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ROAD ACCIDENTS IN URBAN AREAS IN ALGERIA. THE CASE OF THE CITIES OF CONSTANTINE AND ALI MENDJELI

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ABSTRACT

Road safety is a major concern for countries around the world, as it is directly related to the sense of well-being. Road accidents have serious consequences for the victims and impose considerable economic burdens on the state, since their handling is delicate. The African continent, including Algeria, has a high accident rate. In this study, we chose the state of Constantine because of its national importance. Between 2020 and 2022, it recorded a significant number of accidents, particularly in the new town of Ali Mendjeli and the town of Constantine. These areas, with their dense populations and their high attractiveness due to the diversity of facilities they have, are experiencing very large flows and consequently considerable traffic. A territorial analysis of these accidents allows to highlight the dangerous areas, understand the causes and determine the types of victims. From which the identification of the sites most exposed to accidents has allowed us to identify many factors of this risk.

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Introduction.

Over the past few decades, the world has faced an alarming situation, reflected in the increasing use of cars as a mode of transport in cities, following the process of urban development and rapid

expansion of cities. The effect of population growth, with a world population of 8 118 835 999 in 2024 (The United Nations, UN, 2024), and rising demand for and production of cars.

For the majority, the car has become an indispensable and essential part of daily life, partly because of the increase in distances traveled due to urban sprawl and its corollary, the extension of distances, especially for telecommuting, and on the other hand due to the increase in the number of cars in circulation. Global car sales reached 93 million units in 2017 (Freyssenet M , 2007), 2 million more than in 2016, whereas in 2022 over 80 million vehicles were sold (Jean Kaniewicz and Jérôme Sabathier, 2022). The figure has therefore fallen slightly, but this is mainly due to the health crisis. However, according to the United Nations (UN), the number of cars in circulation worldwide will reach 1.5 billion by 2039 (Justine Peru, 2022).

Although transport facilitates the movement of people and goods, as well as access to equipment and services, it also generates significant traffic impacting road safety. More than 50 million people have died on the road since the invention of the automobile, more than during the First World War. In 2024, The World Health Organization (WHO) also revealed that road accidents were the ninth leading cause of death worldwide and predicted that by 2030 they will be the fifth leading cause of death.

Road safety is now a major concern for the UN, which calls on countries around the world to step up their efforts to reduce the number of deaths and injuries on roads by 2030. According to the WHO, around 1.3 million people worldwide die in road accidents each year, mostly children and young adults, half of whom are vulnerable (pedestrians, cyclists and motorcyclists), and more than 90% of these deaths occur in low- and middle-income countries. It also predicts that by 2030, road accidents worldwide will cause 2.4 million deaths per year. While « the latest WHO report says that with 1.19 million deaths per year, the number of people killed in road accidents has slightly decreased. Nevertheless, they remain the leading cause of death among children and young people aged 5 to 29 years old, causing more than two deaths per minute and more than 3200 per day » (World Health Organization -WHO-, 2023).

In addition, « Africa is the region that is the most affected by road accidents, with a road fatality rate of 19.5 deaths per 100000 people, compared to 16 deaths per 100000 in Southeast Asia and 6.5 deaths per 100000 in Europe, according to the WHO Global Road Safety Status Report 2023 » (Osman Benk Sankoh, 2024). Furthermore, according to the National Security Branch, Algeria recorded 24 751 road accidents (National Security Branch, 2023) in 2023 that resulted in 3628 deaths and 33 995 injuries, for a total of 17 045 accidents (National Security Branch, 2023) that occurred in urban areas with 665 deaths and 20601 injuries. In 2022, the state of Constantine, the capital of eastern Algeria, recorded 511 road accidents, including 21 fatalities and 666 injuries in urban areas.

1. Material and method.

The aim of our study, which is the material and the method of our work, is to identify dangerous places. To do this, we began by collecting and processing data from the various departments involved in our study theme, including the Department of Transport and the National Security of the state of Constantine. We have consulted the monthly reports of urban road accidents, which are compiled from the reports of safety officers. Then we analyzed this data using the geographic information system to locate accidents based on field data and observations. After these steps, we were able to identify the sites with a high number of accidents. It is important to note that the accident sites listed by the services involved do not focus on a single criterion or type; locations vary, including different roads, neighborhoods or intersections.

3. Road accidents: causes, statistics and road safety.

The road accident is «an event involving at least one vehicle, motorized or not, on a public highway, and causing physical or material damage» (Philippe Sourha, 2024). The risk of a traffic accident is « the probability that a person will be hit during a journey or over a period of time. All people traveling on public roads, regardless of the mode of transport used, are at risk of accidents; their vulnerability is determined by their own characteristics (young or old, pedestrians or motorists, etc.)» (Arnaud Banos and Thomas Thévenin, 2010). Therefore, road safety « is the set of rules and services that aim to ensure the safety of road users: pedestrians, motorists, bikers, cyclists, etc. Compliance with the rules of conduct is essential for the safety of each of the road users and allows them to avoid many accidents, whether they are minor or serious. » (New Performance Management – NPM, 2022). It is also well integrated into the new sustainable development agenda launched in September 2015 by the UN as part of the 2030 Agenda, entitled «Transforming our world ». The SDG targets related to road safety are found in two integrated targets in two objectives (3 and 11), namely:

- «Good health and well-being to enable all to live healthy lives and promote the well-being of all at any age.

- Sustainable cities and communities to ensure that cities and human settlements are inclusive, safe, resilient and sustainable » (Swiss confederation, 2024).

In this context, the WHO has developed a technical road safety module document entitled « Saving lives, reducing road accidents and ensuring road safety » with six components, namely vehicle safety, road law enforcement, controlled speed, good infrastructure design and improvement, road safety management and survival after an accident.

Road accidents have several causes, which are well defined worldwide by the WHO: Vehicle, man and environment or infrastructure. And most researchers rank driver behavior as the most important factor in speed and alcohol accidents, followed by vehicle condition and then infrastructure.

3.1. The human being or the driver.

- Distractions and dangerous driving behavior: mobile phones, hands-free kits,... etc.
- Speeding: there is a relationship between the increase in average speed and the likelihood of an accident and the severity of its consequences.
- Alcohol or other psychoactive substances while driving.
- No helmet for motorcyclists or safety belt and child restraint systems: « The helmet can reduce the risk of death by 42%, wearing a seat belt reduces the risk of death by 45% to 50%, and child restraint systems reduce the number of deaths by 60% » (Samira Kilanyossi, 2024).
- Lack of code enforcement and control: regular monitoring and compliance with the law.
- Inadequate post-accident care: due to delays in accident detection and preliminary care.

3.2. Vehicles.

There are United Nations vehicle safety rules that, if applied to production, could reduce the accident rate. For example, the installation of airbags and seat belts is mandatory, as well as electronic stability control. And visibility of vehicles (lighting and lights).

3.3. The environment or infrastructure.

- Public space planning is a crucial factor in urban safety and traffic, taking into account:
- road development, which can have a significant impact on safety (road dimensions, track maintenance, adequate pavement for the prevailing climate, separation of traffic flows and transport modes, accessibility to people with reduced mobility);
 - horizontal and vertical signs (speed limit, pedestrian crossings, etc.)
 - visibility and compliance with urban furniture, lighting, etc.

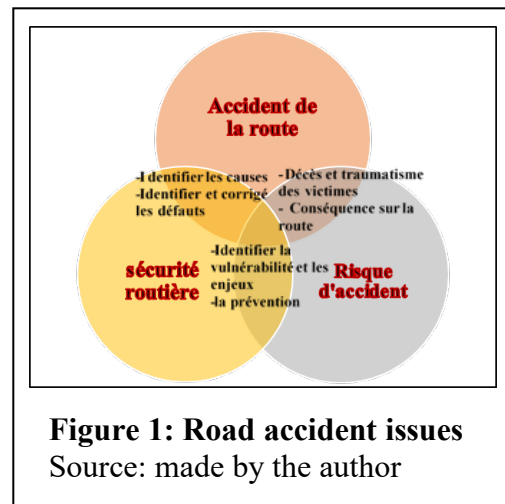


Figure 1: Road accident issues

Source: made by the author

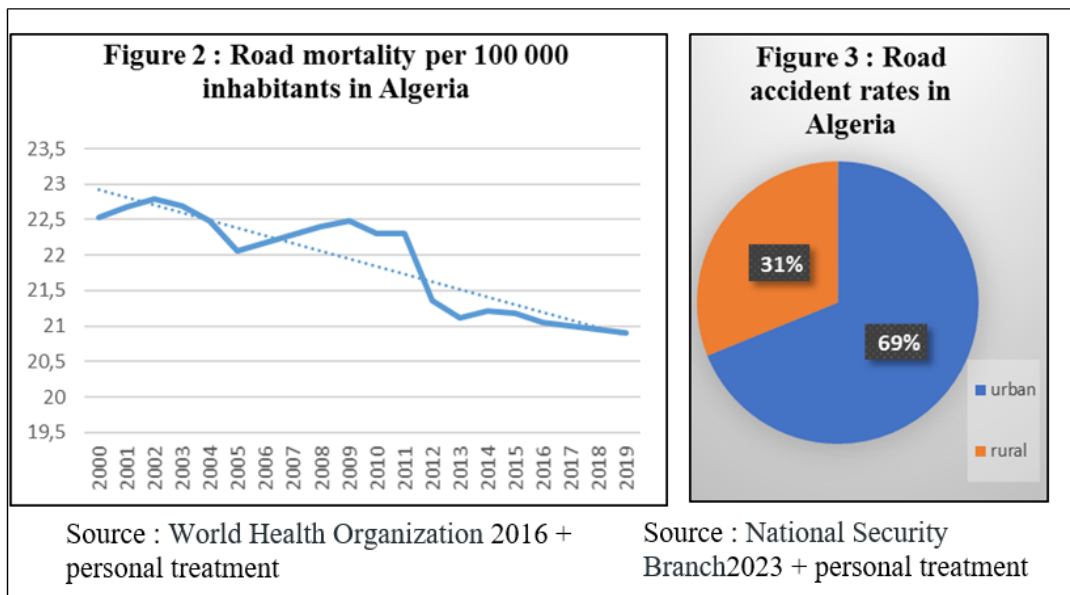
However, accidents are not just the result of individual human action or fault, but the result of the environment or infrastructure, which is the main factor in road accidents. Almost half (50%) of accidents (Center for studies on networks, transport, town planning and public construction CSNTPC, 2012) are due to the environment. This was attested by the United Nations Road Safety Strategy 2020, most of which are directly related to the environment or planning such as: good land use, urban and transport planning, design of roads, Improving public transit, limiting speed, enforcing laws such as the use of seat belts and helmets, reducing blood alcohol levels and improving the management of collision victims.

This is why many experts consider road safety as an essential component of the quality of urban life. In 2022 and according to Dr Tedros Adhanom Ghebreyesus, The World Health Organization Director-General « Road safety is of concern to all of us. Every day we take roads to work, to school and to meet our daily needs. Yet our transportation systems remain far too dangerous. We cannot tolerate any deaths on the road. The mobility of the future must focus on promoting health and well-being and protecting the environment for the benefit of all » (WHO, 2022).

4. Road accidents in Algeria.

In 2024, the total population of Algeria is estimated at 46 278 751 inhabitants (UN, 2024), with an urban population of 34 656 776 inhabitants (UN, 2024). This means that 75% of Algerians live in cities. Most of the Algerian cities have experienced rapid expansion away from their old cores.

In 2019, the country's car fleet reached 6.5 million, compared to 6.4 million in 2018, an increase of 2.47% according to the national statistical office (Algeria press service, 2021). In 2022, the number of vehicles on the road reached 7.7 million (Anis Mouad Mezoued, 2023), an increase of 17% compared to 2019. This increase inevitably has an impact on traffic accidents, which pose a major threat to road safety. WHO estimates the average road mortality rate per 100000 population at 22 over the past two decades (see Figure 2). As shown in Figure 3, more than half of all road accidents, or 69%, occur in urban areas. We are therefore confronted with physical accidents that result in one or more injuries although they are less serious than those in rural areas.

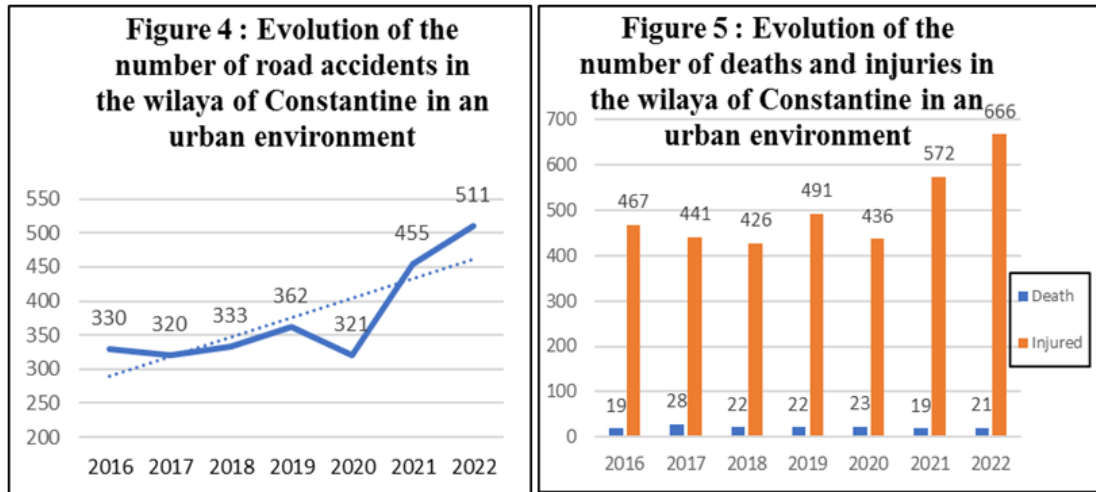


5. Analysis and discussion.

5.1. Urban road accidents in the state of Constantine.

The regional dynamics of the state of Constantine has increased its attractiveness, leading to continuous population flows, particularly due to its spread and urban development. Located in the northeast of Algeria, this state has always been considered as the capital of eastern Algeria. It enjoys a privileged geographical position, located between the Tell and the Hautes Plaines (see figure). It covers an area of 2,187 km² and in 2019, its population was estimated at 1 292 570 inhabitants.

Road accidents occur frequently in cities, and Figure 5 shows the evolution of road accidents in the urban state of Constantine, where they have increased over the years 2016-2018-2017-2018-2019, unlike in 2020 where they have decreased considerably due to the lockdown imposed on the population during the "CORONA" health crisis. Then there is a remarkable increase with 455 and 511 consecutive accidents in the following two years 2021 and 2022.



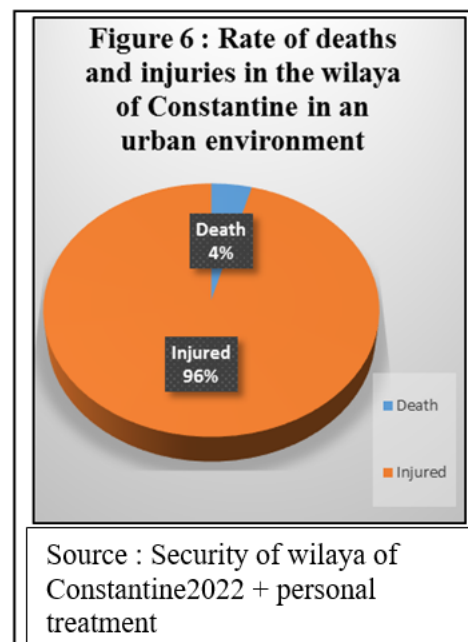
Source : Security of wilaya Constantine2022 + personal treatment

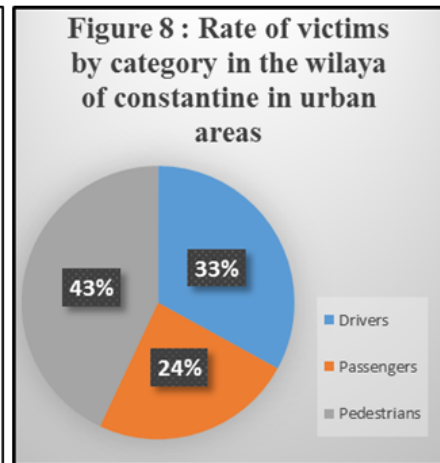
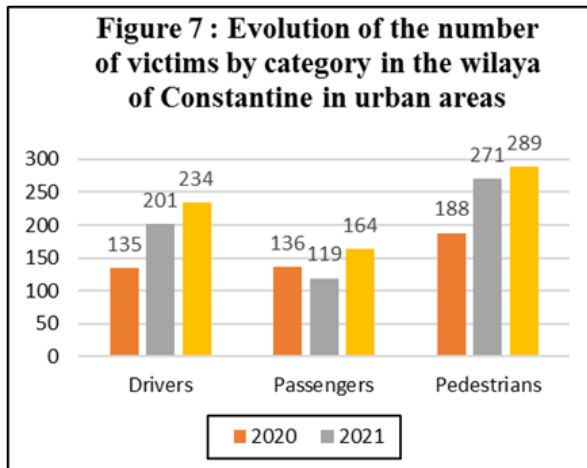
As shown in Figure 4, the number of deaths varies little, from 19 to 28. The number of injuries, on the other hand, is variable with an average of 500 injured (2016-2022). In 2021 and 2022, the number peaked at 572 and 666 people respectively.

The rate of injuries is 96% compared to 4% for deaths (see figure 6), which will result in considerable economic and social burdens for their families and countries. For most countries, the cost of treating injuries represents 3% (World Health Organization, 2023) of their gross domestic product.

5.2. Evolution of the number of victims by category.

In Constantine (figure 8), pedestrians account for the highest percentage of victims (748 people), 43.06%. Next come drivers (32.81%) and passengers (24.12%). All three categories experienced a near-continuous increase in the number of victims from 2020 to 2022 (see Figure 7). This is mainly due to the high rate of pedestrians in cities. The causes could be multiple: non-use of the pedestrian crossing, distraction, poor environmental conditions for the pedestrian or driver, lack and not maintenance of sidewalks and walkways and bike paths.



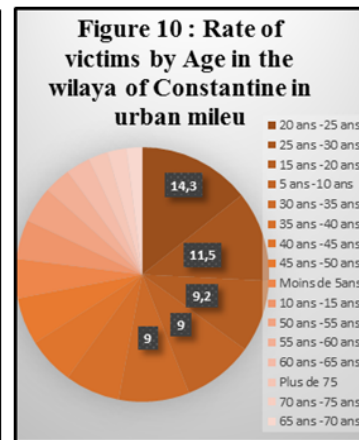
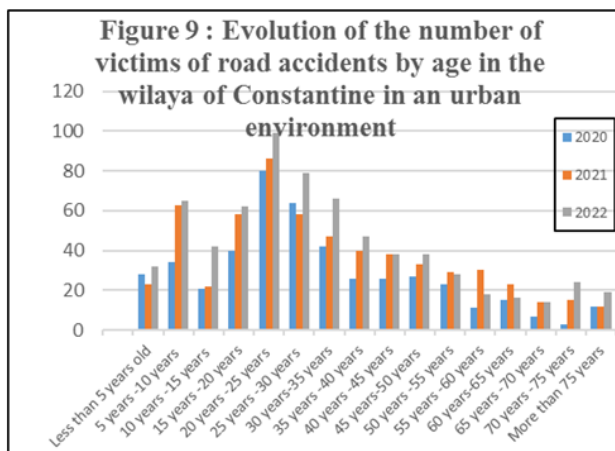


Source : ConstantineTransportDirectorate2022 +personal treatment

5.3. Evolution of the number of victims by age.

Road accidents in the state of Constantine during the period 2020-2022 affected all age groups without exception, but to varying degrees. The 20-25 age group recorded the highest percentage with 14.3%, followed by victims aged 25-30 years with 11.5% and those aged 15-20 years with 9.2%. The categories (5-10 years) and (30-35 years) each have a percentage of 9%. The other categories also have varying percentages, ranging from 7% to 2% (see figure 9 and figure 10).

This may be due to the lack of safety in public spaces and playgrounds, as well as the poor location of schools, which are accessed by major roads and therefore more likely to be hit by accidents. For the 20-25 age group, this is also the new drivers' license holder category.

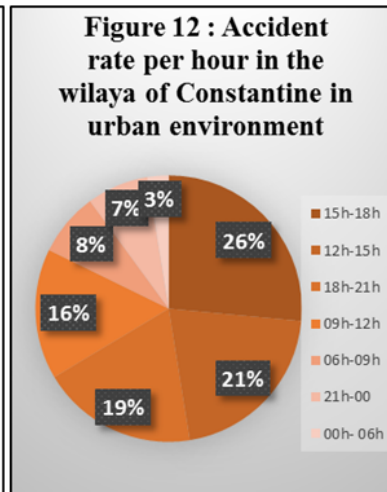
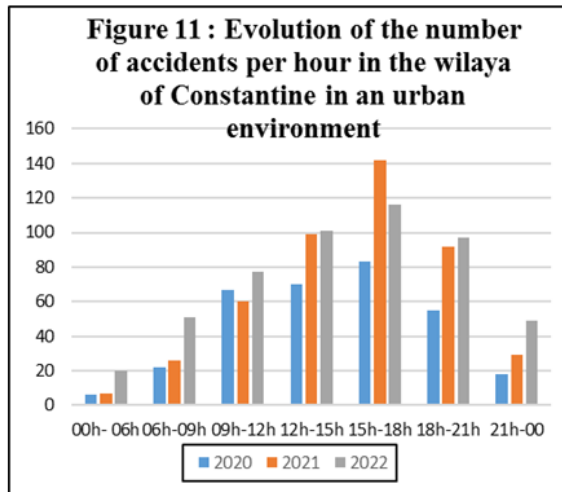


Source : ConstantineTransportDirectorate2022 +personal treatment

5.4. Evolution of the number of accidents per hour.

According to the figures below, in Constantine, road accidents occur mainly between 3 pm and 6 pm, representing 26.49% of the total. Between 12 and 3 pm, they constitute 20.97% of accidents. The time slots from 6 to 9 and 9 to 12 also have significant percentages, with 18.95% and 15.85%, respectively.

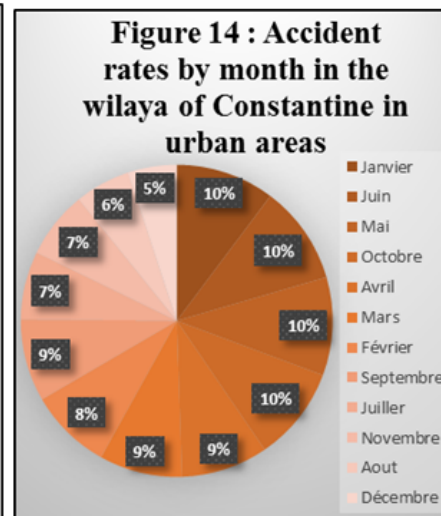
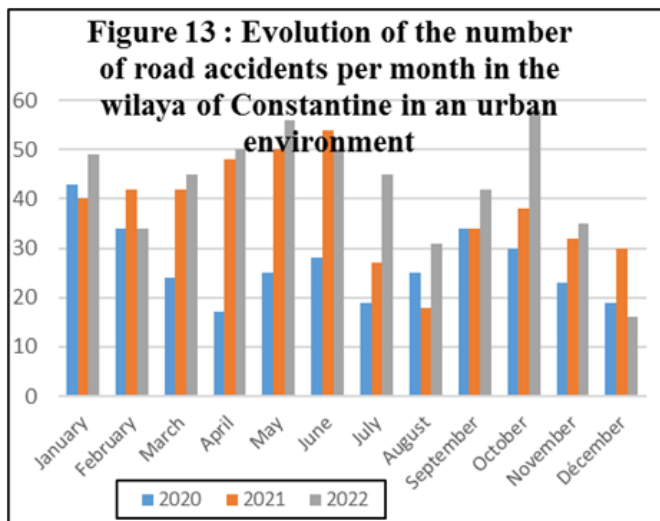
The periods of high accident frequency coincide mainly with peak hours in the evening, when traffic is dense, as well as during the lunch break. On the other hand, for other hours, especially in the evening, high accident rates can be attributed to reduced visibility due to driving conditions and traffic lane design.



Source : Constantine Transport Directorate2022 +personal treatment

5.5. Evolution of the number of accidents per month.

The first observation (Figure 13 and Figure 14) shows that the majority of accidents occur in winter and summer, with notable peaks in January and June, where they each represent 10.25% of the total. Several factors can explain these trends: in winter, weather conditions such as frost, ice, thunderstorms, floods and slippery roads play an important role. In June, accidents increase due to the summer and vacation periods, when traveling is more frequent. The following percentages, 9.79% and 9% respectively, concern the months of October, associated with the social resumption and the month of April.

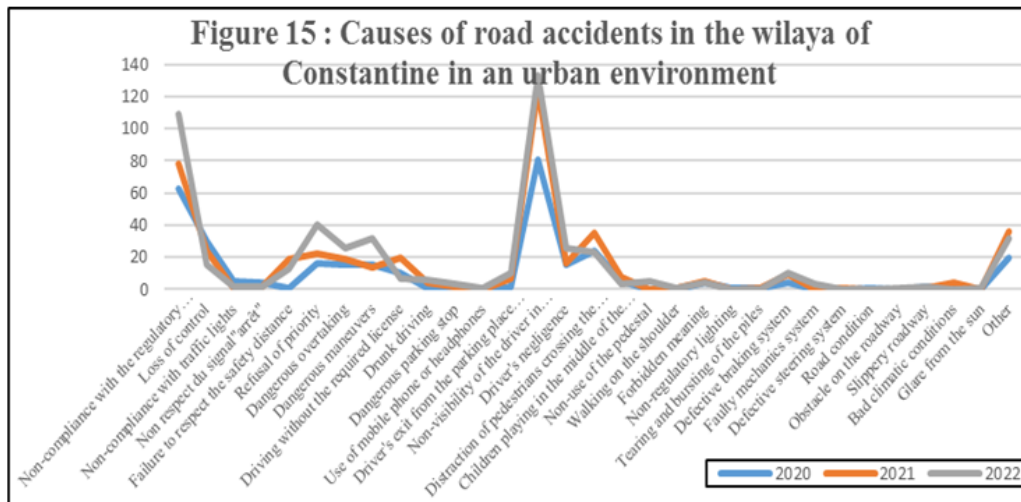


Source : Constantine Transport Directorate2022 +personal treatment

6. Causes of road accidents.

According to statistics from the road transport and road safety directorates (Figure 15), the leading cause of road accidents in the state of Constantine is the driver's inattention, accounting for 26.59% of cases during the 2020s, 2021s and 2022s. The second cause, with 19.41%, is non-compliance with the speed regulations. Other less frequent causes include:

- Reasons not declared in the minutes: 4.84%.
- Failure to respect priority: 6.28%.
- Inattention of pedestrians crossing the roadway: 6.16%.



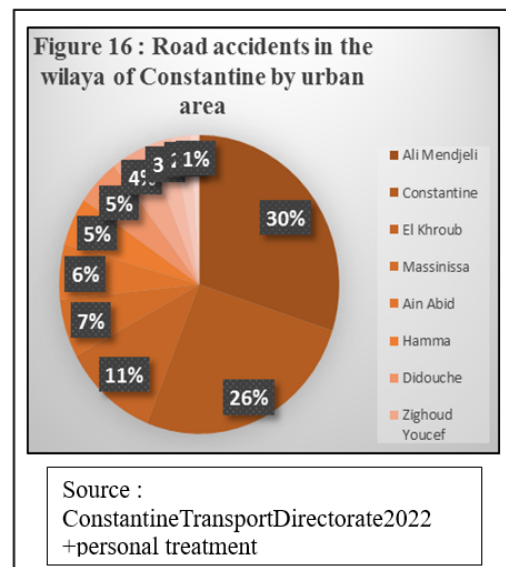
Source : Constantine Transport Directorate 2022 +personal treatment

7. Distribution of road accidents in the urban agglomerations of the state of Constantine.

Road accidents in the state of Constantine are distributed differently from city to city. The new towns of Ali Mendjeli and Constantine have very high percentages, 30% and 26%, respectively. El Khroub is in third place with 11%, followed by the new town of Massinissa, The nearest city, with 7%. Other cities have lower rates, ranging from 6% to 1%.

8. Road accidents and the identification of dangerous places: the case of the cities of Constantine and Ali Mendjeli.

«The management of road risk at a city level is increasingly being carried out through a phase of "territorialization" of traffic accidents, in short by the establishment of a study of issues relating to road safety-mapping accidents to identify dangerous locations and establish a safety diagnosis based on field observations, where risk factors are clearly identified.» (Arnaud Banos and Thomas Thévenin, 2010). In this section, we will present the location of road accidents in the cities of Ali Mendjeli and Constantine, which have the highest number of accidents at the level of the state. By mapping the different accident sites, we will be able to identify the most dangerous places and factors contributing to road safety.



8.1. Presentation of the cities of Constantine and Ali Mendjeli.

8.1.1. Constantine: a thousand year old city, attractive and multimodal.

Constantine is an emblematic city, characterized by exceptional characteristics due to its conditions of construction, its history, its architecture, its urban form, its expansion, its landscape, its culture and its identity. Former capital of a Roman confederation called Respublica quattuor coloniae cirtensens (A. Bouchareb, 2009), Cirta is one of the oldest cities in the world, having seen many civilizations pass through its lands. Constantine has always been a large city and the capital of north-eastern Algeria, thanks to its privileged geographical position between the Tell and the Hautes Plaines (see figure 17), and it's very important road network linking the east of the country to the east and the north to the south. Its unique identity stems from its historical heritage, natural site and rich heritage of architecture, monuments and artistic activities that have contributed to its attractiveness as a metropolis.

Its population was 418 672 according to the 2008 census. The city of Constantine is particularly known for its natural site, often referred to as an « eagle’s nest » (Despois J and Raynal G, 1964) in literature, confronted with a rugged topography generating several constraints: steep slopes, Rummel gorges, landslides, etc.

8.1.2. The city of Ali Mendjeli: a new city experiencing an unprecedented demographic boom and spatial expansion.

Ali Mendjeli is a unique new city experience in the country, located 15 km south of Constantine. It was created to address the housing shortage in Constantine and its satellite cities. Originally planned to cover an area of 1500 hectares, it was intended to house 52 000 dwellings for 300 000 inhabitants as well as 74 large facilities. In reality, the city has undergone many changes in its form, organization, programming and functions. Notably, its territory has expanded with new programs, such as the construction of two universities: the Constantine 2 university center and the Constantine 3 university city (170 hectares). These additions have given a new city its uniqueness despite its young age. It also benefited from two other extensions to the south and west, covering an additional 671 hectares.

Many facilities, especially commercial ones (malls, shopping centers, supermarkets, banks, hospitals, administrations, an aquapark, multiple activity areas, etc.), have contributed to transforming the function and image of this new city. From a « minimum living», Ali Mendjeli rose to the rank of a big city, rivaling Constantine, the mother city.

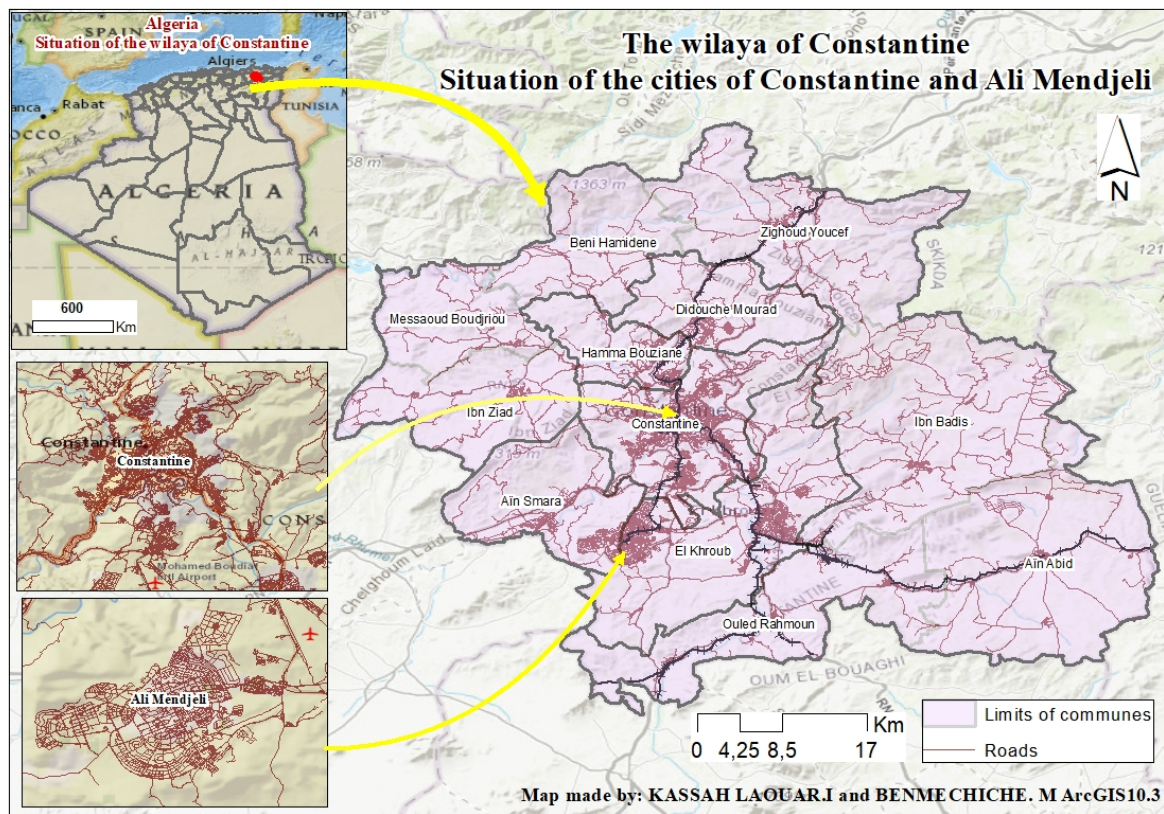


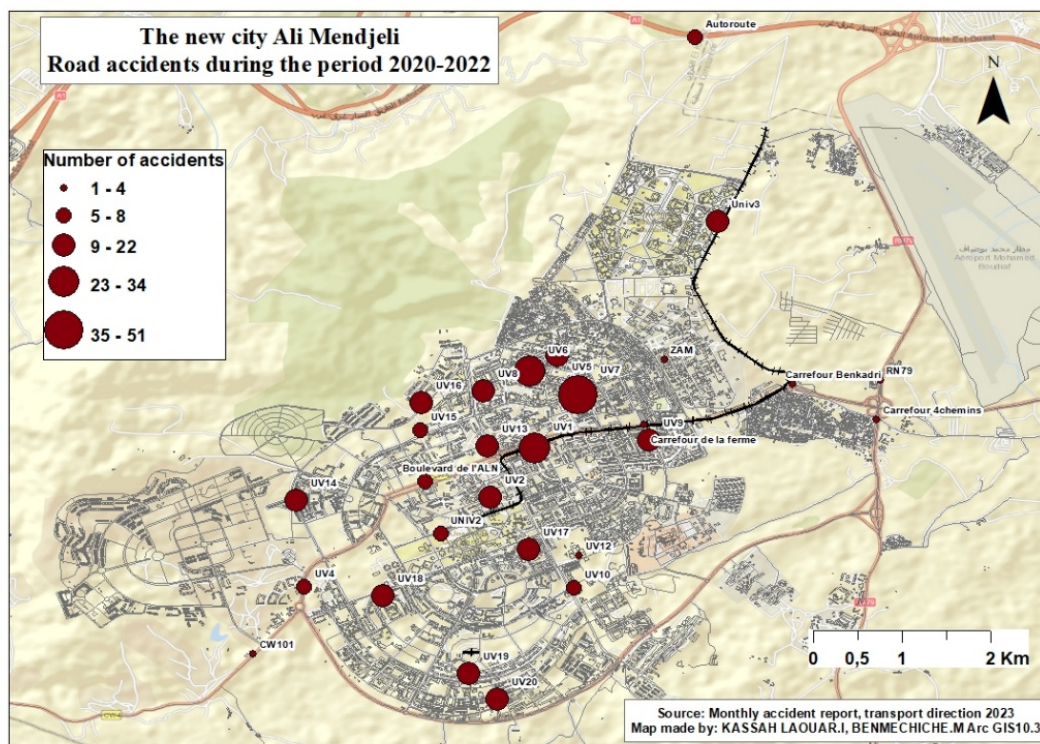
Figure 17. The wilaya of Constantine. Situation of the cities of Constantine and Ali Mendjeli.

8.2. Territorial distribution of road accidents in the cities of Ali Mendjeli and Constantine.

In the three years 2020, 2021 and 2022, the city of Constantine recorded 319 road accidents at 82 sites, while the new town of Ali Mendjeli recorded 362 accidents at 28 sites, with an average of 3.89 and 12.9 accidents per site respectively. In the city of Constantine, the national road NR27 recorded the highest number of accidents, with 29 incidents. In the new town of Ali Mendjeli, Neighbourhood unit 7 had the highest number of accidents, 51 in total.

8.2.1. The new city Ali Mendjeli.

In the new town of Ali Mendjeli, Neighbourhood Unit 7, located to the east of the town, records the highest number of accidents with 51 incidents (see figure 18 and figure 19). It is followed by units 6 and 1, also located in the east, with 34 and 28 accidents respectively. These units are part of the first built areas in the new city. Other sites, such as UV 20, UV 5, UV 17, UV 2, UV 9, UV 16, University 3, UV 8, UV 14, UV 13, UV 18 and UV 19, have a lower number of accidents ranging from 22 to 12. The remaining sites have a range of accidents from 8 to 1. We will now detail Neighborhood Unit 7, where road accidents are most frequent, in order to identify factors contributing to their impact.



*Figure 18: The new city Ali Mendjeli.
Road accidents during the period 2020- 2022.*

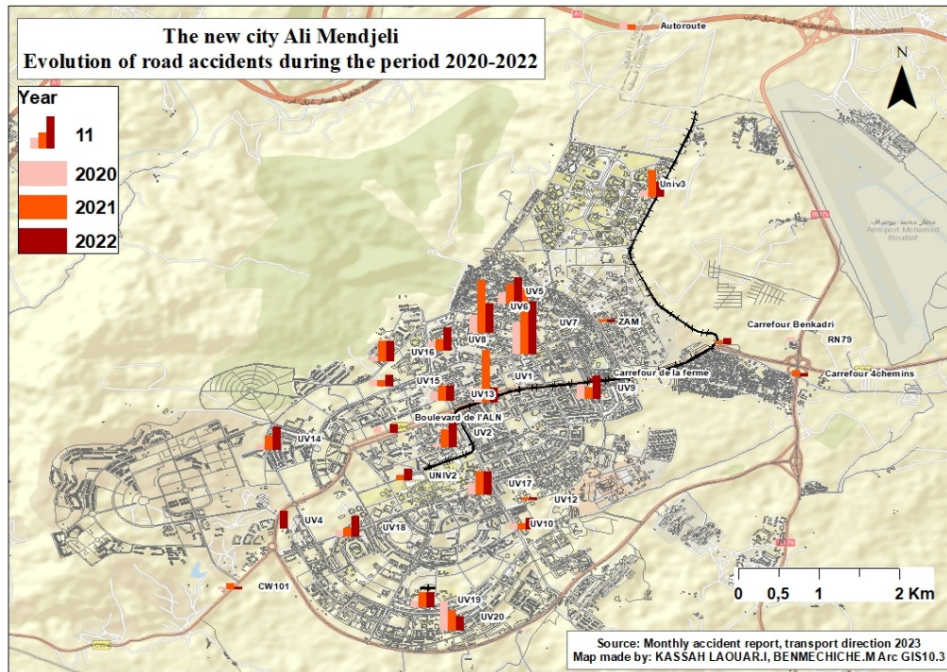


Figure 19: The new city Ali Mendjeli. Evolution of road accidents during the period 2020- 2022.

This site is notable for its large area of 73.02 hectares. It is surrounded by the neighborhood units 6, 8 and 5 in the north, and by unit 1 in the south. These neighboring units have a very high population and housing density, as well as a high concentration of urban functions. The site houses a large number of attractive facilities generating flows and very important traffic, including shopping centers (Coupole and Sans Visa), clinics (Fatma and Clinique Internationale), a public hospital, an administrative city, two hotels, and the External Bank, among others (Figure 20). It is surrounded by a main collecting road.

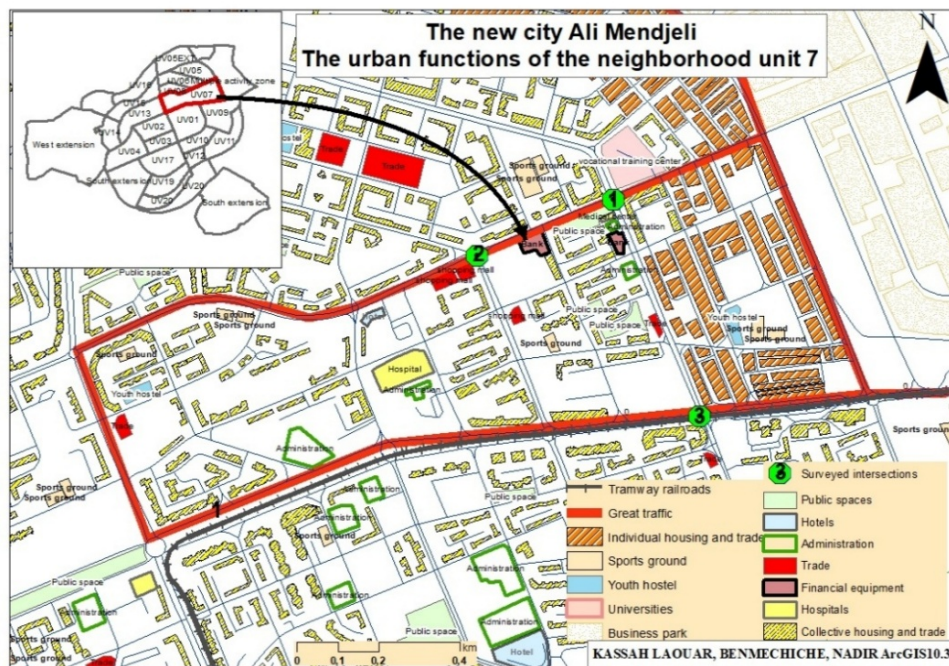


Figure 20: The new city Ali Mendjeli. The urban functions of the neighborhood unit 7.

The analysis of the site reveals points where traffic is particularly conflictual, especially at the three crossroads shown in the figures.

The first four-way intersection, with two lanes separated by a central block, lacks traffic control facilities such as roundabouts or traffic circles and horizontal and vertical signals, as shown in Figure 21. The considerable size of the roads (15 meters on average) allows for a large flow of traffic, but without proper management, this creates traffic conflicts and, consequently, high risks of accidents. The second intersection is heavily trafficked due to traffic from all directions and congestion caused by the presence of many shops and shopping malls with no large parking spaces. This results in parking on both sides of the track. There is also a legal and illegal bus stop and taxi stand around the small roundabout and alongside the directional block (Figure 22).



Figure 21. The new city Ali Mendjeli – Intersection 1



Figure 22. The new city Ali Mendjeli – Intersection 2

The third intersection, located on the city's main boulevard (Figure 23), is a junction between the tram system and the road. This configuration leads to traffic constraints, time losses and, of course, sometimes accidents. Our field investigation revealed that the drivers of cars and buses were not following the signs, and that the lights and priority on the tram were not being used.

Based on the survey of the three junctions and observation of traffic in the city, it is found that there are many risk factors for accidents that can lead to incidents of any kind. Lack of pedestrian signals, in particular, reduces urban road safety, this category being the most vulnerable according to the state statistics of the state.



Figure 23. The new city Ali Mendjeli – Intersection 3

8.2.2. The city of Constantine.

The location of road accidents in the city of Constantine shows that the national road NR27 is the most dangerous site with 29 accidents accumulated over the three years studied (see figures 24 and 25). The second most important route is the Soummam Express, with a total of 21 accidents. Sites with 10 to 13 accidents were Sidi M'cid (at the extreme north of the city), El Emir Abdelkader and Djebel El Ouahch (northeast), Boussouf (southwest along the NR5), Eraïd Chaabane (NR3) turns, National Road 79 in the south, and finally the Palma industrial area.

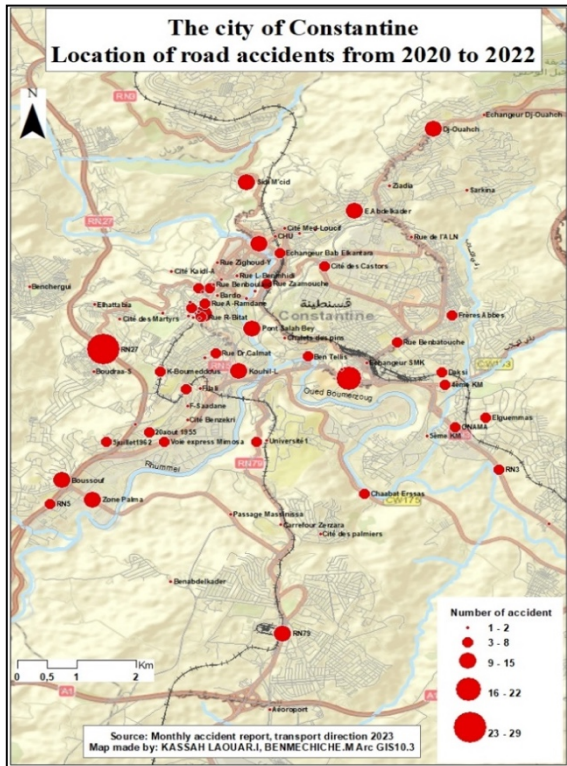


Figure 24. The city of Constantine Location of road accidents from 2020 to 2022.

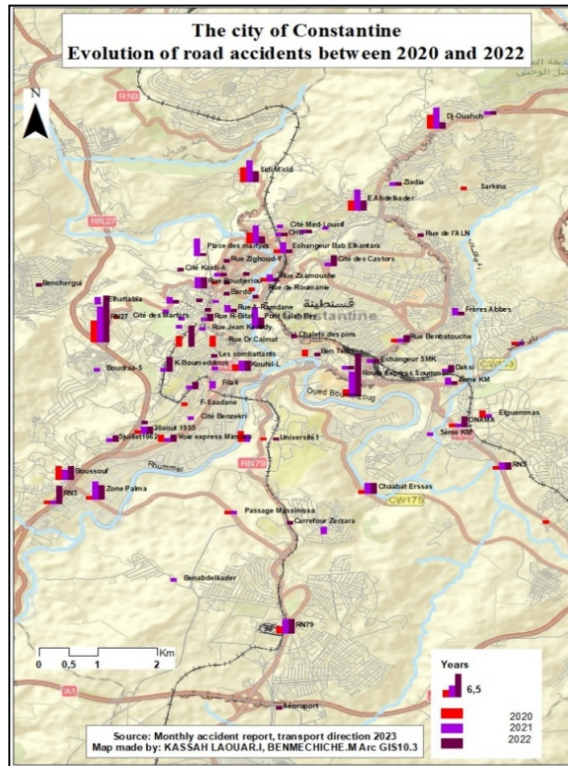


Figure 25. The city of Constantine Evolution of road accidents between 2020 and 2022.

The NR27, which has the highest number of accidents, serves as a bypass for the city of Constantine on the west side. It also includes the northwest and southwest entrances to the city. Its sinuous shape is due to the topography of the site, which has considerable slopes on some sections. It is a collecting route that accumulates traffic from the surrounding dense neighborhoods (Boudraa Salah, Hattabia, El Bir, Benchergui). It is used by heavy goods vehicles and public transport for intercity and inter-states lines. This fast track, with separate roads, is lined with shops of all kinds, which leads to parking on both sides, thus increasing the risk of accidents. This axis also lacks strict signals, especially for pedestrians, and suffers from low lighting, making it a high-risk area for accidents (see figure 26).

For the Soummam Express (Figure 27), located at the southeast entrance to the city of Constantine, it is distinguished by a steep slope and the presence of several attractive facilities such as the Olympic stadium, a clinic, a gas station, and the bus station. This makes it a high traffic road on a potentially dangerous slope, which is accident-prone. Figure 28 shows a high number of accidents in Sidi M'cid, due to the geographical location and shape of the bends serving this area. These turns, located on Oued Rhummel, connect the city center of Constantine to the national road 3 towards the town of Hamma Bouziane, making the road particularly dangerous.



Figure 26. The national road 27

In conclusion, the high number of accidents in the studied localities is mainly due to the topography of the city and the layout of the roads. The concentration of housing and equipment also plays a major role in the increase in traffic.

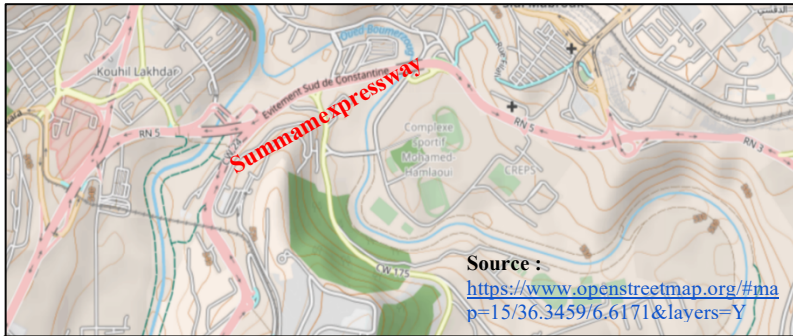


Figure 27. Soummam expressway.



Figure 28. The bends of Sidi M'cid

Conclusion.

Road accidents have become a major concern for governments around the world and a concern for many multidisciplinary researchers as well as international organizations. Their constant increase seriously threatens road safety. This is why this component has been integrated into the goals of the new sustainable development agenda, which aims to ensure health and well-being for all and promote sustainable and resilient communities. In this context, several programs and plans have been put in place to ensure road safety and reduce the number of accidents.

In Algeria, many accidents are recorded every year, especially in urban areas, including Constantine, which is experiencing a continuous increase in road accidents. These accidents, spread over the entire territory of the state, are particularly concentrated in the new town of Ali Mendjeli and the city of Constantine. The new town of Ali Mendjeli has a high number of accidents in the urban unit 7, especially at its crossroads. For the city of Constantine, the most accident-causing roads are at the northwest and southeast entrances to the city, including NR27, Soummam Street and Sidi M'cid.

The location of the most accident-prone sites in both cities, either the old city of Constantine or the new city of Ali Mendjeli, has allowed us to identify many risk factors. Such as the lack of infrastructure development, signals, road configuration, heavy traffic in these attractive areas, and of course the topography of the city including the old town.

REFERENCES

1. A. Bouchareb, «Cirta / Constantine (à l'époque romaine): la vie socio-urbaine à travers les inscriptions épigraphiques », Réflexion(s), avril 2009, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives, New York: Longman.
2. Algérie presse service: le parc automobile a dépassé 6,5 millions de véhicules à la fin 2019, 2021. <https://www.aps.dz/economie/118164-algerie-le-parc-automobile-a-depasse-6-5-millions-de-vehicules-a-la-fin-2019>.
3. Anis Mouad Mezoued: Les paradoxes du système voiture en Algérie; 2023. <https://forumviesmobiles.org/node/15967/printable/pdf#:~:text=D'apr%C3%A8s%20l'Office%20National,m%20v%C3%A9hicules%20en%2010%20ans>.
4. Arnaud Banos et Thomas Thévenin: Mobilités urbaines et risques des transports, Lavoisier Paris 2010; P 151.

5. Arnaud Banos et Thomas Thévenin, Mobilités urbaines et risques des transports approches géographiques, Lavoisier 2010, page 145.
6. Centre d'études sur les réseaux, les transports, l'urbanisme et les constructions publiques. Département Sécurité, Voirie et Espace Public-CERTU- : Aménager la voirie/ 10 principes essentiels pour la sécurité; lyon 2012.
7. Confédération suisse: Agenda 2030 pour le développement durable ; 2024. <https://www.eda.admin.ch/agenda2030/fr/home/agenda-2030/die-17-ziele-fuer-eine-nachhaltige-entwicklung.html>.
8. Despois J et Raynal G: Géographie de l'Afrique du nord-ouest, Payot, Paris, 1964.
9. Direction générale de la sûreté nationale (DGSN), 2023. <https://www.aps.dz/societe/168274-accidents-de-la-route-en-zones-urbaines-665-morts-et-plus-de-20000-blesses-en-2023>.
10. Freyssenet M: La production automobile mondiale, des quatre continents et des principaux pays constructeurs, 1898-2011, Document d'enquête: quatre tableaux et sept graphiques commentés. Édition numérique, freyssenet.com, 2007. <https://www.planetoscope.com/automobile/76-production-mondiale-de-voitures.html>
11. Jean Kaniewicz et Jérôme Sabathier :Regards économiques- le marché automobile mondial se redresse en fin d'année-Transport /tableau de bord n° 20 - t4 2022 (année 2022 et prévisions 2023). <https://www.ifpenergiesnouvelles.fr/article/marche-automobile-mondial-se-redresse-en-fin-dannee#:~:text=Au%20dernier%20trimestre%20de%20l,qui%20%C3%A9taient%20de%2090%20million>.
12. Justine Pérou : Quel parc automobile roulant dans le monde en 2039?, Août 2022. <https://www.largus.fr/pros/actualite-automobile/quel-parc-automobile-roulant-dans-le-monde-en-2039-11009391.html#:~:text=Un%20parc%20roulant%20mondial%20%C3%A0%201%20C5%20milliard%20de%20v%C3%A9hicules%20en%202039&text=Les%20estimations%20avancent%20ainsi%20une,d'unit%C3%A9s%20%C3%A9coule%C3%A9es%20chaque%20ann%C3%A9e>.
13. Martin Winkelbauer : Meilleures pratiques en matière de sécurité routière - Guide des mesures au niveau des pays- ;Luxembourg: Office des publications de l'Union européenne, 2010.
14. New Performance Management (NPM): La sécurité routière; 2022. <https://cabinetnpm.com/la-securite-routiere/>.
15. Organisation mondiale de la santé (OMS): Sauver des vies- module technique de sécurité routière ; 2017.
16. Organisation mondiale de la santé (OMS): Malgré des progrès appréciables, la sécurité routière reste un problème urgent dans le monde, 2023. <https://www.who.int/fr/news/item/13-12-2023-despite-notable-progress-road-safety-remains-urgent-global-issue>.
17. OMS: Une nouvelle déclaration politique historique fixe comme objectif de diviser par deux, d'ici 2030, le nombre de morts et de blessés sur la route; 2022. <https://www.who.int/fr/news/item/30-06-2022-new-political-declaration-to-halve-road-traffic-deaths-and-injuries-by-2030-is-a-milestone-achievement>.
18. OMS: Traumatismes dû aux accidents de la circulation, Décembre 2023. <https://www.who.int/fr/news-room/fact-sheets/detail/road-traffic-injuries#:~:text=Les%20accidents%20de%20la%20route%20co%C3%BBtent%20%C3%A0%20la%20plupart%20des,RES%2F74%2F299>.
19. Osman Benk Sankoh: Comment les pays africains peuvent réduire de moitié les accidents de la route d'ici 2030, Juin 2024, <https://www.un.org/africarenewal/fr/magazine/juin-2024/comment-les-pays-africains-peuvent-r%C3%A9duire-de-moiti%C3%A9-les-accidents-de-la-route#:~:text=L'Afrique%20est%20la%20r%C3%A9gion,routi%C3%A8re%202023%20de%20l'OMS>.
20. Philippe Sourha: Accident de la route et assurance auto, 2024. <https://www.assuranceendirect.com/definition-accident.html>.
21. Samira Kilanyossi: Les accidents de la route: le point; 2024. <https://afiyafira.com/index.php/actualite/oms-les-accidents-de-la-route-le-point/>.
22. United nations: Population northern Africa, Department of Economic and Social Affairs, Population Division World Population Prospects: The 2022 Revision, July 2024. <https://www.worldometers.info/world-population/algeria-population/>.