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Toward Innovative Solutions for Revitalizing Benin Republic Railway Transportation System

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ABSTRACT

Railways which are considered being the most effective mode of transport for moving bulk cargo over long distances is convenient for containing traffic between ports and capitals, carry less than one percent of passenger traffic alongside with less than two percent of freight movement in the country's transport economy. As they are much complex transportation mode, the rehabilitation and maintenance of existing stock, construction of new lines, reliability, and efficiency services need much attention. Yet the sustainable development objective becomes an issue. Using field, interpretative, and processed data sources, this paper shows the historical background of the railway and evaluates the state of its existing infrastructure system in Benin. The key sustainability challenges specific to railway development have been classified. Based on these findings and through the adoption and implementation of strategies, the study presents an innovative solution to revitalize Benin railway system toward overcoming the problems.

KEYWORDS: Innovative solution; Railway; Sustainable development; Challenges; Benin Republic

1. INTRODUCTION

Benin's is a member of the Economic Community of West African States (ECOWAS) and the African Union (AU); the effective integration of which requires transport infrastructure. Its latitude and longitude are 9° 30' N and 2° 15' E respectively. The country has a total land area of 114,800 km² (44,310 sq miles). It currently has a population of about 10.88 million people (2015). It is bordered on the North by Burkina Faso and the Republic of Niger, on the East by the Federal Republic of Nigeria, on the West by the Republic of Togo (Figure. 1). With 124 kilometers long coastline, it stretches north to South some 672 kilometers while its breath extends 324 kilometers at the evident point. This geographical location of Benin, among other factors, makes it a potential international trading partner. The natural resources of the country are unlimited and include limestone, deposits of gold and phosphates which are yet to be explored, an offshore petroleum field located near Cotonou, iron ore, phosphates, chromium, rutile, marble and oil reserves (nearing exhaustion). The economic foundation of the country is very fragile although it has superior location advantage compare to landlocked neighbor's countries (Human Development Report, 2015). The economy of Benin remains underdeveloped and dependent on subsistence agriculture and cotton. Cotton accounts for 40% of GDP and roughly 80% of official export receipts. The contribution of the formal transport sector falls under services, which accounts for about 7% of the country's GDP. There is a lack of adjustment in the agricultural structure, restriction of the development of secondary industry and the tertiary industry which just started (European Commission, 2016; US Department of State: Diplomacy in

action, 2016; World Bank, 2016). All these lead to obstruction of the country economic development.

Currently, Benin's transport system consists of (i) a total length of the road network are about 15,700 km. Though the main roads (Interstate roads and national roads) comprise a total of 6,076 km of highway, 7,800 km of rural roads, and 1,800 km of urban roads (secondary and tertiary roads in urban areas); (ii) a railways network of 578 kilometers; (iii) air transport services consisting of five airports (Cadjehoun Airport located at Cotonou, the major airport at Parakou, the airfields of lesser importance at Natitingou, Kandi, and Abomey); in which the only one has a paved runway; (iv) a maritime service with two major seaports; and (v) a 150 km of navigable waterways, which consisted of its portion of the Niger River, which forms the country's northern border as of 2004.

A change in country's transport mode is essential for economic growth and poverty reduction at the national level and change in trade relationships which brings about globalization on the international scene. In the country's effort in doing business, the World Bank (2006) gave some benefits of an effective transport system such as costs and distance reduction between trading partners, an increase of trade effectiveness and maximization of existing industrial investments and production output. National development and poverty reduction target heavily based and related to the effectiveness of a country's transport system. An efficient railway system gives easy access to the back and forth movement of goods and services and also the movement people from point A to point B (Job, School, Market, Hospital etc.). It also lets farmers get their products to urban markets likewise for miners and manufacturers. It facilitates the haulage of their inputs and/or products to markets and ports. Conversely, lack of access to transport and/or at the instance of being too expensive are barriers to trade, industry, and denier of people the services amounting to social exclusion.

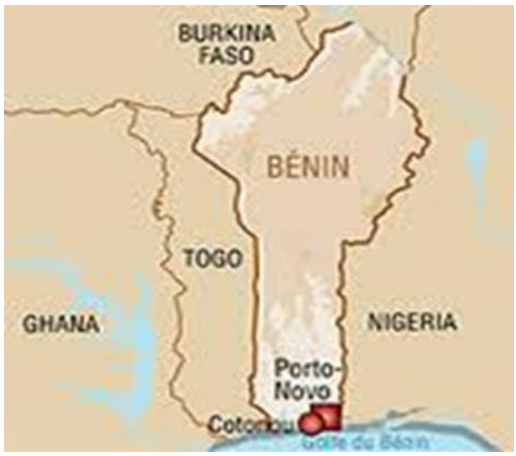

Figure 1. Benin's Republic with its countries borders

A railway as much larger and more complex phenomenon was used by the European for spreading imperialism around the world. Military domination of natives or other colonial powers, matched with mining and cash crop agriculture were among the motivations that pushed colonizers to construct railways (Marcadon et al., 1997). In Africa, rail transport has been thought out, reflected and used as a tool for colonial penetration and supply of metropolises with increasing scarcity of raw materials; which are necessary for the functionality of large production units (Pourtier, 2007). The monopoly on the inland transport of railways was over in most countries by World War I. By the middle of the 20th century, the current railway of Benin

Republic was in place. Since then, the experience has been one of the decays of the existing routes and limited construction of new lines.

Figure 2. Railways in Benin

Given this situation, it has become critical to do a thorough investigation of the analysis of the problems or challenges of the sector and also to find sustainable solutions to these problems. The question now arising is what should be done to solve these mentioned problems now and, in the future, to ensure that the overall and basic needs of railway infrastructure sector meet the need of the population. The authors found that this question is complex since there are many issues that hinder the railway infrastructure development. The design of this paper is done based on primary (field), secondary (interpretative) and tertiary (processed) data sources or some form of a combination of the three as follows. Section 2 discusses the historical background of the railway infrastructure in the Benin Republic. Section 3 identifies the existing railway infrastructure system and keys challenges identification and classification are shown in section 4. We then describe our conceptual framework relative to key problems that can be adapted to support Benin government; achieving the socio-economic development of people at the national level. The study is new and was carried out based on the framework of the larger regional research project and contributed to the building of integrated railway transportation system with full play of technical and economic advantages through planning and deploying in the Benin Republic.

2. HISTORICAL BACKGROUND

The construction of the first Dahomean railway (current Benin) dated in the early 19th Century during the French colonial rule between the port of Cotonou and Ouidah. It was constructed with an inner gauge of 1,000 mm (3 ft 3 3⁄8 in) and was 47 km (29 mi) long. Between 1903 and 1905, Pahou was successfully linked to Ségboroué (32km); another line was developed from Cotonou to Pobè via Porto-Novo between 1907 and 1913 (106km). The Cotonou-Parakou (438 km) metric line which is the backbone of Benin railway was built during the same period (Charlier and Tossa, 1996). The Abomey-Zagnanado lines via Bohicon (40 km) and Segboroué-Athieme (68 km) respectively built between 1924 and 1927 and between 1925 and 1932 were closed just after the Second World War. In 1990, the two coastal lines were also closed due to reconstruction. Figure 2 shows the railways system in Benin. All these railway lines were firstly operated by the French West Africa Railway Board (la Régie des Chemins de

Fer de l'Afrique Occidentale Française) and then by the Dahomey-Niger Joint Organization (OCDN) in July 1959. The OCDN became the Benin-Niger Railway Service (OCBN) in 1975 which is a bi-national public institution (belonging to the Benin and Niger states) and having both industrial and commercial status endowing civil personality and financial autonomy with a share capital of 36, 488,549 euros (SIEGA BENIN, 2007).

3. EXISTING RAILWAY INFRASTRUCTURE SYSTEM

The railway network system of Benin is lightly used and is in its poor condition. It doesn't cross border nor link landlocked countries. The railway provides inland railheads in Parakou city from which goods can be transported to Niger by roads. Several lines that have been built in the middle of the twentieth century are not currently in operations due to natural disasters, general negligence and lack of funds. The Cotonou-Parakou (438 km) metric line which is the "backbone" of the Benin railway accommodates only relatively lightweight and slow-moving trains. It lacks periodic maintenance over a long period in the past and this has caused many sections of the track to deteriorate; in some cases almost beyond repair, resulting in loss of rolling stock productivity and competitiveness. The fleet of rolling stock is outdated and obsolete with an average age of more than 25 years. The difficulties and high maintenance cost reduce the carrying capacity of the rolling stocks. This fleet consists of 10 locomotives BB 600, 2 railcars, 2 loco-tractors, 20 passenger cars and 297 wagons of all series combined. This park has remained stable since 1980 and is only available at 40% (MDCTTP-PR, 2009).

The low productivity of assets and labor, inadequate network connectivity, aging of the staff, the failure of organic texts of the railway enterprise and unfair railroad competition are among the challenges that face the railway sector in Benin. The traffic density in terms of passengers and freight is low. For instance, from 269,674 tons in 1996, freight traffic slumped to 51,998 tons in 2005 (Charlier and Tossa, 1996). Over the same period, passenger traffic went down from 715,457 to 117,657 passengers (Charlier and Tossa, 1996). The poor human resources policy of the OCBN also explains the difficulties of the Benin railway. In 2007, it was found that 75% of staff had more than 20 years of service compared to 25% of staff with less than 20 years of service. The analysis by age group shows a very high number of agents whose age varies between 45 and 55 years (Charlier and Tossa, 1996). Moreover, staff who are employed in full-time, are engaged in little productivity whereas semi-employed incurs resentment and did not take any initiatives and undermine the overall effectiveness. Besides that, the lack and difficulty to access reliable information on the country's railways do not give a clear picture of the real and potential economics of the sector. There is, therefore, a problem of perspicuity towards the elaboration of the strategic approach to the development of the rail transport.

4. KEYS CHALLENGES IDENTIFICATION AND CLASSIFICATION

The general purpose of the railway network is to preserve and sustain the socio-economic development of the country. To achieve this purpose and objective, there is a need to rehabilitate and maintain the existing stock, construct new lines and make reliable and efficient services. However, the above objectives are hindered by many problems that influence its progress and development. Indeed, the revitalizing of Benin railway sector is fragile due to the immaturity of the country rail network; maintain the colonial pattern; management mode of railway companies, financial constraints and deficient allocation of the resources; public ownership, institutional policy, and political appointments.

4.1 Immaturity of the rail network

Taaffe et al. (1963) undertook a comparative analysis of the development of transport in developing countries and they were able to show that certain broad regularities permitted "a descriptive generalization of an ideal-typical sequence of transport development". Their spatial model of the transport network in developing countries has proved to be a valuable help in the understanding of transport development and has been widely applied to other developing lands. They identified six stages in their sequence of transport development. Unfortunately, in most cases, black Africa and especially Benin's railway has not gone through the third stage. B. Hoyle agrees with the same point while noting that the earlier railway lines first rolled along the existing tracks before serving the main agglomerations (Hoyle, 1998).

Africa has a very low density of railway lines, 2.7 km/1000 km² compared with 400 km / 1000 km² for Europe (Union Africaine des Chemins de Fer, 2006). This situation does not make the African railway profitable. Thus, most railway undertakings owe their life expectancy to donations and subsidies from states and financial partners. Benin has experienced the same situation. The railroad perpendicular to the coast from the port of Cotonou ends in the middle of the country (Parakou), a distance of about 438 km, which is also distance from the border of Niger or Burkina Faso (the real users of the port).

4.2 Maintaining the colonial pattern

The "littoral development" (Sakho, 2002) corresponds to the will of the colonizer which hardly goes beyond the development of the colonies. Through the concept of colonial development, it is necessary to understand the free exploration of the resources from the colonies to the metropolises in order to face the difficulties faced by the "white masters" after the two wars. After independence, African leaders, instead of correcting this type of planning and think about an equitable spatial distribution of housing, administrative centers, production centers and economic interests throughout their territories, maintained consciously or unconsciously the colonial scheme. The divergence of regional economic development in Benin appears to be very immense, with southern Benin being developed and northern Benin lagged behind.

4.3. The managerial mode of railway companies, financial constraints and deficient allocation of the resources

The difficulties of Benin's railway began since the management of the OCBN has been taken over by the public authorities of the partner states (Benin and Niger) after their independence. From the independence to this date, the linear inherited from the colonizer has regressed instead of progressing. The successive deletions of lines (Chaléard and Chanson-Jabeur, 2006), in order to restructure the railway sector (critical condition), has reduced the primary network from its initial length of 578 km to 438 km; a reduction of 24%. Apart from that, the project of extending the railway to Niger remained a purely political pious. The recovery plan document of OCBN drawn up in 2007 mentioned that "the OCBN had its hours of glory since its turnover reached 12,213,740 euros in 1998 with freight tonnage of 340,084 tons, slightly lower than the 350,000 tons needed to achieve operating equilibrium (SIEGA BENIN, 2007). Thus, in 2005, revenues falling to 1, 41 which do not even cover the company's salary costs estimated at 2,561,165.93 euros. In addition to the Bearish trend in traffic and consequently in turnover, there is also the debt burden of the OCBN of which 11,755,725 euros loans are made with the French Development Agency (AFD) for a timetable of 580,152 euros per semester. The inventories of

the railway network situation in Benin shows that continuous deterioration took place due to lack of financial resources, cost control and venture capital which are the common factors that hinder the railway development. This issue is the result of the low country's Gross Domestic Product (GDP) which accounts for 7,5 percent of the Gross National Product (GNP) in the absence of railroad transportation, following Benin's natural potential and geographical situation (European Commission, 2016; US Department of State: Diplomacy in action, 2016)

The national economy which relies on the agriculture, the transit of goods for landlocked countries, the source of livelihood, nearly 70% of the country's workforces (US Department of State: Diplomacy in action, 2016; World Bank, 2012; Background Note Benin, 2010) are not sufficient source of financial resources to provide an adequate path of rail transportation. In addition, the processing of agriculture products still remains primitive. The agriculture and industry both do not offer adequate paths in achieving competitiveness due to insufficient infrastructure to support the production; especially in the area of railway transport. The solutions to this financial problem are restricted by the inefficiency of national stakeholders to implement and monitor public policies and the deficient of domestic financial resources; with a direct consequence of the limited development of private sector. Analysis of the investment budget of Benin's transport sector shows that no financial resources have been allocated to the railway sector for more than ten years. There is the cessation of subvention from member states currently subject to the injunctions of development partners for whom the railway must be buried in favor of roads. Although the call for a competition launched by Mazars and Guerard companies, funded by the World Bank and the French Development Agency (AFD) for an amount of 580,000 euros, the concession process for the Benin railway has definitively declared unsuccessful (MDCTTP-PR, 2007). Furthermore, the financial situation of the Benin railway company has further deteriorated during the period 2002–2006 and remains same up to now.

4.4. Public ownership, institutional policy, and political appointments

The underdevelopment of railway transport infrastructure is due to lack of the political will and leadership problems as it is the case of road sector. The development of railways transport- and its direction growth is influenced by politicians. The huge financial commitment of the government in the transport sector leads to the overbearing influence of governments in infrastructure transport development projects in most developing countries. In Benin as elsewhere in most Africans countries, transportation infrastructure (roads or railways) projects have been used by politicians as bait to collect more votes since the advent of democratic rule in 1990. In addition, the Benin national road railway's (BNRR) requests are reflected in the national draft budget after which the Ministry of Finance approves. The BNRR had therefore relied on the influence of the ruling of the sitting government of every regime. The transport infrastructures along with reforms, rehabilitation and/or modernization have also undergone the same process since the advent of democratic rule. This abnormal control of transport infrastructure and especially railway has created a corruption environment between transport businesses and politicians. The poor policies of Benin's Government have favored the development of roads instead of railways while its poor administration has made the corporation of the latter run under capacity. The public ownership and management are identified as a problem to the railway sector and thus there were related operational inefficiencies and excessive fiscal's resources. These aforementioned problems have blocked Benin to benefit from certain projects or sometimes the obstruction in their execution. As an example, the conflict between Bolloré and Dossou-Awouret about Benin-rail project has delayed the process of construction

and rehabilitation of lines. In fact, the project consisted of building a high railroad transportation way, bridges, train stations, multiple connections with the original railway.

The identified challenges above have led to the inactivity of Benin's railway. Unfair competition between the railways and the road haulers has gradually put an end the activities of the OCBN, thus creating a surge in the car fleet facilitated by the importation of used vehicles from the western countries. In 2001, the registration of the number of heavy truck vehicles for transport of goods reached 2,601 before starting to decrease to 692 in 2006. The 2001 explosion of heavy goods vehicles is explained by the improvement of the road network due to the complete construction of asphalt pavement of two main roads: port de Cotonou to Malanville (747km) and port de Cotonou-Porto-Novo (641km) through Bohicon- Dassa- Savalou- Djougou-Natitingou. The 2001 explosion of heavy goods vehicles has also resulted in the early deterioration of road infrastructure, traffic accidents, causing property damage, loss of life: 3736 cases of road accidents in 2007, of which 595 were killed and 3,332 injured and increased of air pollution due to the use of adulterated fuel. It may be noticed that it is extremely difficult to breathe clean air in traffic in Cotonou. The little oxygen has been replaced by the presence of chemical elements harmful to the skin, lungs and all human organisms. The entire city aspires to polluted air, which comes from the smoke caused by the exhaust gases. For the moment; the impact of greenhouse emissions on nature at the level of the Beninese industries is not known. Cotonou being the city which shelters many industries, it results from the evidence that it is the most polluted city in Benin. The consequences are unfortunate; skin diseases, cancers, and many other lung diseases decimate small urban populations.

5. SUGGESTED STRATEGIES

Given the above assessment of paralysis of the railways and the increase in externalities caused by road transport, it is important to note that there is a serious need to make constant follow-ups and ensure implementation of the initiatives to redefine new measures to revitalize Benin's rail transport infrastructure effectiveness and efficiency problems. In order to avoid the import of ready-made models from developed countries, each problem or challenge must be deeply discussed, based on the country reality and particularities by taking into account the experience and knowledge gained or accumulated by western and some developing countries. Some suggested strategies for boosting the railway infrastructure transport in Benin are presented in Table 1.

6. CONCLUSION

This paper has reviewed the construction purpose of railways in Africa and shows the historical background in Benin's railway infrastructure. The evaluation of the existing railway infrastructure shows that it is in crisis due to factors that impeded its development. Using field, interpretative and processed data sources, the diagnostic study revealed that mismanagement, political issue, financial constraints, institutional factors among others have hindered the railway effectiveness and efficiency in Benin.

Based on experience gained from developed and developing countries around the world and the current railway infrastructure problems, the paper has presented an innovative solution developed by authors for overcoming challenges of the problems. The innovative solution consists of strategies that aimed to improve the capacity of Benin towards railway infrastructure development. They included practical strategies for boosting Benin economy by injection of private funds into the country railway system, application and sustainable investment in the

Benin's railway which will pave the way for development of sub-regional international railway corridor in West Africa, review of railway law, promotion of commuter rail service in Cotonou, adoption of dynamic transport policy, creation of reforms with necessary legal framework and public-private partnership. It would be more judicious if the innovative solution is taken into account, as this would open up regions, hinterlands, and rural areas by facilitating agricultural development, cotton production, and regional trade on which the economy of the country is based as well as the growth large scale industries and the widening of markets and expansion of the export sector towards neighboring countries. In view of the benefits that this innovative solution can bring once implemented, the paper calls for the government to raise development policies or have Marshall Plan that will aim at strengthening the sector if broad-based economic development is to be achieved.

Table 1

Strategies	Objective	Effects
Integration of program to boost the railway in short-run	To make the port of Cotonou more competitive by improving the level of service of the rail network	Rehabilitation of the rail infrastructure and services; concession of rail freight transport
Integration of program to boost the railway in long-run	To concretize the revival of the railway sector of the sub-region in general and that of Benin in particular	This will improve the regional trade and reduce the transport time and cost
Integration of the rail-road transport operators	To provide an interoperability transport system between road and rail-based public system	This will avoid the unfair competition between rail and road and improve the passenger and good transfer and reduce the wasted carrying capacity and disruption to users
Review of railway law	To allow the privation of railway transport mode	This will be able to break the corrupt link between business and politics
Create reforms with necessary legal framework	To minimize political control over enterprise	This will allow the independence and autonomy of the railway institution in Benin
Adoption of dynamic transport policy	To liberalize the railway transportation system	This will allow the deregulation of the rail sector in Benin and hold the solutions to multi-faceted problems that railway infrastructure encounter
Expand the railway network system in the whole country	To balance the transportation system within different regions in Benin	Expand the railway network from Parakou to the border of Niger (Malanville)
Promote the commuter rail service in Cotonou	To improve the urban public transportation	This will improve the air quality and solve the congestion problems
Promotion of public-private partnership	To avoid excessive dependence on fiscal resources and make maintenance adequate and operation efficient	This will develop and deliver a wide range of socio-economic infrastructures

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