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Hierarchy of the Road Network for Smooth Traffic: Case of the City of Batna- Eastern Algeria

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Abstract				

The city of Batna has a dense and meshed road network that revolves around the track bypasses (north and south bypasses), interchange routes (penetrating), and city center arterial and distribution lines. These interlock with each other and uniformly crisscross the city to constitute a reasonably extensive network in the urban fabric. It is, therefore, essential to control the circulatory phenomenon, both from the point of view of ability and the point of view of safety and constraints related to the living environment, to clearly define the functions assigned to each element (way) of the road network. To do this, geomatics and remote sensing tools are used in the road network hierarchy to have fluid traffic in Batna. This hierarchy is a prerequisite that significantly facilitates the design and construction of facilities, especially their operation.

Key words: City of Batna, hierarchy, traffic, road network, GIS.

INTRODUCTION

The hierarchy makes it possible to define for each level a function in terms of circulation, a calibration of the traffic lanes by specifying the recommended speed regime, facilities useful for motorized traffic (number of traffic lanes, types of intersections, etc.), but also the possibilities of cohabitation with pedestrians, public transport ordinary and heavyweight as well as staking [1-4]. The main objective of this study is to [7] use geomatics and remote sensing tools for a road network hierarchy to maintain fluid traffic in the city of Batna [5-9].

MATERIALS AND METHODS

Presentation of the Study Area



The city of Batna, in Chaoui Bathenth, capital of the Aurès, capital of the wilaya, is located 435 km south-east of Algiers and 113 km south-west of Constantine, with an area of 11641 hectares situated in the northeastern part of the wilaya, at the crossroads of the Constantine, Biskra, and Khenchela. (Fig.1)

The city of Batna is located between 6° 7' 59' and 6° 13' 31" East Longitude and 35° 34' 23" and

35° 31' 26" North Latitude, peaks at an altitude of 1040 m.

The city of Batna is located at the intersection of two main roads:

- the North-South axis, linking the North of the country to the South and the Great South,
- and the axis that runs through the high plateaus from East to West.

Classification of Urban Roads

The Administrative Classification of the National Road Network and Regional

The road hierarchy at the national level consists of four (4) levels of roads:

- Motorways and expressways.
- National Roads (RN)
- Wilaya paths (CW)
- communal paths (CC)

Consistency of the road network of the wilaya of Batna

The road network of the wilaya of Batna has a total length of 4923.15 km. It breaks down as follows:

The paved road network accounts for 77.29% of this network. The rest, 22.71%, is in the state of track hence the need to deploy more effort for its improvement (Source Monograph of Batna) [19].

Table 1. The road network of the Wilaya

Nature	Length in kms	%			
R.N	804.30	16.34			
C.W	650.40	13.21			
C.C	2463.98	48.60			
Tracks	1151.37	22.71			
Total	5070.05	100%			
Roads double	172.80				



Figure 2. The road network of the Wilaya

Functional Classification

The functional classification is a hierarchy of roads based on their respective functions [6]. Demographic and socioeconomic factors determine this ranking [10]. Except for the motorway network for which the design is the essential element, and the class is always determined according to the function of the road [14-16].



Figure 3. Functional classification

Diachronic Classification

The city of Batna has experienced significant road network development over time[1]. The maps below demonstrate this diachronic evolution with calculations of the road network length (the years 2000 and 2018) [17].



Figure 4. Diachronic classification 2000





Hierarchy of the Road Network of the City of Batna

To globally plan the road network of the city of Batna, it is necessary to carry out a functional classification (hierarchy) of the urban network at the scale of the city.[3](Fig 05)

Current Functional Hierarchy

Bypass

The role of these roads is to ensure a double function: interurban link and bypass of the city and the city center [2]. The 'private vehicles' part dominates this type of road network [8].

Channels of Exchange

These are essential roads (which carry large flows) whose vocation is to connect the municipality of Batna and the neighboring localities, on the one hand, and to allow the exchange between the city center and the districts, on the other hand[1].

City Center Network

This network is made up of two categories of roads that are located in the city center[9]. These are arterial roads and service roads [15]

RESULTS AND DISCUSSION

Hierarchy and Organization Strategy of the Network

In accordance with the principles and strategies retained, the network's prioritization is possible with the current network [10]. This hierarchy will be supplemented to respond to a strategy network organization.

In this study, only the roads ensuring an essential function in the accessibility of the city center and those that constitute the main routes will be retained.

Bypasses and Transit Routes

This network includes

- A southern siding bypasses the city of Batna from the south.
- A northern siding: a northern bypass of the city.

The infrastructure developments proposed for the bypass network are:

- The construction of a two-lane bypass on the city's eastern outskirts.
- North Avoidance Duplication
- Development of all notched bus stops
- Construction of pedestrian crossings on the ring road.

Channels f Exchange

These are essentially exchange channels made up of

- The axis between the roads of Biskra-route of Constantine
- The Avenue of the Republic
- The Batna-Khenchla link (RN31)
- The extension of the RN3
- The street of the mosque
- The Hamla Batna axis
- The blue ravine road

- KL Boulevard
- Ibn Sakhria Street
- Tazoult Street
- Abdelmadjid Abdessamad Street
- The facilities proposed for the exchange routes are
- Creating door effects at city entrances by developing crossroads and sidewalks where they do not exist.
- Replacement of traffic lights (traffic lights) at intersections that have become obsolete.

- Global overhaul of road signs (horizontal and vertical) following the inter ministerial decree and instruction of July 15, 1975, relating to road signs road.

City Center Service Network

This network includes all the roads where there is a concentration of tertiary activities[18]. These do not all have the same importance due to the configuration and importance of the commercial activity[13].

Arterial Pathways

The main access roads are the roads that must capture a maximum of exchange flows with the city center[11]. To these different roads, vehicles going to the city center must be directed as a matter of priority. These paths are only the physical extension of those that belong to the exchange network (penetrating).

These are the following axes

- -The Ben Boulaid alleys
- Independence Avenue
- Republic Avenue
- Larbi Tebessi Street
- Sidi Hani Street
- Grine Belkacem Street
- Benefits Street;
- Rue Abdessalam Hocine, which connects to Rue Fréres Bouakkaz.

Service Roads

The service roads are the roads that allow exemplary service from the city center to the various districts toward which the penetrating roads converge [12]. This category includes:

- Fidayines Street
- Ben Badis Street
- Rue de l'Aures
- Rue des Frères Lamrani
- Sahraoui Said Street
- Ammar Ali Street
- Benabas Med Salah Street;
- The rue des Frères Bouabsa.



Figure 6. Hierarchy of the road network of the city of Batna

CONCLUSION

At the end of this work, an automated solution is proposed to solve this problem. The growing interest in this type of map is remarkable, which constitutes an essential tool, particularly in regional planning. The methodological issues raised are due to the large amount of information required to realize this menu type, which necessitates a cartographic generalization tailored to the scale. Geographic information systems have reduced the management difficulties inherent in mass information. They brought a new lighting in the mapping and modeling of the future of space. So, work is still needed to improve the results obtained, mainly through a more efficient choice of tools and methods but also through more in-depth research.

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