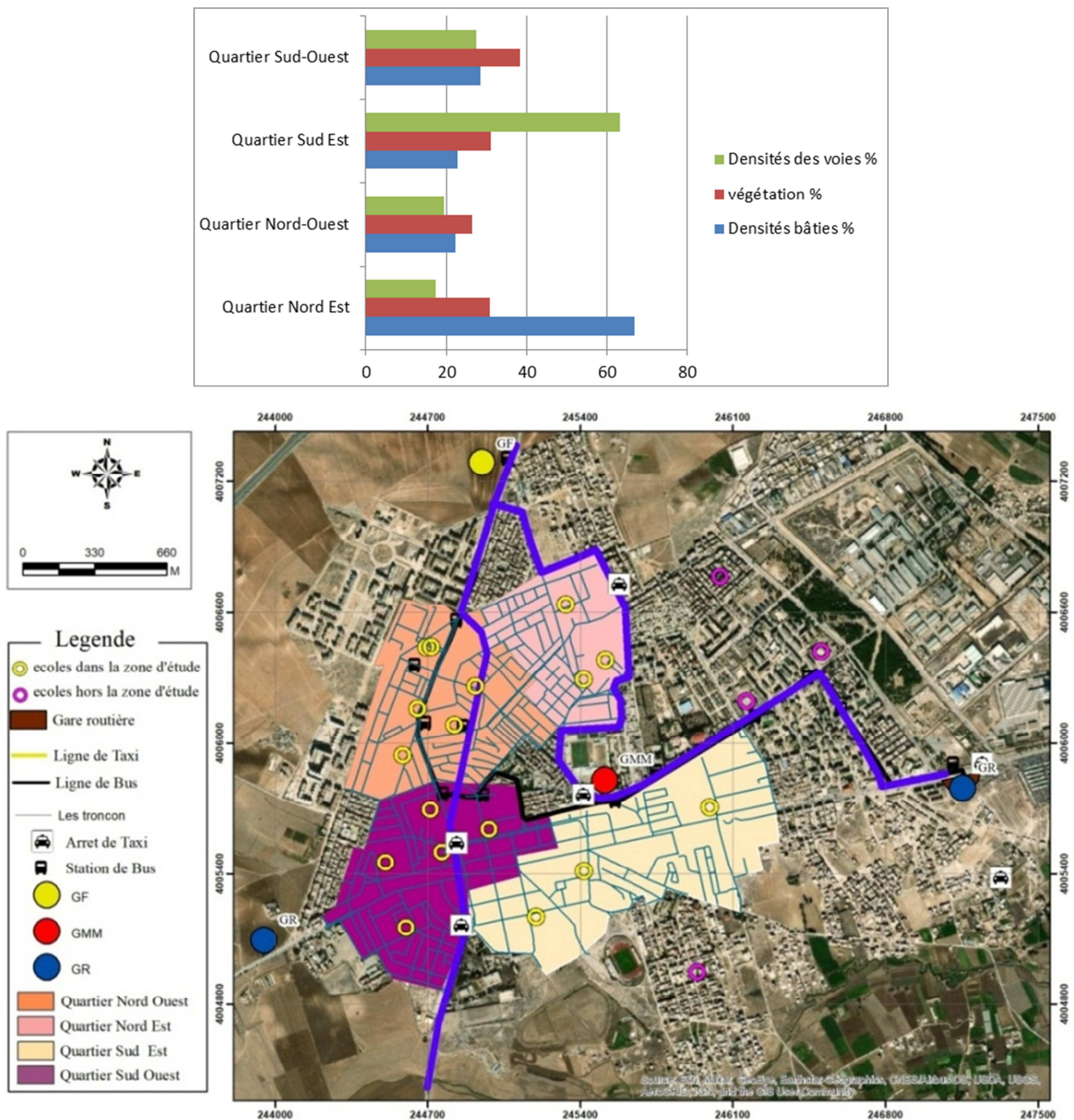


Figure 4. Characteristics of the components of the environment of the Smart Station: Building, Vegetation and free space.

Figure 4, here above, indicates that the old North-East district is the only one to record a high rate of built density (66.93%), the three other districts present low values, they vary between (22.4% and 28.55%). The new districts of collective and individual housing located in the North-West and South-East are the least dense, in the North because of the significant roadway and parking space at the foot of the buildings and in the South because there is a concentration of public spaces and equipment.

The northern districts are porous. They benefit from good

legibility because their intersections generally involve the crossing of three roads. These nodes constitute small surface elements that represent real centralities for their districts. The nodes in the southern districts, on the other hand, are junctions and are therefore less important. The opposite trend can be observed for the length of the lanes, which are shorter in the north (between 55m and 70m) and longer in the south (between 107m and 117m), making them less favourable to walking. The analysis of the comfort of all the neighbourhoods in our study area reveals a generally

unfavourable environment for walking, with only 7.88% of the streets shaded, whereas the heat is very strong in summer. Pavements are generally in poor condition. There is also a lack of public gardens and street furniture, the only public places that exist in the former South-West district: the church garden and two squares, but which are in a degraded state.

As a result of this analysis we have opted for an urban project around the concept of public space (Figure 5) in the sense that it is:

- 1) A place of life with a rich and diversified programme;
- 2) An urban articulation whose infrastructure fits discreetly into the existing city network thanks to an underground infrastructure, with two levels, one dedicated to bus boarding and the other to rail transport.
- 3) A meeting zone accessible by all sustainable means of transport but which favours walking and gives priority to pedestrians.

- 4) We have removed the ticket offices and replaced them with a reception and information stand, in addition to the large display panels in front of the entrances, and smaller ones in the main traffic areas.
- 5) There are several shops and the waiting areas for passengers have been transformed into comfortable lounges. This will change the behaviour of station users, who will receive information about their journeys individually on their mobile phones, will feel reassured and will have more free time to stroll around.
- 6) For the outdoor spaces, we have planned a small footprint for the passenger building to leave free space for a landscaped forecourt, planted and organised to make walking a pleasant activity.
- 7) We have used the basement to bring the station and its surroundings up to the same level, and have provided for natural light and ventilation from the ground.

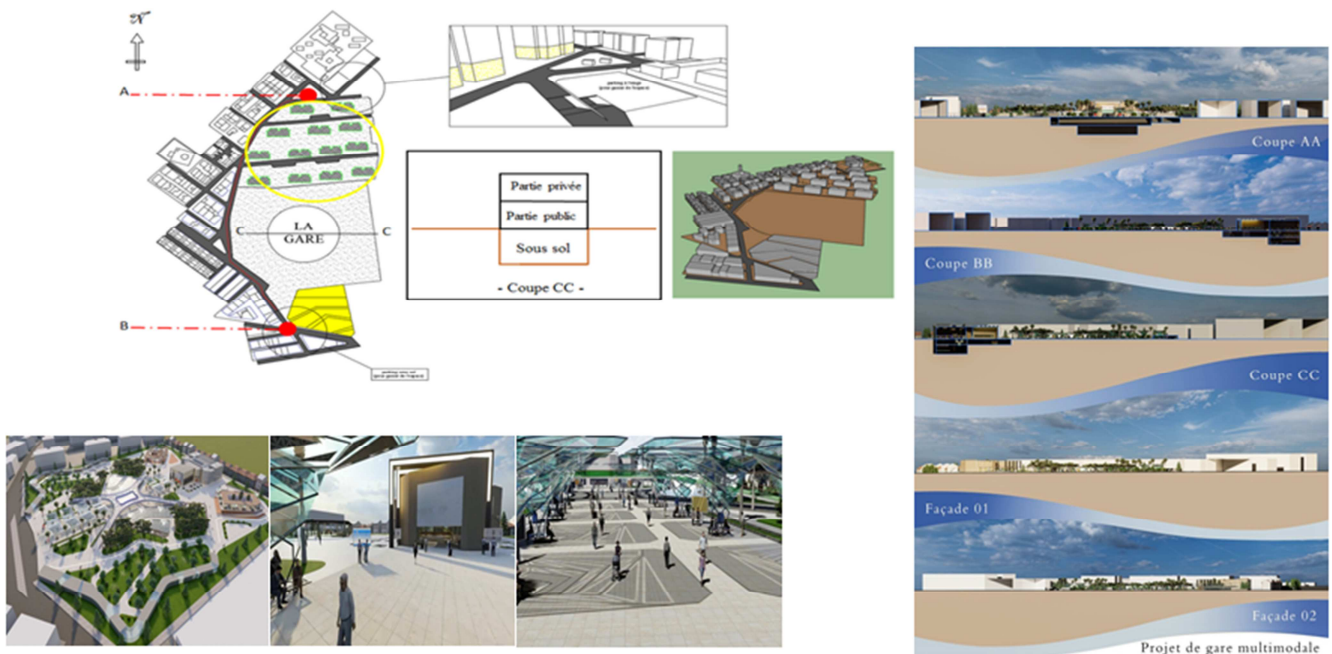


Figure 5. Separation of pedestrian, mechanical and railway flows in the multimodal station of Chalhough Laid. Zgheilet., Abderraouf, 2022.

This results was confirmed by Ester Cerin, all, (2017) [12] who cited that: «the most consistent patterns of positive associations were observed for walkability, public transport, land use mix – destination diversity, shops commercial destinations.». This kind of Party requires a reorganization of the environment in such a way as to offer it added value in according to Salaheldin Hadeel (2021) [13], who cited that: «the lack of a cohesive and integrated relationship between the built environment and the transport system is one of the most significant factors. It is fundamental for architects, urban designers, town planners, and policymakers to understand the design and planning factors that promote or deter pedestrian behavior in the urban environment.». However, intervention in urban projects is not governed by legislation, which makes it a difficult task to carry out. This means that any redevelopment planned as part of the project will not only have to be designed, but also carried out in

close collaboration with the citizens and municipalities and the technical services concerned, which is, as mentioned in the Rapport-étape, (2022) [14]: «a sine qua non condition for the success of the project.».

5. Conclusion

A Smart Station project in C. Laid is an urban design project that transforms the environment to accommodate walking as an active mode of transport. The pedestrian becomes an important actor in multimodality. The project is located in the city centre, which has a high residential density and where most of the schools are located. Overall, our study focuses on the results of the analysis of the built environment, the perception of the pedestrian potential in the city centre, around the multimodal station. This required an assessment of the quality of public spaces, to define: safety, comfort and

legibility of these spaces. The selection of indicators depended on the availability of data at the scale of the city of Chelghoum Laid. This analysis showed that this environment is generally unfavourable to walking. The multi-modal station is a concept that fits into the theory of the compact and mixed city, where it is currently fragmented. It is therefore a question of reinventing the station project so that it brings more urban value.

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