

APPLICATION OF BOT MODEL IN HIGHWAY CONSTRUCTION MANAGEMENT IN BENIN

AHOUMENOU GAEL, ZEPING ZHANG, HAOYI MIAO, LI GONG

Taiyuan University of Technology, Shanxi Taiyuan 030024, China
3056037319@qq.com, miaohaoyi@126.com

Abstract: Transport infrastructure and services have a vital role to play in the economic and social development of any country. They were designed to facilitate the distribution and sale of income-generating products, to promote goods transit towards neighboring countries; and to facilitate trade between towns and rural areas, and ensuring access to social infrastructure and services in the rural area. Try to continually provide Effective transportation system on various programs to ensure Provision of adequate road transport bridges and effective road maintenance Meeting the needs of the Beninese. By studying this case, the research seeks to identify and expand on lessons learned and looks at the Build Operate Transfer (BOT) model, hereafter referred to as BOT which is one of the methods used by most of the major developed countries. The BOT projects have the potential to serve the government and private sector with equal effectiveness. BOT projects are also offering attractive opportunities to foreign investors, which in turn can generate substantial foreign exchange for economic growth. Today, the BENIN construction industry has a lot of prospects for BOT projects in the fields of power, irrigation, transportation, real estate, highways construction, multistory buildings and urban development, which can gain the attention of foreign investors. In this paper I will discuss the utility of the BOT projects in the Road and Bridge construction hereafter referred to as “R-B” in BENIN.

Keywords: BOT projects Road networks and the bridge system, road maintenance, the question of the development.

1. Introduction

The development of an efficient transport system based on a properly operated and maintained infrastructure network is a sine qua non condition for the success of the Growth Strategy for Poverty Reduction in Benin (SCRPR). This strategy is part of national, regional and even global targets for infrastructure development, in particular the eight Millennium Development Goals (MDGs), the Brussels Program of Action (BAP) for the least developed countries, the Paris Declaration, The New African Partnership for Development (NEPAD) , the Medium- and Long-Term Perspectives, and Benin PAG of the present president. The transport sector ensuring the mobility of people and goods remains upstream the essential pillar for achieving the targeted development objectives. Improved road structuring and efficient road services encourage better production [1]. The permanent accessibility of users and beneficiaries of roads (at a fair cost) to markets, places of wealth creation, basic social services and cetera, assumes an upkeep of the infrastructure upstream. And in Africa, particularly in Benin, physical infrastructure, like the financial service, hampers rather than promotes development; the infrastructure includes telecommunications, electricity, drinking water, transport and other interconnections for which the road remains the structuring node. Greater efficiency in the operation and maintenance of existing facilities would provide substantial benefits, including the sustainability of the type of infrastructure under its system.

In order to make the road maintenance system more efficient, institutional reforms had been carried out in 1996 at the level of the Road Fund to stabilize and secure the resources allocated to road maintenance and the operation of the current Initiative General direction of the public transport (DGTP) in view to ensure a more efficient management of road maintenance to ensure an adequate level of service to the network. The implementation of these reforms, backed up by the Sectoral Transport Project (PST started in 1996), enabled the upgrading of the various road axes and the improvement of the road maintenance system. Benin's road network had become one of the most appreciated road networks in the West African sub region, with its satisfactory level of service provided to users, because it was well maintained. Similarly, the financial situation of the Road Fund had become good to the point of recording an exceptional excess liquidity in 2000. In 2001, a new classification took place. The enthusiasm then generated by this operation led to the repayment of nearly 2,600 km of tracks in the class of national roads RN to make them eligible for financing the Road Fund. This new classification was enshrined in Decree No. 2001-092 of 20 February 2001. The classified road network has thus increased from a line of 3425 km to 6076 km and from 2005 no longer meet the competitiveness criteria for Support for development.

Today, the performance of the maintenance system remains unclear. Many development partners, notably Danish International Development Agency (DANIDA), the European Union, International Fund for Agricultural Development(IFAD), the World Bank, etc., were interested in finding this performance for Benin through various road projects / programs (PST, PASR), the results of which - in terms of road or tracks - require a more rigorous maintenance system. Optimizing its road maintenance systems in Benin appears to be essential to the performance of this system. Indeed, it is with the aim of contributing to this optimization that I have proposed to improve the current situation in this field and to reflect on the theme: Research on the operation and management of highway construction in Benin. The preparation of the research report on this topic requires an organization divided into several parts, including: infrastructure maintenance diagnostics, the road and bridges development, the advantage and the disadvantage of the present practice in Benin,

2. Infrastructure Maintenance Diagnostics

The previous Government had confirmed its willingness to give high priority to the maintenance of transport infrastructure in order to ensure the conservation of the R-B project and proper operation of the very large investments it has made. In implementing this policy, the Government established a five-year transport program to improve the tools for updating the program and to improve procedures for financing and implementing road maintenance programs. A program of investment and maintenance of all transport infrastructure has been developed. It places high priority on routine maintenance and periodic maintenance of transport infrastructure, including those managed by autonomous structures. This program only includes investments with an internal rate of return of at least 12%. This program has been and may be updated annually according to the needs arising from changes in demand and possible refocusing of the transport strategy. This program should be discussed with industry donors at round tables to be held at least every two years. The transport component of the public investment program include, as a priority, the projects included in the five-year program.

The method of financing road maintenance may be reviewed to ensure the necessary funding for routine and periodic maintenance programs. The Road Fund (RF) has been constituted into an autonomous structure of the Public Interest Group (GIP) or similar type. The Road Fund has financed road maintenance activities exclusively on the basis of the work actually carried out. The operation of the structure is thus constituted of the audits, receipts, expenses and a partial participation in the partial operating costs of the services of the Ministry of

Public Works and Transport (MTPT) -intervening in road maintenance. Also, the operation of the structure is pending the establishment of operating budgets necessary for the activities of the Ministry of public works and transport (MTPT) in the field of programming and monitoring of road maintenance activities.

The revenues of the Road Fund consist mainly of an allocation of the general budget of the State, repayment by the Treasury of fuel taxes and the road tax allocated to road maintenance by the Finance Act, Road tolls, the collection of which is entrusted to private operators under collection contracts awarded after the competition of potential candidates. The allocation to the general budget corresponding to one quarter of the annual amount to be paid at the beginning of each quarter and the payment of Collections by the (Government) Treasury made within a maximum period of two months also forms revenues from the Road Fund. Tolls have been progressively generalized throughout the tarmac network in order to increase revenues so that the FR was able, in the 5-year term, to finance all the maintenance of the network dependent on the MTPT. Priority is given to the sections on which toll stations are installed, as well as the mechanized maintenance of the rural network, which is progressively recovered, and 30% of the periodic maintenance of the dirt roads of these two networks. The FR's revenues then gradually increased so that the FR was in a position to finance the 70% of the remaining periodic maintenance, which is financed by the Public Investment Program (PIP). It is understood that the PIP continue to finance the periodic maintenance of paved roads. Mechanisms to gradually increase the participation of users and beneficiaries through their authorized representatives in the preparation of road maintenance programs and in the management of the FR have been established.

Road maintenance work carried out on a regular basis was limited to the operational capacity of the teams, which costs about CFAF 1 billion per year in cruise, and was paid by the FR on the basis of the work actually carried out. The remainder of the work was entrusted to private companies under contracts awarded after tenders. The organization of the DROA and its staff was reviewed to adapt to the refocusing of its activities. A system of support and training of local SMEs, which was managed by the representatives of the profession and eventually entirely financed by the beneficiaries, was set up. A system of production and performance bonuses was introduced gradually for all agents involved in road maintenance. The Ministry of Finance (MF) delegated to the MTPT the management of contracts relating to road maintenance from the award procedure to the signature for contracts of less than the equivalent of 500 million CFA. The MF has been monitoring the procedures a posteriori. The DMTP was converted into a mixed economy leasing company or similar. The new structure operates on a purely commercial basis in compliance with competition rules with private companies. The Government gradually transferred the management of the rural road network to the beneficiary users. The general policy in this area is based on the following principles: the State contributes to the financing of the rehabilitation and maintenance of the network, which is not the responsibility of the MTPT, provided that the network is of demonstrated economic interest and that local partners take over the counterpart to the financing and the expenses of manual current maintenance by ensuring the preliminary execution of the works object of this counterparty; Programming and management of the network should be ensured by the local partners and the financing of the State provided through special lines within the Road Fund after verification of the eligibility of the program by a National Technical Council made up of the different administrative entities (MTPT, MDR, MISAT, FR) and representatives of local partners. The transfer strategy was adapted in the light of the results of the then and future operations and subsequently was applicable to all public entities involved in carrying out work on the rural network within the framework of national budget or external financing.

3. Roads and Bridges Development

Benin Republic is a densely populated, blessed with undulating topography, which ordinarily would have made it easy to navigate the entire state in a matter of hours. However, there are important deficiencies of about thousands of kilometers of dirt roads which serve villages and agricultural areas. In some cases where adequate infrastructures exist, the roads are impassable to vehicles because of the severe deterioration of the road network formation, which is due either to inadequate construction or lack of maintenance or a combination of the two [4]. Even where trafficable R-B exist, they are frequently impassable during critical periods of planting and input supply and at other times can only be used if high vehicle operating costs are tolerated.

Efficient and effective R-B, and means of transport, make a crucial contribution to economic development and growth and bring important social benefits. Poorly maintained R-B constrain mobility, significantly raise vehicle operating costs, increase accident rates and their associated human and property costs, and aggravate isolation, poor health, poverty, and illiteracy in rural communities [16]. Suffice to add that rural areas in Benin Republic city house a number of resources convertible for industrial purposes. But since these villages are inaccessible, nobody would come. That is the evil of not having good rural access road networks and bridges system. It makes investors turn away from any society, however cheap the raw materials are. These and other problems associated with poor R-B in the whole country informed government determination in committing funds to the construction of R-B, rehabilitation of R-B to link all the different areas of the local government as shown in Tables 1 & 2 (data from our first question survey). However, the pace of progress in R-B development in the whole country varies from region to region and is insufficient to reach the 2025 Agenda targets for sustainable development. The following tables show and give brief information on the list of road construction projects carried out in Benin. It is safe to say that the government of The Republic of Benin controls everything namely the payment and the quality control, notwithstanding the assignment of specialized agencies to complete the project, like the banks, the government still plays the most vital decision making role.

Table 1. Construction of some important bridges (2005-2017)

S/N	PROJECT TITLE	LOCAL & NATIONAL GOVERNMENT
1	FIFADJI BRIDGE	LOCAL – NGB
2	GODOMEY INTERCHANGE BRIDGE	NGB- CHINA
3	OVERPASS HOUYEIHO	NGB
4	KINDONOU BRIDGE	NGB
5	SECOND BRIDGE	NGB
6	THIRD BRIDGE	NGB
7	OVERPASS STEINMEZ	NGB
8	GUEZIN BRIDGE	NGB
9	TOVEGBAMEY BRIDGE	NGB
10	ALLADE BRIDGE	NGB
11	THALINGA BRIDGE	NGB
12	AFFON BRIDGE	NGB
13	ATHIEME BRIDGE	NGB
14		NGB

Table 2. Construction and rehabilitation of roads (2005-2017).

S/N	PROJECT LOCATION	No. of kilometer	Cost
1	Beroubouay-kandi-malanville roads	170.0km	56b
2	Parakou- beroubouay roads	152.0km	45 b
3	Parakou-Djogou roads	137.0km	68b
4	Djougou-Ndali roads	125.0km	-
5	Akassato -bohicon roads	102.0km	50b
6	sortie parakou-bembereke roads	100.0km	23b224468921
7	Godomey-hillacodji roads	98 km	83b
8	Akpro-misserete roads; dangbo-AdjohounBonou-Ouinhi-kpedekpo roads	90.0 km	21b336387186
9	N'dali-nikki-chicandou roads	77.0km	23b
10	Kandi- Banikoararoads	68 km	-
11	Come Zoungbonou roads	43.0km	10b
12	Djougou-Ouake roads 17	37.0km	11b
13	Pahou Tori Allada roads	37.0km	13b
14	Pahu-Ouidah roads	18.75km	29b
15	Godomey-Pahou roads	16.5km	23b
16	Godomey-Calavi roads	10.5km	26b
17	Aéroport-Place souvenir Street	5.7km	11b
18	Ouando-Hounsa roads	4.61km	12b
19	Calavi-Akassato roads	4.0km	6b3

3.1 The Advantage and the Disadvantage of the Present Practice in Benin

Overall, the weaknesses and strengths of the subsector are as follows:

3.1.1 Weaknesses

Insufficient national coverage of the road network; insufficient resources of the Road Fund, which cover only about 59% of the current needs for routine maintenance of the road network (periodic maintenance partially financed by EU budget support); insufficient control and the absence of penalization of vehicle overloads; the multiplicity of complex and varied procedures linked to the diversity of external financial partners, leading to a slowdown in the consumption of external resources mobilized for projects; the absence of a specific method of road management and public works programming; the inadequacy of procurement procedures with the promotion objectives of SMEs operating in the sector; the lack of an adequate mechanism for training SMEs; the lack of means of network monitoring by the deconcentrated units; the multiplicity of stakeholders in the field of rural roads and the lack of effective coordination; the financial, technical and organizational difficulties leading to the underperformance of certain companies and consulting firms; the unavailability of heavy equipment for the execution of the work; inadequate high-quality road materials in some areas; failure to define a multi-year road maintenance program; failure to integrate road safety audit into the design of road projects; the ineffectiveness of the transfer of runway management to local authorities the high level of unit costs both for work and for studies and other services; the poor organization of archives.

3.1.2 Strengths

The significant improvement in the level of service provided by the structuring road network over the last ten years; the existence of an autonomous Road Fund; the progressive generalization of the toll / weighing system on the road network; the existence of a significant

volume of road maintenance contracts; availability of external funding from donors in the sector; the existence of an important fabric of SMEs. In assessing the weaknesses of the current infrastructure management system in Benin I've deduced that there needs to be a shift in the management system and have come to propose an effective solution to improve the effectiveness of road infrastructure in Benin Republic - the BOT model. This is a solution method employed by first world countries like China, for the first time in 1979 and is still in use up to today.

4. Build–Operate–Transfer

4.1. Introduction

The Build operate and transfer (BOT) term in construction management has been gearing up popularity tremendously in recent times. In developing countries (i.e. BENIN), where often, the government does not have enough finances to carry out the infrastructure development projects, the BOT model can provide a unique opportunity to assist both the financier and the government. Developing countries, for example BENIN, require extensive infrastructure to meet the various development challenges that they are facing and will face in the future. The governments in the developing countries mostly have budgetary constraints to commence development projects. The priorities always remained debatable for the commencement of any government funded infrastructure development project, especially in BENIN. BOT is an option for financing the infrastructure and boosting the economic growth of the country without direct utilization of government finances. In the private sector for owners who have land resources but no finance to make the sufficient development on these lands BOT can be a feasible alternative. Due to the long-term nature of the arrangement, the fees are usually raised during the concession period. The rate of increase is often tied to a combination of internal and external variables, allowing the proponent to reach a satisfactory internal rate of return for its investment.

Examples of countries using BOT are China, Pakistan, Thailand, Turkey, Taiwan, Bahrain, Saudi Arabia, Israel, India, Iran, Croatia, Japan, Vietnam, Malaysia, Philippines, Egypt, Myanmar and a few US states (California, Florida, Indiana, Texas, and Virginia). However, in some countries, such as Canada, Australia, New Zealand and Nepal, the term used is build–own–operate–transfer (BOOT). Traditionally, such projects provide for the infrastructure to be transferred to the government at the end of the concession period. In Australia, primarily for reasons related to the borrowing powers of states, the transfer obligation may be omitted. For the Alice Springs – Darwin section of the Adelaide–Darwin railway the lease period is 50 years, see Austral Asia Rail Corporation. The first BOT was for the China Hotel, built in 1979 by the Hong Kong listed conglomerate Hopewell Holdings Ltd (controlled by Sir Gordon Wu).

4.2. BOT (build–operate–transfer)

Most of the BOT projects undergo six identified stages. Figure 1 below shows these six stages and the principal activities contained in each of them. It can be roughly divided into two parts covering those happening before and during the concession period. In the first part of the process a feasibility study is done and then a consortium is awarded the concession to build and operate the facility. In the second part the concessionaire starts to implement the project by obtaining the necessary requirements, designing the facility and constructing it. The facility is then used to generate revenues for the concessionaire and, after a specified period, transfers the ownership of the facility and its assets to the host government.

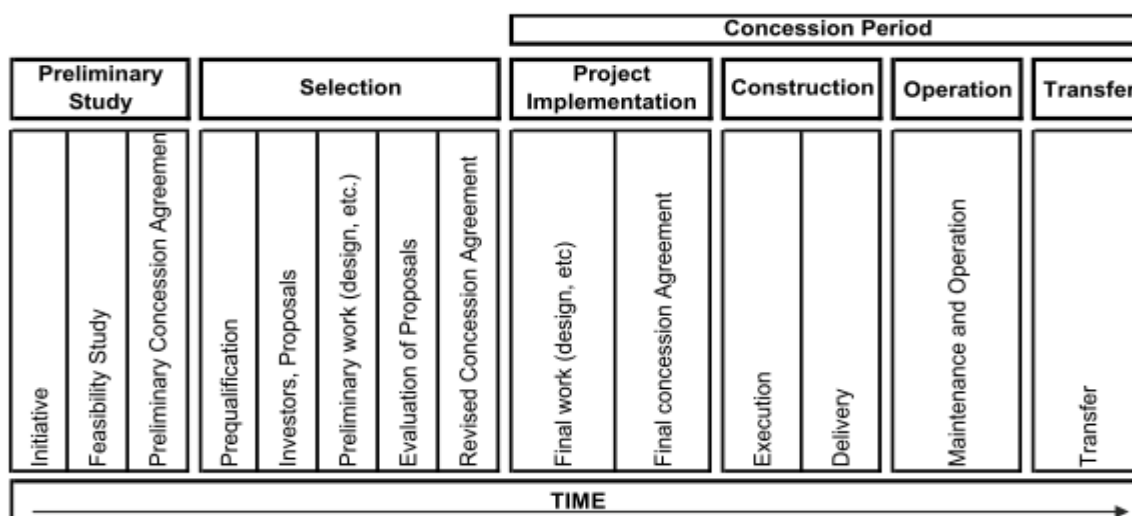


Figure 1: Stages in the BOT process

4.2.1. BOT Approach for the R-B Constructions Development

Usually the government identifies the infrastructure priorities and the facilities that have to be built. In the case of the Philippines, the government prepares a Medium Term Public Investment Program that lists the priority infrastructure projects that the public sector and the private sector are expected to design, finance and construct. Some of those projects are identified as projects that may be implemented through the BOT approach. The government may then contract independent parties to conduct feasibility studies to determine the potential viability and desirability of the project. Projections of profit streams are done here to determine the viability of private sector participation. In the Philippine experience, some enterprising private sector proponents directly submit to the government unsolicited project proposals that they think could address some infrastructure shortages. Thus, while the Philippine government takes the initiative with respect to solicited projects on the one hand, private sector proponents may take the first step with unsolicited projects, on the other hand.

4.2.2. Selection Process

As stated above, there are two basic avenues for the BOT approach: solicited and unsolicited project proposals. The former refers to the general public selection or public bidding process. Here, the government disseminates request for submission of expression of interest to provide a particular infrastructure facility and upon receiving applications it requests some pre-qualified consortia to submit their proposals. The proposals are then subject to evaluation. The Philippine government uses the “two-envelope system” to evaluate the proposal. Under the two-envelope system, the evaluation based on technical merits is followed by financial evaluation that considers the financial viability and economic benefits of the project. The concession is then awarded to the proponent, which has successfully passed the technical and financial evaluation. Under the unsolicited mode a private proponent submits a proposal directly to the government. In contrast to the solicited mode where government takes the initiative in asking private parties to submit a project proposal, the private party makes the first move under the unsolicited mode. If deemed acceptable, the proposal is opened up to some form of competition (e.g. Swiss challenge) to determine who will undertake the project. After the necessary evaluation process, the project is granted to a concessionaire.

4.2.3. Project Implementation

After the concession has been granted, the consortium will then develop a specific work program, including drawing up project designs and detailed engineering, obtaining necessary legal permits to facilitate the project, etc. It is during this phase that potentially conflicting or competing interests of all stakeholders (e.g. communities affected, environmental issues) are balanced to ensure support or acceptance to the project and its speedy completion.

4.2.4. Construction

After satisfying the necessary legal, environmental and social requirements, the construction of the infrastructure facility begins. This is usually undertaken by the contractor who has also hired the construction crew, suppliers and technical and project management consultants.

4.2.5. Operation

After the facility is built, the concessionaire designates an operator to operate and maintain the facility. The operation lasts until the termination of the concession period.

4.2.6. Transfer

Upon completion of the cooperation or concession period, the ownership of facility and all its assets is then transferred to the host government. Transfer can also be done prior to the expiration of the concession period but the concessionaire has to be compensated properly for the investments made in the project. The government may then operate the facility itself or decide to hire an independent operator.

5. Conclusions and Recommendations

The financial resources required to invest in high-budget infrastructural projects increase the interest in the Build-Operate-Transfer (BOT) models. Mega transportation projects, in which BOT is commonly used as a financial model, are seen as potentially important because of the considerable impact they have on the construction industry and it is a system that a lot of countries are using to attain their objectives. It will prove very advantageous for Benin to adopt this BOT management model.

6. References

- [1] Strategy Paper reduction of poverty in Benin PRSP. (2002), pp. 29.
- [2] Carolina Dominguez-Torres and Vivien F. Benin's Infrastructure: A Continental Perspective. (2011) pp. 4-13.
- [3] Stratégie Sectorielle des Transports, Benin. (2014-2018), pp. 26
- [4] Strategy Paper reduction of poverty in Benin (PRSP 2011-2015) Year (2011), pp. 29.
- [5] AICD (Africa Infrastructure Country Diagnostic). ECOWAS's Infrastructure: A Regional Perspective. Africa Region, World Bank, Washington, DC, 2010.
- [6] Yepes, Tito, Justin Pierce, and Vivien Foster. Making Sense of Africa's Infrastructure Endowment: A Benchmarking Approach. Policy Research Working Paper 4912, World Bank, Washington, DC. 2009.

- [7] World Bank Group; International Finance Corporation. Doing Business 2016 Economy Profile: Benin Washington, DC, 2016.
- [8] Declaration of population policy (DEPOLIPO/1996, pp.8-11).
- [9] Foster, V., and Cecilia B. Garmendia, C. Africa's Infrastructure: A Time for Transformation. Paris and Washington, DC: Agence Française de Développement and World Bank, 2010.
- [10] Human Development Report (PDF). United Nations Development Program. Retrieved 14 December, 2015.
- [11] Information on http://ec.europa.eu/europeaid/countries/benin_en. Last access: Tuesday 1 November, 2016.
- [12] Information on <http://www.state.gov/r/pa/ei/bgn/6761.htm>. Last access: Sunday 15 November, 2016.
- [13] World Bank, Benin Country Brief (2016). Last access: Friday 12 November, 2016.
- [14] Cesar Queiroz and SurhidGautam. Western Africa Department and Infrastructure and Urban development Department. The World Bank WPS 921(1992), pp. 3-12.
- [15] Carolina Dominguez-Torres and Vivien F., Benin's Infrastructure: A Continental Perspective, 2011, pp. 5-8.