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THE CITY CHALLENGES AND EXTERNAL AGENTS. METHODS, TOOLS AND BEST PRACTICES

Vol.15 n.2 August 2022

print ISSN 1970-9889 e-ISSN 1970-9870
University of Naples Federico II

TeMA Journal of
Land Use, Mobility and Environment

THE CITY CHALLENGES AND EXTERNAL AGENTS. METHODS, TOOLS AND BEST PRACTICES

2 (2022)

Published by
Laboratory of Land Use Mobility and Environment
DICEA - Department of Civil, Architectural and Environmental Engineering
University of Naples "Federico II"

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Editor-in-chief: Rocco Papa
print ISSN 1970-9889 | on line ISSN 1970-9870
Licence: Cancelleria del Tribunale di Napoli, n° 6 of 29/01/2008

Editorial correspondence
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The cover image shows a sea glacier ice that melts away.

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TeMA Journal of Land Use, Mobility and Environment

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2 (2022)

Contents

TeMA Journal of Land Use, Mobility and Environment

TeMA 2 (2022) 249-261
print ISSN 1970-9889, e-ISSN 1970-9870
DOI: 10.6092/1970-9870/8472
Received 11th May 2022, Accepted 19th July 2022, Available online 31st August 2022

www.tema.unina.it

Youth urban mobility behaviours in Tunisian Sahel

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Abstract
In this paper, we analyze a 2019 survey data in order to gain a better understanding of the urban mobility behaviours of Tunisian young people aged from 15 to 29 years old, in the Tunisian Sahel region. For this study, we selected 739 participants, scattered over 40 delegations each with a different structure. We distinguish two age groups: from 15 to 19 years old (31.8%) and 20 to 29 (68.2%). The descriptive analysis was conducted on two spatial scales: The region named also the great Tunisian Sahel (scale 1) formed by three costal governorates (scale 2): Sousse, Monastir, and Mahdia. The variables analysis falls into two main categories: "daily trips volume coupled to the modal choice", and "the trip trinomial": Distance, Time, and Costs. Significant differences have been found in mobility practices, not only between social and spatial levels, but also between the youngest of 15-19 years old and those of 20-29 years old, thus emphasizing trends in travel habits as a function of age.

Keywords
Mobility; Spatial variability; Distance; Time; Costs.

How to cite item in APA format
Ghédira, A. & El Kébir, N. (2022). Youth urban mobility behaviours in Tunisian Sahel. *Tema. Journal of Land Use, Mobility and Environment*, *15* (2), 249-261. http://dx.doi.org/10.6092/1970-9870/8472

1. Introduction

The ability to move has become a social norm, a resource to achieve access to various amenities presented by social life. Mobility has been defined by Larousse dictionary as the: "Property, character of what is capable of movement, of what it can move or be moved, change place, function". Mobility can also be viewed as a concept that describes the practices of people moving to perform a specific activity. This term has different characteristics depending on the social and individual context. It is used to denote residential, professional, social, or even spatial travel (Saidou, 2014). According to Kaufmann (2000), mobility is closely related to people's psychological, cognitive, and even cultural abilities. In other words, he pointed out that every individual has the potential to move, and they can use it or not according to their desires. For example, if you live in a city that offers many leisure opportunities and has significant mobility potential, you may only rarely use them.

The analysis of urban mobility practices has been the subject of several academic studies and has gained popularity as a topic that covers multiple aspects of social life, including not only the different interactions between human attitudes, their socio-demographic characteristics or even their different cultures with the practices of their daily movements, but also the particularities of the existing relationship to their spatial identity and the built environment (Moeinaddini et al., 2012; Mamdoohi & Janjani, 2016; Adeel, 2018; Akhavan & Vecchio, 2018; Tesoriere & Errigo, 2018; Porter & Turner, 2019). In this article, the aim is to analyze the mobility habits in one of the Northern African countries, "Tunisia", more specifically the Tunisian Sahel region and to focus on the daily mobility practices of young people aged between 15 and 29.

In developing countries, research studies on mobility behaviours are clearly limited. For the Tunisian context, pioneering research addressing mobility behavior dates back only less than ten years. These studies from various disciplines have looked at mobility behaviors and modal choices from different perspectives: mobility management (Krifa and al., 2014), value of travel time (Chaibi & Jebsi, 2012), land use and transport interaction (Ghedira, 2015), gender (El Kébir & Ghédira, 2021) or shared mobility (Turki & Ghédira, 2022).

In addition, less attention has been paid to the youth category by researchers. As such, its travel habits remain untested and less understood. Young people are going through several lifestyle changes that lead to greater independence and access to the different activities offered in their community, where mobility plays an important role as a means of socialization and participation in public life.

This moment of transition represents an interesting field to study and understand the mobility practices of this group of people. The attitudinal differences between adolescents and adults make young people an attractive target for study as they do not have the same needs and preferences compared to other ages and are in the process of developing new attitudes that are similar to increasing independence as they age.

The objective of this paper is to be able to draw a portrait of the mobility practices of the youth community in Tunisia and to be the first reference for the travel habits of such demographic group that has been largely forgotten. In this respect, our paper is structured as follows. Section 2 provides a brief overview of the main existing work on youth mobility. Section 3 is reserved for presenting the data collection technique such as the geographic area studied and the variables to be analyzed. The results and findings obtained are presented in Section 4. The last section concludes this work by summarizing the main results and the different future research directions.

2. Literature review

The literature examining young people's daily mobility practices is relatively scarce and the lines of study are mainly specific to developed countries in Europe or the United States (Dalton et al., 2011; De Paepe et al., 2018; Kamargianni & Polydoropoulou, 2011; Kamargianni et al., 2012; Konrad & Groth, 2020; Kuhnimhof et al., 2012; Marzoughi, 2011; Porter & Turner, 2019; Stark et al., 2015; Woldeamanuel, 2014). For those works,

youth mobility is examined under two main aspects: travel habits, also called trends, and changes in mobility behaviour (1) and their causes as a function of time (2) (Konrad & Groth, 2020).

The themes relate to a descriptive analysis of the general characteristics of mobility, focusing on the specifics of the journeys made and mainly the mode of transport choices made by young people (Clifton, 2003; Copperman & Bhatt, 2011; Dalton et al., 2011; De Paepe et al., 2018; Kamargianni & Polydoropoulou, 2011; Kamargianni et al., 2012; Kuhnimhof et al., 2012; Marzoughi, 2011; McDonald, 2006; Porter & Turner, 2019; Soltanzadeh & Masoumi, 2014; Stark et al., 2015; Woldeamanuel, 2014). Other studies focus on the analysis of commuting to and from school as one of the most studied axes in the literature (Copperman & Bhatt, 2011; Emond & Handy, 2012; Kamargianni & Polydoropoulou, 2011; Kamargianni et al., 2012; McDonald, 2006; Woldeamanuel, 2014) and some focus on the relationship between daily mobility habits and socio-demographic characteristics of young people, mainly gender (Kuhnimhof et al., 2012; McCray et al., 2011; McDonald, 2006; Thakuriah et al., 2009).

The territorial context is also represented by the possible interactions between mobility behaviour and the environment young people are exposed to (Dalton et al., 2011; McDonald & Trowbridge, 2009; Skelton, 2013). Other axes are also examined, namely safety, independence from parents and the accident rate (Kamargianni & Polydoropoulou, 2011; Marzoughi, 2011; McCray et al., 2011; Mohamed & Bromfield, 2017; Woldeamanuel, 2014), as well as the effect of new communication technology on the characteristics and mobility needs of this demographic category (Berrington & Mikolai, 2014; De Paepe et al., 2018). In the literature, these aspects are treated separately or in combination. In other words, several articles try to share them by covering, for example, the safety aspect of young people with modal choices or even the reasons for travel (Kamargianni & Polydoropoulou, 2011; Kamargianni et al., 2012; Woldeamanuel, 2014).

Regarding the practices of adolescents in most of the study areas, it seems that with increasing age this population group tries to be more mobile, travel more and spend more time in traffic (Konrad & Groth, 2020). Studies have shown that adolescents prefer private car travel, whether as a driver or passenger (Copperman & Bhatt, 2011; Konrad & Groth, 2020), and their trips on foot or on public transport decrease with age (Clifton, 2003; McDonald, 2006).

However, other studies have found that driver license ownership among them decreases with the rate of motorization and the most common modes of transport used are public transport, walking and bicycles (Berrington & Mikolai, 2014; De Paepe et al., 2018; Konrad & Groth, 2020; Kuhnimhof et al., 2012; Marzoughi, 2011). The choice of transport can be influenced by several factors, such as: the travel purpose (Copperman & Bhatt, 2011; McDonald, 2006), the characteristics (Emond & Handy, 2012) or even the specifics of the built environment (De Paepe et al., 2018; McDonald & Trowbridge, 2009; Voorhees et al., 2011). Regarding this last point, Dalton et al. (2011) found that young people in two rural areas of the United States walk or bike their commutes to and after school, mainly when traveling through neighborhoods with intersections and covering multiple buildings and amenities. In terms of gender, young women are the most likely to experience difficulties with their daily travel, particularly due to security issues (McCray et al., 2011; Thakuriah et al., 2009), which is why the majority of this category travel by private car and are least likely to use public transport, bike or walk (Clifton et al., 2009; Emond & Handy, 2012).

3. Methodology and analysis variables

In this section, we explain the methodology of our study, with a focus on the data collection technique, the geographic area studied, and the analysis variables studied.

3.1 Data collection and geographic area of the study

The data used for our study was collected from a survey conducted in 2019 at each of the 40 Tunisian Sahelian delegations. This study area presents the eastern region of Tunisia, which covers an area of 6,659 km^2 (4%

of the total area of Tunisia) and includes three governorates: Sousse, the most popular city; Monastir, the main university center of the region; and Mahdia, the largest. These three geographic entities host about 1,739,589 inhabitants distributed among 40 delegations according to the 2017 population estimate (GCRD: General Commission for Regional Development), making the Tunisian Sahel the second most popular region of Tunisia with 15.2% of the total population (Fig.1).

Through its mix of high-value-added industries, tourism, and agriculture, the region has played a significant role in the nation's development. Geographically, Tunisia's Sahel occupies an advantageous location that makes its three governorates a vital link between the south and north of the country, supported by the development of a basic infrastructure that makes traveling between the two increasingly simple.

Our motivation lies in the aim of analyzing the spatial variability of urban mobility practices between these three historically homogeneous geographic entities and emphasizing the imbalance that can exist between their different residents, especially young.

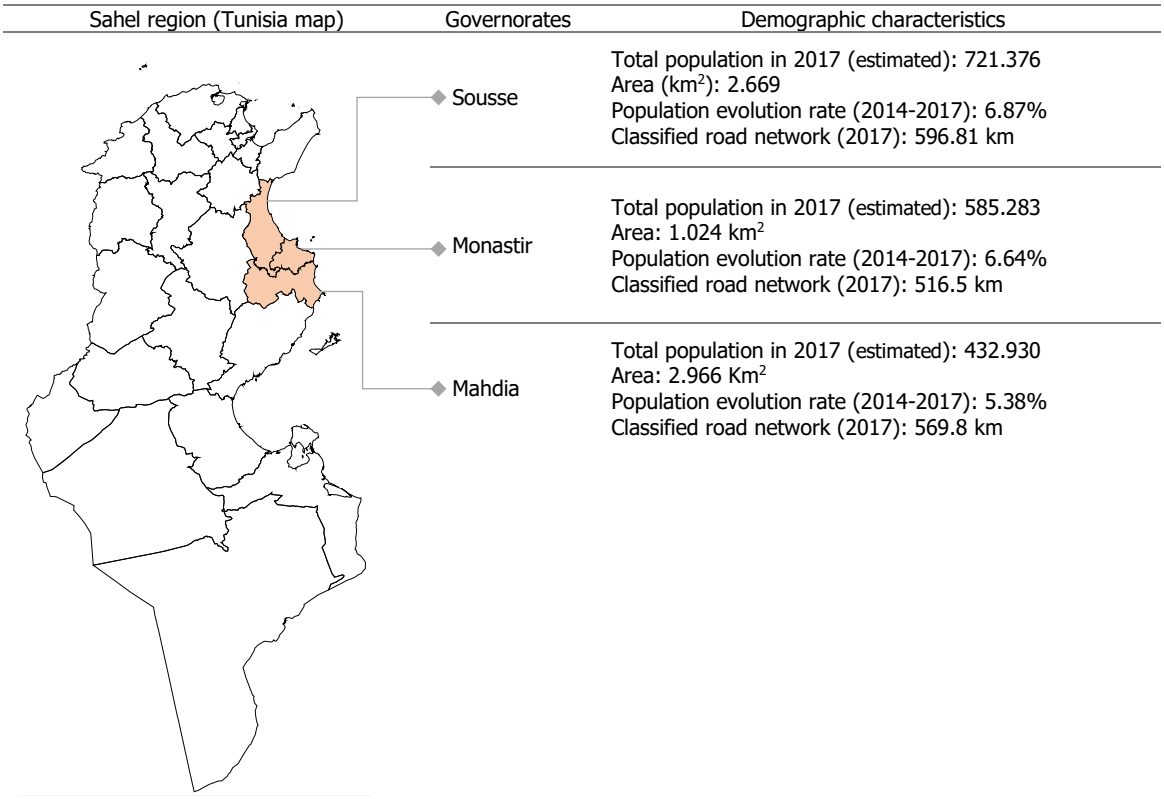

Fig.1 Geographical field of study: the Sahel region of Tunisia and its three governorates

The aim of our survey is to have a real snapshot of the way in which the inhabitants of this region move and participate socially, while focusing on the spatial variability of the daily rhythms of mobility between the various areas of the Sahel region. The main questions of our survey revolve around: How do the inhabitants of the Sahel move around? What are their mobility patterns? what means of transport do they use? how often? for which purpose? for how much cost, time, and distance? How do they assess the quality of the transport services available to them? What variability can be observed between the different socio-demographic categories serving this region? And what are the spatial differences in mobility and access to social life between the different governorates and even the different delegations that make up the Sahel region?

The survey was carried out on 2021 people, among a total population of 1,206.763 people aged between 15 and 60 years old, previously defined using the probability stratified sampling techniques. Stratification was based on spatial context (governorships/delegations), gender and age of the Tunisian Sahel population. Therefore, we set a specific number of observations by gender (male/female) and age (from 15 years to over 60) for each delegation of each governorate.

The first step in conducting this questionnaire was to inform the concerned authorities in each of the delegations visited about the subject of our study. The collection technique was through meetings on the streets and in public places as privileged targets to capture as many participants as possible with distinctive profiles. Once a person agrees to participate, the total duration of the questionnaire is estimated at 15 to 20 minutes. The statistical reference is the person interviewed. The survey started on January 29, 2019, and lasted a month and a half, not counting Sundays and Mondays, school, and national holidays. The observations judged to be deviating were eliminated from the outset and re-collected during this time.

From 2021 observations, our study involved 739 individuals aged between 15 and 29 years old, of which 39.8% are in Sousse, 35.7% in Monastir and 24.5% in Mahdia. It is composed more of men (50.7%) than women (49.3%), most of whom are single and have incomes less than or equal to DNT 1050. The socio-professional status of the 739 respondents revolves around three main occupations, namely high school students (32%), students (27.7%) or a freelance job (32.2%). The following Tab.1 shows in detail the distribution of our sample according to criteria such as gender, marital status, income, and socio-professional classification for the two geographical analysis scales.

		People aged between 15-29 years old			
Geographic area		Tunisian Sahel region	Sousse	Monastir	Mahdia
Sample number		739	294	264	181
Gender	Female	49.3%	50%	51.1%	51.4%
	Male	50.7%	50%	48.8%	48.6%
Marital status	Single	89%	89.1%	90.5%	86.7%
	Married	10.1%	10.2%	8.7%	12.1%
	Widower	0.7%	-	-	0.5%
	Divorced	0.2%	0.7%	0.7%	0.5%
Income	0-1,050 DNT	94.8%	95.2%	93.5%	96.1%
	1,050-1,750 DNT	4.1%	4%	4.5%	3.3%
	1,750-2,450 DNT	0.5%	0.7%	0.7%	-
	+2,450 DNT	0.5%		1.1%	0.5%
Socio-Professional Category	High school student	32%	32.3%	29%	35.9%
	Student	27.7%	27.9%	33.7%	18.8%
	Teachings	0.5%	-	0.7%	1.1%
	Private profession	32.2%	31.3%	30.3%	36.4%
	Public profession	1%	0.3%	1.5%	1.6%
	Liberal profession	0.4%	0.7%	0.4%	-
	Unemployed	6%	7.5%	4.5%	6%

Tab.1 Socio-demographic characteristics of the study sample

3.2 Analysis variables

The variables studied fall into two categories, namely the number of journeys young people make and the trinomial: distance, time, and cost. For the first, we have the rate of daily trips, or the average number of trips per day, and the modal choice. The second category focuses on the total distance travelled, the time budget, the average journey time (The average duration by trip), the daily transport costs, and the transport costs per kilometer / per hour.

Time budget is an indicator that measures the total time a person invests during a trip over a day. The average duration by trip is measured by the ratio between the time budget and the number of daily trips. When it comes to travel costs, the average daily travel costs are stated by those surveyed, on the basis of which we even show the expenses per trip. The cost per kilometer, on the other hand, gives a relative indication of the cost per kilometer driven and is measured by the ratio between the daily transport costs and the distance. In

the same way, the hourly cost allows each hour spent to be quantified and is measured by the ratio between the daily expenses and the time budget, multiplied by 60.
The analysis of the different variables is presented on two hierarchical aggregation scales, including the Sahel region as a whole and the three governorates. The main idea is to be able to focus on the points of divergence and convergence between these three sub-areas of study.

4. Results and discussions: Scale of the Tunisian Sahel region

For this spatial level, we first focus on the rate of daily travel as well as the trinomial of trips made by young people aged 15-29 compared to other age groups, specifically people aged 30-49 and 50-60 and older. We then examine the mobility practices of young people by dividing them into two categories, namely youth aged 15-19 and youth aged 20-29. The aim is to analyze mobility trends by age.

4.1 Comparison between age groups

The results obtained for each one of the variables and the age groups exploited are presented in Tab.2.

	People aged between 15-29 years old	**People aged between 30-49 years old**	**People aged between 50-60 and over years old**
Daily travel rate	3.9	3.6	3.2
Total distance traveled (Km)	24.7	25.7	22.7
Time budget (minutes)	91	74	72
Average duration of each trip (minutes)	28	24	27
Daily transport expenses (DNT)	2.670	4.636	3.423
Daily transport expenses/Trip (DNT)	0.857	1.407	1.203
Kilometric Cost (DNT)	0.410	0.652	0.473
Hourly cost (DNT)	2.621	5.988	4.807

Tab.2 The daily rate and the trinomial of trips

After comparing the three categories, we found that the rate of daily trips is inversely related to age, meaning that people are less mobile as they get older. This observation is validated for time budget by how much time young people aged 15-29 spend on their daily journeys, averaging one and a half hours, versus 73 minutes for people aged 30-49 and 72 minutes for adults aged 50-60 and older. With a total of almost 28 minutes, young people have an average duration per trip longer than the other two categories. However, it seems that people in their 50s and 60s can last quite a long time, close to the latter at around 27 minutes. For the remaining variables, the most important average values are more likely to appear for the 30-49-year old's, namely total distance traveled (25.6 km/day), daily transport costs (4.64 DNT/day), daily transport costs/trips (1.41 DNT/day), cost per kilometer (0.65 DNT/km) and hourly cost (5.99 DNT/km).

4.2 Modal choice

According to the first census, young people in the Sahel primarily use 15 modes of transport for their daily journeys. They are presented in Table 3 and identified under the realm of three categories according to individual, collective or semi-collective character. For the Sahel we are talking about two means of semi-collective transport: "louage" and collective or shared taxi. A third mode of transport has emerged under the name of "Clandestine" and it's an informal mode of transport (illegal), available on routes with little presence of public and non-regular (NRPT) transport. Owners of private vehicles actually act as passenger carriers at variable prices depending on the volume of the service.

	Mode of transport character		
Mode of transport	Individual	Semi-collective	Collective
Two-wheel drive	X		
Animal	X		
Bicycle	X		
Truck	X		
Van	X		
Walking	X		
Individual taxi	X		
Private car	X		
Work bus			X
Clandestine		X	
Louage		X	
Collective taxi		X	
Bus			X
Tram			X
Train			X

Tab.3 Presentation of transport modes by character

According to the modal split shown in Table 4, 65.2% of daily trips of young people aged between 15 and 29 years old in the Sahel region are made by individual, 18% by collective, and nearly 17% by semi-collective modes. This absolute dominance of private transport manifests itself in the 15 to 19 and 20 to 29-year-olds in the same way with changes from one age group to the other with 64.4% to 65.6%.

Modes of transport	**Youth aged between 15-29 years old**	**Youth aged between 15-19 years old**	**Youth aged between 20-29 years old**
Two-wheel drive	6.8%	2.5%	9.1%
Bicycle	2%	3.5%	1.2%
Bus	**15.4%**	**24.6%**	**10.5%**
Work bus	0.5%	0.2%	0.8%
Clandestine	0.5%	1.2%	0.2%
Louage	5.5%	2.5%	7%
Walking	**41.7%**	**47.7%**	**38.6%**
Tram	1.9%	0.7%	2.6%
Collective taxi	**10.8%**	**6.4%**	**13.1%**
Individual taxi	2.5%	1.9%	2.7%
Private car (as driver)	**5.1%**	**1.4%**	**7.1%**
Private car (as a passenger)	**7%**	**7.4%**	**6.7%**
Animal	0.1%	-	0.1%
Van	0.1%	-	0.1%
Train	0.1%	-	0.2%

Tab.4 The modal split in the Sahel region by age group

However, public transport is most commonly used by young people aged 15-19 with around 25.4%, compared to just 14% for 20-29-year-olds. This finding is reversed for semi-collective modes of transport, of which 20% of their trips are made either with shared taxis, louage or even in clandestine mode. Among young people between the ages of 15 and 19, only 10% of their journeys are made using these modes of transport. Specifically, young people in the Sahel use walking as the main mode of transport (42%), the bus (15.4%) and their own car (12.1%). The shared taxi ranks fourth and handles just under 11% of the daily journeys by

this group of people. The use of animals as a means of transport, the van, and the train, have the lowest shares.

Analyzing each age group separately, walking remains the dominant part, whether among young people between 15 and 19 years (47.7%) or others between 20 and 29 years (38.6%). Initially, one in four journeys is made by bus, which comes second, followed by private cars with almost 9% (mainly as passengers (84.4%)) and shared taxis (6.4%). As they get older, around 14% of young people are more likely to use cars, 7% of them as drivers. In third place is the shared taxi with a share of almost 13%, followed by the bus, which only provides 10.5% of the total journeys for users.

4.3 The volume and trinomial of trips

The following table quantitatively compares the different average values for young people aged 15 to 19 and 20 to 29 years old.

	Tunisian Sahel region	
Age groups	**15-19 years old**	**20-29 years old**
Daily travel rate	4.3	3.7
Total distance traveled (Km)	15.2	29.1
Time budget (minutes)	89	92
Average duration of each trip (minutes)	23	30
Daily transport expenses (DNT)	1.154	3.377
Daily transport expenses/Trip (DNT)	0.297	1.119
Kilometric Cost (DNT)	0.287	0.468
Hourly cost (DNT)	0.978	3.387

Tab.5 The daily rate and the trinomial of trips by age group

In terms of daily journeys rate, youth between the ages of 15 and 19 are more mobile than those of 20- to 29-year-old, with an average of around 4.3 journeys/day, compared to 3.7 journeys/day for the elderly. However, in terms of total distance travelled, young people aged 20-29 travel an average of 29.1 km/day, compared to just 15.2 km/day for the 15-19-year-olds. This is mainly explained by the development of the activity space of 20–29-year-olds, which accompanies their socialization and the development of relationships with their community, escaping the control of their adult superiors. This observation is also reflected in a very high time budget (92 minutes) and average duration per trip of 30 minutes for this group of people, in addition to the expenses related to their trips.

5. Results and discussions: Scale of the three governorates of the Tunisian Sahel region

At this level of the article, we choose to refine the analysis and focus only on the two age groups of 15-19 and 20–29-year-olds, separately at the level of each governorate of the Sahel region.

5.1 The modal choice

As with the analysis at the overall regional level, we start with the modal split of the two population groups (Tab.6). In the governorates of Sousse and Monastir, the most common means of transport are walking, bus, shared taxi and private car. For Mahdia, the two-wheel drive takes the place of the shared taxi. They account for more than 80% of young people's daily journeys and the intensity of use varies from age to age. For the entire Sahel, the dominance of individual transport is validated for each of the two age groups in the three governorates, in addition to differences in the use of collective and semi-collective transport between them.

More specifically, 47.1% of young people in Sousse aged 15-19 choose to walk, compared to 37.3% in the 20-29 age group. For the first age group, the bus follows with a share of 25.2%. For the second it is more the private car with a share of almost 18%, for which around 59% of the journeys are made as a driver.

	Sousse		**Monastir**		**Mahdia**	
	15-19 years old	**20-29 years old**	**15-19 years old**	**20-29 years old**	**15-19 years old**	**20-29 years old**
Two-wheel drive	1.3%	9.4%	1.5%	6.7%	**6.5%**	**12.2%**
Bicycle	2.5%	0.3%	3.4%	1.2%	5.5%	2.7%
Bus	**25.2%**	**12.9%**	**17.2%**	**8.8%**	**37.3%**	**9.5%**
Work bus				0.3%	0.9%	3.3%
Louage	2%	6%	0.7%	5%	7.4%	11.9%
Walking	**47.1%**	**37.3%**	**58.1%**	**39.1%**	**29.5%**	**39.9%**
Tram		0.4%	1.7%	6.1%		0.5%
Collective taxi	**9.1%**	**13.4%**	**4.4%**	**15.8%**	5.1%	8.1%
Individual taxi	0.7%	2%	3.9%	5.2%		0.2%
Private car (as driver)	**2%**	**10.6%**	**1.5%**	**5.8%**		**2.9%**
Private car (as a passenger)	**10.1%**	**7.4%**	**4.7%**	**4.7%**	**7.8%**	**8.8%**
Animal	-	-	-	0.3%	-	-
Van	-	-	-	0.3%	-	-
Clandestin	-	-	2.9%	0.4%	-	-
Train	-	0.3%	-	0.3%	-	-

Tab.6 Modal split by age group and geographic area

The latter mode of transport appears in third place among young people between the ages of 15 and 19 with a share of 12.1% and 83.3% as passengers. This can be explained by the age limit for obtaining a driver's license in Tunisia (from 18 years), as well as financial capacity and family attitudes. Among young people between the ages of 20 and 29, the shared taxi takes third place with 13.4% of journeys, followed by the bus with a share of 12.9%. For youth between 15 and 19 years old, the shared taxi ranks fourth with only 9%.
As for Monastir, we observe the same modal split as in the case of Sousse, where young people aged between 15 and 19 have the same modal use classification. For 20-29-year old's, the shared taxi is in second place with 15.8% of trips after walking (39.1%). Third place is for the private car with 10.5% and almost 55.2% as the driver and finally the bus, which made less than one trip out of 10 for this category. For Mahdia, the majority of daily travel is primarily provided by bus, foot, private car and the two-wheel drive. A proportion of 37.3% of people aged between 15 and 19 travel by bus, on foot (29.5%), with their household car as a passenger (7.8%) and on the two-wheelers (6.5% %). Among 20-to-29-year old's, walking comes first with 39.9% of total journeys, followed by two-wheelers (12.2%) and walking (11.9%). In fourth place is the car with a share of 11.7%, with 75% of trips being made as a passenger.

	Sousse		**Monastir**		**Mahdia**	
Age groups	**15-19**	**20-29**	**15-19**	**20-29**	**15-19**	**20-29**
Daily travel rate	4.3	3.8	4.6	3.7	3.7	3.4
Total distance traveled (Km)	14.5	22.6	13	32.9	19.7	34.1
Time budget (minutes)	76.462	75.225	94.253	108.881	101	95.488
Average duration of each trip (minutes)	17.97	22.82	21.65	34.57	32.90	33.83
Daily transport expenses (DNT)	0.919	3.233	1.424	3.354	1.120	3.643
Daily transport expenses/Trip (DNT)	0.242	0.944	0.336	1.066	0.326	1.475
Kilometric Cost (DNT)	0.217	0.417	0.474	0.608	0.112	0.352
Hourly cost (DNT)	0.886	3.644	1.151	2.945	0.863	3.599

Tab.7 The daily rate and the trinomial of trips by age group and geographic area

5.2 The volume and trinomial of trips

The average values obtained by governorate and by age group are presented in Tab.7 above.

The rate of daily trips

Across the three governorates, young people aged 15-19 are more mobile than those aged 20-29, with the highest average observed in Monastir: 4.6 trips per day, followed by Sousse (4.3 trips) and Mahdia (3.7 trips). This division differs from the second age group. In fact, it seems that the average number of daily trips decreases from 3.8 trips per day in Sousse to 3.4 in Mahdia governorate as we move towards the largest area of the Sahel.

The total distance

As previously mentioned, the most important values of each variable of the traveler's trinomial are revealed by adolescents between the ages of 20 and 29 years. In terms of daily distance traveled in Mahdia, the two age groups cover more kilometers compared to the other governorates, with 19.69 km/day for young people aged 15-19 and 34.16 km/day for those aged 20-29. These figures can be explained by the large area of Mahdia of about 2,966 km^2 (the largest region compared to the other two governorates), leading to a diversification of the different activities in which this category participates. On the other hand, the least significant average values for people of 20-29 years old occur in Sousse (22.65 km per day), while the youngest tend to cover the shortest distances in Monastir (13 km per day).

The time

In terms of time, young people aged between 20 and 29 years in Monastir have the largest time budget compared to other governorates with an average value of around two hours and 49 minutes per day. This value is less important in Mahdia with around one hour and 35 minutes and in Sousse with one hour and 15 minutes. For the youngest between 15 and 19 years old, they spend most of their time on their daily trips, averaging around two hours in Mahdia. Monastir is second with an average of one hour and 34 minutes, followed by Sousse, which is the same as young people aged 20-29, the lowest average of almost an hour and 16 minutes. This spatial variability is also reflected in the same classification of governorates for the duration of each trip undertaken.

The costs

The significant distances traveled by young people aged between 20 and 29 in Mahdia translates into significant daily expenditures of around 3.64 DNT/day, equivalent to 1.48 DNT/trip. In second place is Monastir governorate with an average of 3.35 DNT/day and an average per trip of 1.07 DNT. The daily fare in Sousse is approximately 3.23 DNT/day with an expenditure of 0.94 DNT per trip. Young people aged 15-19 spend the least on their daily travel compared to others in the three regions. As for the rate of daily journeys, Monastir has the highest average cost spend with a value of 1.42 DNT/day and only 0.34 DNT/journey. In second place we find Mahdia with 1.12 DNT/day and 0.33 DNT per trip. The governorate of Sousse remains in the same rank with less spending of only 0.92 DNT/day and 0.24 DNT per trip. In terms of kilometer costs, young people between the ages of 20 and 29 living in Monastir bear higher kilometer costs than in the other two regions, at an average of 0.61 DNT/km. Sousse is second with 0.42 DNT/km, while Mahdia is around 0.35 DNT/km. This ranking remains unchanged for the youngest between 15 and 19 years old in Monastir, with a kilometer price of around 0.47 DNT/km, compared to 0.22 DNT/km in Sousse and 0.11 DNT/km in Mahdia. Quantifying

transport spending over time, Sousse governorate ranks first with hourly costs of around 3.64 DNT/hour for young people aged 20-29, followed by the Mahdia region with 3.6 DNT/hour and Monastir with 2.95 DNT/hour. The youngest between 15 and 19 years spend the most in Monastir per hour traveled (1.15 DNT), followed by Sousse (0.89 DNT/hour) and Mahdia (0.86 DNT/hour).

6. Conclusion

The aim of the article was to draw a portrait of the everyday mobility practices of young people aged between 15 and 29 in the Tunisian Sahel using two spatial aggregation scales. According to the various observations from the analysis of the characteristics and travel habits of this demographic category, a large variability was found not only between the different age groups but also between the different governorates of the study area.

Our analysis of the quantitative variables considered has shown that young people in the Sahel are more mobile than older adults aged 30+ and spend most of their time in transportation services. In terms of modal choice, in the demographic category, individual modes of transport are the most frequently used, followed by collective and semi-collective transport amenities. The detailed analysis by age group also confirmed this absolute dominance and showed that the youngest from 15 to 19 years old move significantly more than those from 20 to 29. However, the most dominant mode of transport for both categories is walking. A private car has gained in importance and is associated with increasing age.

On a finer spatial scale, differences were observed between the three governorates of the Sahel. When choosing transport mode, the individual amenities always remain in the foreground of the three study perimeters. Young people in Sousse and Monastir mainly use walking, buses, private cars, and shared taxis, as reported across the Sahel region. However, in Mahdia, two-wheel drive is one of the most commonly used modes of transport, with significant shares for the two age groups studied. Private car use is well represented among young people aged 20-29, mainly as drivers, and its share decreases when moving from the most populated region (Sousse) to the least populated (Mahdia). As with the other analyzed variables, the means are like the ranks of the governorates differ as they move from one age group to another. This variability can be summarized in the table below depending on the intensity of the observed mean (most important and least important).

	15-19 years old		**20-29 years old**	
Intensity of mean values	**The most**	**The least**	**The most**	**The least**
Daily travel rate	Monastir	Mahdia	Sousse	Mahdia
Total distance traveled (Km)	Mahdia	Monastir	Mahdia	Sousse
Time budget (minutes)	Mahdia	Sousse	Monastir	Sousse
Average duration of each trip (minutes)	Mahdia	Sousse	Monastir	Sousse
Daily transport expenses (DNT)	Monastir	Sousse	Mahdia	Sousse
Daily transport expenses/Trip (DNT)	Monastir	Sousse	Mahdia	Sousse
Kilometric Cost (DNT)	Monastir	Mahdia	Monastir	Mahdia
Hourly cost (DNT)	Monastir	Mahdia	Sousse	Monastir

Tab. 8 Summary of the spatial variability of quantitative variables for each age group

Our current work on youth mobility practices represents the first milestone for a future extension of this research direction that seeks to fill the existing gap in the literature. To deepen this analysis, research perspectives can be articulated by emphasizing the degree of social integration of young people in relation to their mobility and even opting for finer spatial scales involving country delegations. The analysis of mobility practices in relation to the socio-demographic characteristics of young people such as gender or income, as well as their environment, offers very interesting axes that can be used in similar contexts.

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