Abstract—This work aims to integer road users to black areas identification through a qualitative methodology based mainly on a series of questionnaires and interviews and by a development of a geographical information system on the road accidents in studied area. The road user, particularly the driver, is generally considered as the first person in charge in the case of accident, while his opinion is rarely joined into the establishment of the solutions to the problems of the road insecurity, considering needs for the treatment of black areas, problems of the lack of data on the accidents, the different advantages that suggests the concept of participation and the feasibility integrating the road users into the analysis of the road safety. The participative approach aims at supplying with the accessibility for the users of the road to indicate the places of male performances of safety according to their feeling and of them the experience. The approach by the GIS aims at first to establish road accidents on the studied site by associating data of different nature and then to make a spatial analysis via ArcGis tool. The study area is a section of national road Highway RN6 of 38 Kms(from the PK00 to the PK38) which across the wilaya of Mascara. it is considered a highly centralized, for a system of market economy, liberal oriented. The study site is a section of national road N6 Sig linking the city to the north and the town of Mascara south of 38 Kms in length (the Sig PK0.00 to KP 38) Fig.1. This denotes the extreme revolved by such a plague and proves that the Algerian roads are of the most murderous. Every year the road accidents cause more than 4000 handicapped persons (association of the handicapped persons, the reference). The road accidents cost more than 100 million dollars a year for the treasury. According to the Ministry of Transport, that is approximately 2 % of the GDP of the country [1,3].

The road accidents represent approximately 70 % of the accidents in rural zone and approximately 56 % of accidents on all the national road network in 2011 [2]. The Main roads which register more traffic accidents are: RN6 (Bechar-Mascara), RN5 (Alger-Constantine), RN1 (Alger-Djelfa), RN4 (Alger-Mascara-Oran), RN3 (Skikda-Constantine), RN11 (Algiers-Mostaganem), with respectively 24 %, 20 %, 19 %, 13 %, 13 % and 10 % of accident.

Wilaya of Mascara, occupies a strategic geographical position, making the wilaya a crossroads of all Western Algerian towards all regions (West, East, North, South). It is characterized by a dense network highways, composed of twelve sections, with a very high mobility of people and goods (oulha, 2010). The most important axes that cross the province are stretch N4, N6, RN14, N7, RN17 and RN17A, respectively connecting the wilaya of Mascara with wilayates Oran, Relizane, Saida, Tiaret, Sidi Bel Abbes (Fig. 1).

The wilaya of Mascara is one of the most affected Algerian wilaya by road accidents especially in rural areas. It is ranked second among rural and 6th at the national level according to the number of fatalities of road accidents in 2008. The accidents on highways in Mascara represent about 70% of accidents in rural areas and about 56% of all accidents on the road network of the wilaya in 2010.

In 2009, the services of the National Gendarmerie reported 64 killed due to road accidents in the stretch between RN6 Mascara and Oran which represents about 40% of all accidents killed at the scale of the wilaya [2].

II. Presentation of the Study Area

Algeria has begun, following the crisis caused by falling oil prices in 1986, structural reforms which were aimed at abandoning the system of economic management and social, highly centralized, for a system of market economy, liberal oriented. The study site is a section of national road N6 Sig linking the city to the north and the town of Mascara south of 38 Kms in length (the Sig PK0.00 to KP 38) Fig.1. This section is of vital importance, not only for the province of
Mascara but also to several provinces of Algeria Adrar. An important vehicle traffic runs daily on this route. This traffic consists of all types of vehicles with a strong presence of heavy trucks [3]. It is a winding stretch with several slopes of 10%, plus the fact that it supports heavy traffic at all times and in all categories of vehicles. The morphology of this section requires heavy practicing at low speeds on a dual carriageway direction not exceeding 6 meters in width see Table 1, which causes discomfort to the flow of traffic for light vehicles, leading to dangerous maneuvers where many of them end badly.

The geographical position occupied Mascara and making it an area of transition from a large flow of lorries on Oran axes - Mascara Adrar (N6), consisting essentially of buses carrying passengers and tankers carrying fuel. Under this study, we used the network mainly in the wilaya of Mascara and the axis of the N6 on the territories of the province of Mascara and Saida. This choice is justified by several factors:

- Dense network used by local traffic and transit traffic (north-south and east-west) important because it acts as an interface between the north west and south west and the High Plateau in the west.
- Different types and sizes vehicles using the network.
- Network rural primary component that concentrates the majority of accidents (56% against a national average of 88% for Mascara)
- Mascara is ranked 2nd (in 2008) at the national level for accidents in rural areas (10a, 10b, 10c)
- Diversification geometric layout and environment
- Proximity to the different actors in the acquisition of information.

### III. METHODS

The Objective of this work is to try to approach drivers (taxis inter-wilaya, buses, trucks, vans, private) as daily users of the axis N6 and daily witnesses at risk in order to locate the best places dangerous than present this axis.

The approach followed in the analysis of road accidents on the stretch of N6 kilometer point (KP) PK No. 00 to No. 38 PK is to use two sources of information on the location of road accidents: accident statistics road mileage by point provided by the services of the National Gendarmerie over a period of five years (2005 to 2009), interviews and questionnaires of different drivers on this stretch more often (bus drivers, trucks and taxieux inter wilaya (Mascara - Oran - Mascara.) This survey work was carried out during the months of February and March 2012.

### IV. COLLECTING INFORMATION

The collection of information necessary for the preparation of this work was performed at the following organizations:

- National Gendarmerie (accidents per kilometer point from 2005 to 2009);
- The Directorate of Public Works (geometric characteristics of the section of the road, work on the floor, etc.).
- The Department of Transportation (various statistics of accidents in urban and rural areas);
- the Union taxieux (number of taxieux on line Mascara - Oran);
- the company Algerian Des Eaux (ADE) (for number of drivers on the stretch Mascara - Sig).

### V. PRESENTATION OF THE SAMPLE INTERVIEWS AND QUESTIONNAIRE(SURVEY)

A sample of 144 drivers has been developed. This sample is composed of several drivers of different vehicles: taxi drivers inter wilaya of heavy trucks, vans carrying goods, buses and private drivers. The goal is to have a representative sample of the population of drivers on the stretch N6. The sample was allocated as follows:

- 35 drivers inter-wilaya taxi;
- 20 drivers of trucks;
- 20 company drivers ADE: Algerian Des Eaux;
- 10 truck drivers;
- 20 bus drivers;
- 39 individual drivers (academics, students, traders, etc.).

The questionnaire consists of two sections, the first is used to identify the respondent and the second includes questions about the location of places that have a high risk road, the feeling of insecurity in driving the section on evidence of accidents and damage reported by drivers and weather conditions at the time of the accident. The responses are then coded and analyzed by SPSS software.

In addition, thirty interviews were conducted with taxi drivers inter wilaya (Sig-Mascara-Mascara-Oran) and bus transit in the same line. These interviews were conducted in
their vehicles while traveling with these drivers. The objective was to locate the most accident-prone locations, abnormal road layout and amenities that may be introduced on the road environment, according to these drivers, to improve the driving safety. The information collected during interviews complement those of the questionnaire. A GIS has been developed in stages are summarized in Figure 2, to locate places high road risk is to treat the black points.

VI. SPATIAL ANALYSIS OF ROAD RISK

✓ Spatial analysis is the most powerful and richest mode. It consists in the analysis capabilities of operators to incorporate in queries geometric criteria and some opportunities calculations on geographic data. The different relationships that can be implemented concern the nearby (find objects close to one another), topology (joined objects included, partially included, excluded etc.), or shape (tiller guy etc.). It is possible to combine the geometric properties with semantic properties to achieve a fairly complete analysis. Other spatial analysis functions are mathematical operations that exploit the topological properties of spatial data:

✓ Creating buffers around points, lines, areas, polygons;
✓ Crossing polygons (polygons calculation resulting from the intersection of two or more surface objects) and more generally Boolean operations on polygons (intersection, union, inclusion, exclusion etc.).
✓ Analysis graphs (search the shortest path following distance or some other criterion).

From the figure we see, 68% of users admit that the section (Mascara-Oran) is dangerous (Yes: 31.9% and No: 68.1%).

VII. RESULTS AND DISCUSSION

A. Feeling of insecurity, age of drivers and driving experience

Following the question: "in general, is that you feel safe in using the road", the responses of drivers are shown in the following figure:

Figure 4 shows that drivers who are driving age less than 15 years on the section N6 feel insecure driving on the stretch N6 (that is to say, they said no) with a percentage important. By against drivers who have seniority driving more than 16 years on the stretch N6 (old drivers) feel more safety while driving on this stretch.
In the opinion of users asked about the main causes of accidents on the section studied, approximately 35% of accidents are due to the geometry of the section including the existence of corners.

The existence of the corners is both a positive and negative in the occurrence of the accident factor. Indeed, the existence of corners makes the driver more careful when driving and thus flows at moderate speeds. Even if there would be accidents, they will not usually fatal [6,8]. By cons, straight roads can generate monotony when driving, especially when it comes to long distances, and drivers feel more confident and well practiced excessive speeds which leads in most cases to unpredictable accidents and fatal.

On the other hand, the section is full of turns with the existence of vehicles at various speeds (PL, goods vehicles, V Light) causing traffic jams. Thus, out of the corners, drivers tend to recover delay dangerous maneuvers (dangerous overtaking, excessive speed, failure to respect the rules of the road, etc.).

27% confirm that they have witnessed accidents that caused property damage and killed and / or injured. Certainly, it should be noted that the judgment of drivers remain subject because the state of a victim of a traffic accident can be defined as a specialist in the field [4,7]. But these opinions are the stretch as deadly[6,9].

Table I

<table>
<thead>
<tr>
<th>damage reported by drivers</th>
<th>number of drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>damage, deaths and injuries</td>
<td>27</td>
</tr>
<tr>
<td>damage</td>
<td>24</td>
</tr>
<tr>
<td>damage and killed</td>
<td>26</td>
</tr>
<tr>
<td>damage and injuries</td>
<td>29</td>
</tr>
<tr>
<td>no findings</td>
<td>38</td>
</tr>
<tr>
<td>Total</td>
<td>144</td>
</tr>
</tbody>
</table>

Counts carried out on the site have shown that there is a complexity of traffic over the N4 and N6 (Fig. 6). The agricultural character of the Wilaya of Mascara has found that daily on these roads, vehicles carrying agricultural products toward the city of Oran. The geographical position of the Wilaya of Mascara axis between the north and south and east and west of Algeria supports the presence of the bus carrying passengers to the capital Algiers in particular via the N4 (fig.6). In addition, major construction works of the East-West Motorway and other penetrating favored the presence of heavy trucks carrying construction materials. The flat morphology of Sig and Mohammadia villages located on the axis N4 and poor quality of public transport has encouraged the use of both wheels of all kinds. This mode of transport is much responded particularly in these villages and is used as a means of transport by all categories of age.
by the presence of corners, so the driver is very careful
and we have fewer fatalities and less killed;
- The yellow color for PK whose death toll is less than 6
  killed;
- Orange PK for the death toll of less than nine killed.
- Red PK for which the death toll is more than 9 killed as
  PK2 with 17 killed and PK9 with 15 killed.

Based on the analysis of the question "specify the exact
location of the accident," the majority of users involved in an
accident are agreed on the danger of PK36, PK33, PK30 and
PK5 including corners of the Hacine locality [5].

These include human factors (driving experience, speeding,
failure to respect the rules of the road, risk perception, etc.)
and environmental factors (presence of bends, fittings
unsuitable, weather conditions at the time of the accident, etc.)
which are put forward in this paper.
This method can easily be used on other roads as it provides a
precise look at local issues of road risk and certain
adjustments unsuitable. The integration experiences of road
users will undoubtedly improve safety on roads.

REFERENCES
[1] ADDA KHADIDJA « approche de risque routier de la wilaya de
  Mascara » projet de fin d'étude pour l’obtention du diplôme d’ingénieur
d’état en génie civil, université de Mascara 2010.
[2] BENSALAH, DJ ET BENCHETTI, O « problématique de base des
données au sujet accidents de la route en Algérie entre réalité et
perspective : cas de wilaya de Mascara » projet de fin d’étude pour
l’obtention du diplôme d’ingénieur d’état en génie civil, université de
Mascara 2010
Mascara » encadré par M OULHA R. et Co-encadreur M
HAMADOUCHE M.A., projet de fin d’étude pour l’obtention du
diplôme d’ingénieur d’état en génie civil, université de Mascara2009
[4] CARINE CHAMPIGNLLE « Devenir des enfants accidentés de la
circulation routière dans le département du Rhône » Rapport de stage
Master1 Santé et population Institut National de recherche sur les
transports et leur sécurité (INRETS)25, avenue François Mitterrand,2009
[5] Protection civil : des statistiques des accidents de la route dans la ville de
Mascara 2012.
[6] La gendarmerie National des statistiques des accidents de la route dans
la ville de Mascara 2012.
[7] La direction de travaux publics (DTP) des statistiques des accidents de la
route dans la ville de Mascara 2012.
[8] OURNIDI FATIMA « Analyse spatial du risque routier chez les enfants
piétons dans la ville de Mascara » encadré par M OULHA R. et Co-
encadreur M HAMADOUCHE Med amine projet de fin d’étude pour
l’obtention du diplôme d’ingénieur d’état en génie civil, université de
Mascara 2010
piétons
[10] Analyse spatiale des risques potentiels et des risques perc. us pour une
meilleure prévention »Thèse présenté a la faculté des études supérieurs
en vue de l'obtention du grade de Ph.D en Géographique, Département de
Géographique, Faculté des Arts et des sciences encre université de
Montréal(Canada),2008.