

Case study of the Algerian Highway section called “East-West Autoroute”

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Abstract

The goal of this paper is to present the Algerian section of the Trans-Maghreb Highway project, and its probable impacts on the development and Environment. This linear network must have a length of seven thousand kilometers and realization duration of ten years. The road section situated in Algeria has one thousand and two hundred kilometers and the study starts in 1997. The final cost is twelve milliards us dollar (12 billion us \$) for 1200 km. The international ratio is sustained between 6 to 8 million us dollars per kilometer for a Highway having three (3) lanes. This difference in the costs is origin of a large national debate. The work begins by the description of the Highway, then by the data and finish by the predictive impacts on the development and environment. These predictive impacts are deduced by comparison with similar projects and by practice in this field and cited in literature, because the real consequences cannot be assessed that after several years.

Keywords: Highway, East-West Autoroute, Cost, development, impacts

INTRODUCTION

For the millennium, the governments of five countries: Algeria, Morocco, Tunisia, Libya and Mauritania decide to realize an big road that symbolize the territorial unification of the north African Region called "Maghreb". This linear network must have a length of seven thousand kilometers and realization duration of ten years. The beginning of work starts in 2007 and must finish at first January 2011. In January 2012, the project is finish in a proportion of 95% and some little amenities around a few towns must be finished. The costs of works are estimated at three, then five and at end seven milliards us dollars and it is considered by the Algerian Minister of pavement like project of century. In September 2012, the Minister of pavement declares that the final cost is twelve milliards us dollar (12 billions us \$). The Algerian economists and politicians hope that this “Autoroute” should generate many services, trades and social activities in different sectors and these impacts are positives for the creating of new employments.

PRESENTATION OF PROJECT

The project is part of the 7,000 km-long of Autoroute Trans-Maghrébine project. The figures 1 and 2 show respectively the path of the future Highway and the path of the Algerian section. The road section situated in Algeria has one thousand and two hundred kilometers and the study of section located in Algeria starts in 1997 and the beginning of work starts in 2007 and must finish at first January 2011. The first phase, the East-West Highway, involves the construction of a 1,216km section linking Annaba in the east to Tlemcen in the west, passing through 24 Algerian provinces. The first section is further divided into three sub-sections: the Eastern section, Central section and Western section. The project is a six-lane toll highway. It is being developed along Algeria's borders with Morocco and Tunisia. The development will have 12 tunnels, 70 viaducts, 60 interchanges and 390 structures. It also includes a provision for building truck stops, service stations and maintenance facilities.

1) Contractors

Three construction consortia are involved in the building of the 1,200km Algerian stretch of the “Auto route Trans-Maghrébine”. The eastern section running from the Algerian city of Bordj-Bou-Arredj to the border with Tunisia is being built by the Japanese consortium COJAAL. A subsection around Algiers is executed by Algerian contractors ALTRO and COSIDER, while the rest of the section is handled by the Chinese consortium CITIC-CRCC. Construction of the highway was to be completed in only about 3.5 years. The Algerian construction industry was not capable of handling this mammoth job on its own. Accordingly, the government awarded the contract to build roughly 650 km of the highway in the western part of the country to CITIC-CRCC, a Chinese consortium. The contract to build the section covering about 400 km in the east went to the Japanese Consortium for the Algerian Auto route (COJAAL). Algerian companies handled construction or expansion of the roughly 150 km of highway around the capital of Algiers. Over a dozen were submitted by over 60 companies from Japan, Germany, China, France, Portugal, Italy and the US. Many additional companies from all over the world are also involved in the construction of

bridges, tunnels and drainage systems, etc. The capital investment for the job site in Algeria alone totals USD 11 billion. The construction contract for the 169 km Central and 359 km Western sections were awarded to a consortium of China Rail Construction Corporation and China International Trust and Investment Corporation. The 399km-long Eastern section of the project is being built by Japanese Consortium COJAAL, which is made up of Kajima Corporation, Nishimatsu Construction Company, Itochu Corporation, Hazama Corporation and Taisei Corporation. COJAAL selected ACONEX to manage an online document management and collaboration system. Topcon Positioning Systems will supply surveying and machine control instruments. System formwork and technical support for the main structures was provided by PERI Japan KK. Dessau-Soprin, in cooperation with “Autoroutes du Sud de la France”, is responsible for assisting project management and section of 100 km stretch of the highway was designed by TESCULT.

2) Construction

The “Auto route Trans-Maghrébine” over the entire 1,200km stretch is designed as follows: a base course of cement treated gravelly sand is placed to a thickness of 20cm, followed by a 14cm bituminous bound base, with the road finally being surfaced with a wearing course of asphaltic concrete (0/14) between 6 and 8cm thick. The 1,200km stretch of the highway will use a base course of cement-treated gravelly sand, laid 20cm thick. Following a 14cm bituminous bound base, the road will be coated with 6-8cm of asphaltic concrete. Of the three project sections, the Eastern section is the largest. Costing \$5bn, it will include 43 bridges on the main route and three tunnels. Around 110 million cubic meters of earth will be moved and about 1.93 million cubic meters of concrete used during construction. The East-West Highway project was launched by Algerian President in March 2007.

3) Path



Figure1: Path of the Trans-Maghreb Highway



Figure 2: Path of the actual Algerian section of the Highway.

RELATION BETWEEN HIGHWAY, DEVELOPMENT, AND ENVIRONMENT

It is considered that the urban planning can be linked to the transport system. More so, efficiency of the linkage and system will define the impact of transportation infrastructure on urban development.

1) The Transportation Infrastructure

There is often debate about the desirability of development patterns, generally termed sprawl and smart growth. Critics argue that sprawl imposes numerous economic, social and environmental costs, and that smart growth development is desirable. Smart growth critics argue that sprawl provides benefits that offset these costs, and meets consumer demands. The transportation infrastructure development is a prior condition for the global national development process [1] and [2].

2) A mega national Project for Development

This Project was considered vital by the Algerian government in order to quickly connect as many of the country's residents as possible to this new national Infrastructure". Altogether, the highway crosses 24 of Algeria's 48 wilayas (provinces). This axis provides more than 80 million people with a connection to cities, international airports, harbors and major rail lines. In Algeria, the route passes along the north of the Tell Atlas mountain chain and traverses some high plateaus. Due to the many tunnels and inclines that were involved, this route through mountain terrain was quite challenging for the road builders. This will make it possible to reach the large cities quite a bit faster and more safely too. The works have generated over 100,000 jobs. Several Experts and Consultants [3] have estimated that 10,000 jobs will be created on the long term as a direct and indirect result of this highway.

3) The Interaction between Development and Environment

The sustainable development of any Society is linked to the system composed by the following element: human Society, Economy, Transport and Environment. North Africa has developed into a veritable boom region in recent years. In order to maintain this growth, huge investments are currently being made in a gigantic road construction project. "Autoroute Trans-Maghrébine" is the name of the largest African road building project ever and, for the time being, the largest in the world. Once completed, the motorway is planned to connect the Maghreb states of Morocco, Algeria, Tunisia and Libya over a stretch of more than 3,200km in the first time, and in the second time to connect Mauritania to Morocco. It is known that every society needs to develop the transport network for the satisfaction of the economy. But the construction of roads and railways use land and provokes negatives effects on the Environment. The figure 3 illustrates the relations between Society, Economy, Transport and Environment.

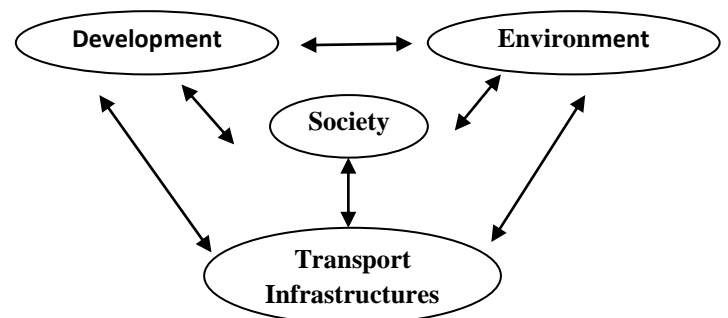


Figure 3: Relations between Society, Economy, Transport and Environment.

RESULT: PREDICTIVE IMPACTS

The impacts are deducted from the absence of required equipments and by the recommendations preconized by the Algerian department of Environment.

1) Economic impacts

In Algeria, the route passes along the north of the Tell Atlas mountain chain and traverses some high plateaus. Due to the many tunnels and inclines that were involved, this route through mountain terrain was quite challenging for the road builders. Once all of the sections are complete, it will be possible to drive across Algeria, the first largest country in Africa, in only ten hours. This will make it possible to reach the large cities quite a bit faster and more safely too. The new infrastructure is opening up many new opportunities for the country's people and its economy. The works have generated over 100,000 jobs. Several Experts and Consultants [3] have estimated that 10,000 jobs will be created on the long term as a direct and indirect result of this highway. For example, the Japanese, Chinese and Italian partner affirm that for each kilometer of road, there are two permanent employments and five seasonal employments in relation with the management and the maintenance of the Highway and two permanent employments in relation with others activities like tourism and passengers.

Road and urban sprawl impacts are widely recognized by land use planners and ecologists [4; 5 and 6]. Ecologically active lands such as wetlands, forests, farms, and parks (collectively called green space or open space) provide external benefits, including wildlife habitat, air and water quality, and beauty [7; 8 and 9]. The external benefits exist in addition to direct benefits to landowners and are not reflected in land's market value [10]. Some values are reflected in the tendency of green space to increase nearby property values and tourism, and in existence, option, and bequest values [11; 12 and 13].

2) Ecological Impacts

Banzhaf and Jawahar [14] identify the following benefits from preserving undeveloped urban fringe lands: 1- Protecting groundwater. 2- Protecting wildlife habitat. 3- Preserving natural places. 4- Providing local food. 5- Keeping farming as a way of life. Refers to the contribution land makes toward various environmental functions such as wildlife habitat, and surface and groundwater recharge. Roads and parking facilities have hydrologic impacts (changes to surface and groundwater flows, which tend to concentrate storm water, increase flooding, scouring and siltation, and reduce dry season supply, and create barriers to fish [15]. These impose both economic and ecological costs. Paved surfaces create heat islands, causing ambient summer temperatures to rise 2-8° F in urban areas, which increases energy demand, smog, human discomfort and health problems [16 and 17]. Noos and Forman [18 and 19] identify various types of ecological damages caused by roads, listed below. Forman et al [19]

identifies road density thresholds (maximum road-miles per square mile) for various habitats.

- Roadkills: Animals killed directly by motor vehicles. More than 1 million large animals are killed annually on U.S. highways, representing more than 8% of all reported crashes. Roadkills increase with traffic speeds and volumes.
- Road Aversion and other Behavioral Modifications: Some animals have an aversion to roads, which may affect their behavior and movement patterns. For example, black bears cannot cross highways with guardrails. Other species, on the other hand, become accustomed to roads, and are therefore more vulnerable to harmful interactions with humans.
- Population Fragmentation and Isolation: By forming a barrier to species movement, roads prevent interaction and cross breeding between population groups of the same species. This reduces population health and genetic viability.
- Pollution: Road construction and use introduce a variety of noise, air and water pollutants.
- Habitat Impacts: This includes loss of habitat, invasion of exotic species, and other effects.
- Impacts on Hydrology and Aquatic Habitats: Road construction alters watersheds through changes in water quality and water quantity, stream channels, and groundwater.

3) Pollution Emissions impacts

Smart Growth tends to reduce per capita energy consumption and pollution emissions, by reducing per capita vehicle travel and supporting other energy conservation strategies such as shared building walls and district heating [20; 21; 22; 23 and 24], although it can increase exposure to local emissions such as carbon monoxide, particulates and noise. The following factors can affect energy consumption and emissions:

- Urban Density affects the distances that people must travel, and the potential of transit, walking and cycling.
- Major activity centers (locate employment, retail and public services close together in walkable commercial centers) increases the feasibility of transit use and allows people to make personal and business errands without driving.
- Parking management (flexible minimum parking requirements, shared parking, priced parking and regulations to encourage efficient use of parking facilities) affects the relative price and convenience of driving, and affects land use density, accessibility and walkability: Street, Transit Oriented Development, and Pedestrian Accessibility.

4) Aesthetic Impacts

Roads and traffic also reduce natural environmental beauty and cause urban blight [25 and 26]. The Transportation and Traffic Engineering Handbook [27] (Edwards 1982, p. 396) cite than the visual aesthetic degradation is generated by major negative impacts of roads. William Shore [28] argues

that an automobile oriented urban area is inherently ugly because retail businesses must “shout” at passing motorists with raucous signs, because so much of the land must be used for automobile parking, and because the settlement pattern has no clear form. The value of attractive landscapes is indicated by their importance in attracting tourism and increasing adjacent property values. Segal estimates that a 3/4 miles stretch of Boston’s Fitzgerald Expressway reduced downtown property values by the equivalent of \$600 million by blocking waterfront views [29]. Amortized, this cost averages \$1.30 to \$2.30 per expressway vehicle trip. This is an extreme case, but indicates that aesthetic degradation from roads may impose significant aesthetic costs. Public and professional surveys can be used to evaluate such aesthetic impacts on the landscape [30].

DISCUSSION AND CONCLUSION

The relationships between transportation, Environment and land use are complex. Transportation planning decisions can have many direct and indirect impacts on the land use and on the global national development. To complete this study, it is recommended to achieve the impact studies by a deep analysis about the ecological, esthetical and urban sprawl aspects because the urban sprawl is always generated by the presence of road. Some observations can be making on the deficiency of night lighting along several sections of road, on the absence of underground path for the animals and the few of trees along all sections.

The main remark concerning this project is its cost. The final cost is twelve milliard of us dollar (12 billions us \$) for 1200 km. The international ratio is sustained between 6 to 8 million us dollars per kilometer for a Highway having three (3) lanes. This difference in the costs is origin of a large national debate. It is know that the development and Environment are antagonists and it is demanded to imagine solutions compatibles with the sustainable development. In many cases, the cost of the impacts is very important in term of ecology, safety, health, etc. The real consequences cannot be assessed that after several years.

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