

Critical Planning Considerations for PPP Road Project Sustainability: A Case Study Approach

Chioma Okoro¹, Innocent Musonda², Justus Agumba³

Abstract

Road transport projects are complex and laden with risks and uncertainties which influence their success or otherwise; even more so, with projects involving the private sector. Private investors decide to proceed with projects based on projections of costs and benefits potentially accruing to a proposed project, which ultimately reflect the success or failure of the project. However, the risks associated with roads delivered through public-private-partnerships (PPP) are grave and if strategies are not put in place to reduce or mitigate the chances of their occurrence, the expected performance of the projects may not be realised. The current paper aims to identify critical feasibility considerations to ensure sustainability of PPP road projects. A thematic content analysis of extant literature and case study illustrations was undertaken. Journal and conference articles were sourced from databases including Academic Search Complete, ASCE Library, Google Scholar, Scopus, Taylor and Francis, Google and Science Direct. Findings revealed that joint decision-making and concessionaire selection procedure and considerations were the most important feasibility factors for PPP road projects sustainability. These factors should be taken cognisance of at the feasibility stage to ensure that mechanisms are put in place in order to realise expected project performance.

Keywords: public-private partnerships, road infrastructure, sustainability

1. INTRODUCTION

Road projects, like any other infrastructure developments, go through certain development stages including pre-planning, implementation, and operation and maintenance stages and each of the stages has specific purpose and objectives (Khmel and Zhao, 2016). Road project life cycles are unique in the sense that they do not have a definite end in time and are not disposed of easily; instead they undergo a continuous process of change as their individual components wear out and are replaced with new materials in the maintenance phase (Liljenström, 2013). This unique feature

¹ Doctoral Candidate; School of Civil Engineering and the Built Environment, Department of Engineering Management, University of Johannesburg, South Africa; chiomasokoro@gmail.com

² Associate Professor; School of Civil Engineering and the Built Environment, Department of Construction Management and Quantity Surveying, University of Johannesburg, South Africa; imusonda@uj.ac.za

³ Senior Lecturer; School of Civil Engineering and the Built Environment, Department of Construction Management and Quantity Surveying, Durban University of Technology, Kwazulu-Natal, South Africa; justusa@dut.ac.za

underlies the importance of sustainability of procurement and financing structures for maintenance and operational activities. Moreover, procurement and financing structures and considerations defined at the planning stage allow for successful partnership and eventual continued operational success of the projects (Rebeiz, 2012; Gupta *et al.*, 2013). Consequently, public-private partnerships (PPPs) have been advocated as a panacea to ensuring sustainability of road infrastructure developments through their long life cycles.

Public private partnerships (PPPs) have been used for over four decades predating the contracting out initiatives of the 1970s in the USA (Buerthey and Asare, 2014). It has since been widely adopted to accelerate the delivery of a wide range of key infrastructure projects, including road projects (toll ways), for instance, the Gauteng Freeway Improvement Project in South Africa and the Maputo Development Corridor's N4 toll road project (Farlam, 2005; Brits, 2010). Increased traffic demand as a result of economic growth and wider acceptance of the user pays principle are reasons that ginger PPP adoption in the transport sector (Pantelias and Roumboutsos, 2015).

However, despite the din advocating the adoption of PPPs, the private and public sector partners have a bleak record of delivering on large infrastructure costs and performance promises, including road infrastructure (Flyvberg *et al.*, 2009). For instance, in Germany, a new tolling system in 2003 that was meant to showcase efficient PPP road management failed, resulting in an estimated loss of €6.5 billion in toll revenues (Flyvberg *et al.*, 2009). Another example is the M1/M15 toll motorway in Hungary, cited earlier whose traffic volume was 40% lower than forecasted (Cuttaree, 2008). Consequently, the concessionaire was unable to service its debt and the government had to take over the concession at a high cost. In addition, the South African N4, Maputo corridor toll concession's lack of information and openness resulted in the tolling process impacting negatively on local perceptions of PPPs and many residents were outraged that placing tolls on the N4 will hinder access to opportunities and schools, jobs and the main shopping centres in Nelspruit (Brits, 2010).

Nevertheless, a recurring theme is that for PPPs to be successful, governments need to undertake thorough feasibility studies to identify, assess and address the risks and develop strategies to manage them such as risk transfer (Farlam, 2005). This tends to suggest that the risks inherent in PPP arrangements are surmountable given adequate attention to the factors that underlie the sustainability of the structures. More especially, given the long duration of concession periods, emphasis should be on the arrangements proposed (at the planning stage) for the operational phase. Procurement and financing structures are critical because if defined at the initial stages of a project, the continued viability of the projects in terms of financial returns and operational sustainability will be affected.

Most previous studies on PPP and sustainable road delivery have focused on incentives to promote public participation and investment. For instance, Feng *et al.* (2015) focused on the role of government guarantees in toll road delivery (toll charge, road quality and capacity) as a means of incentivizing private investors, irrespective of actual demand. Tan and Yang (2012) explored the

usefulness of flexibility in PPP contracts under demand uncertainty. However, demand is not the only risk that threatens the sustainability of road projects and thus Tan and Yang's focus is somewhat inadequate. Glaister et al. (2010) revealed that a performance contract that incentivizes effective delivery and good operations will ultimately contribute to the reduction of risks associated with private sector participation in infrastructure development. However, this study did not include projects in Africa and cannot really be generalised since environments and stakeholders' interests differ in geographical locations (Pârvu and Voicu-Olteanu, 2009; Glaister et al., 2010). More recently, Nnaji and Okoro (2016) focused on success factors for PPP in transport delivery. However, few studies have related the feasibility analysis of these optimal procurement and financing strategies to the sustainability of road projects funded through PPPs. It can be argued that the sustainability of road infrastructure projects cannot be realised if plausible trajectories and enabling conditions to sustain cash flow and revenue source are not adequately addressed at the feasibility stage. Moreover, the financial burden of maintenance and operational activities lies on the cash flow from the road investment while in operation.

The objective of the current study is to identify critical factors that should be considered at the project feasibility stage in order to sustain road infrastructure delivery using PPPs. Furthermore, a study in Africa is necessary to ascertain whether the factors are relevant and applicable to the region given that PPPs differ according to the location or country. The methods adopted to conduct the study, as well as the findings are presented hereafter.

2. METHODS

The current study was conducted through a detailed review of extant literature and a thematic analysis. The search for literature for the current study started by listing the relevant key words and phrases, namely, on PPPs and sustainable road delivery and using them in conjunction with feasibility studies, procurement and consideration. The approach adopted for the study was a desk study. Databases used included Academic Search Complete, ASCE Library, Google Scholar, Scopus, Taylor and Francis, Google and Science Direct. A simple matrix was conducted to determine which keywords and phrases led to relevant literature. Materials were selected only if they met the following criteria: possession of any of the keywords; articles published in the last 12 years (since 2005). Each piece of literature was reviewed and synthesised to determine the focus, context and key findings. Thematic analysis was thereafter used to identify emerging themes from eighteen articles specifically focused on PPP sustainability factors for road infrastructure delivery. Thematic content analysis identifies, analyzes and interprets patterns of words (themes) used in textual data (Vaismoradi et al., 2013). The relationships between the works and views of authors are highlighted to reveal the consensus in the literature (Avni et al. 2015). The PPP sustainability considerations, from the thirteen articles, are tabulated and the frequency of occurrence in the sampled literature is evinced and this reflects the level of consensus among the sampled authors regarding the factors.

Following the thematic content analysis, two projects that exemplify the successful application and sustainability of PPP in road transport infrastructure in Africa were identified and discussed in order to extract critical sustainability factors.

3. OVERVIEW OF PPPS

Public–private partnerships (PPPs) are arrangements whereby private parties participate in, or provide support for, the provision of infrastructure, using their skills, expertise and assets, and thus resulting in a contract for a private entity to deliver public infrastructure-based services (Pârvu and Voicu-Olteanu, 2009; Hueskes, 2017). The World Bank (2014) defines PPP as:

“...a long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance”.

The preceding definition encompasses new and existing assets. The concept of PPPs is suggestive of the existence of voluntary agreements, outsourcing or contracting out, public interest in the provision of service, service level agreements (Sudić et al., 2013). These arrangements in road transport infrastructure projects thus involve parties who have a binding agreement and obligation to provide road infrastructure assets and manage the services thereof for the welfare and to the satisfaction of the users, throughout the infrastructure life cycle.

Public–private partnerships can differ widely in different countries depending on cultural, economic and social context and therefore any model adopted should be applicable to the situation and particular environment (political, financial and otherwise) (Pârvu and Voicu-Olteanu, 2009; Glaister et al., 2010). According to Burger and Hawkesworth (2011), Buerthey and Asare (2014) and Shen et al. (2016), PPPs are of a wide variety, depending on the ownership of capital assets, extent of involvement and responsibilities of the private partner or the investment distribution, the amount of risks undertaken, duration of contract and the conceptualisation of the project. For instance, the private partner may undertake to be responsible for the design, financing and/or ownership. This suggests that with some procurement models, ownership reverts to the public sector, a view supported in Buerthey and Asare (2014). Thus, different variations exist depending on the level of involvement of the private partner and the nature of the contract (reversal of ownership at the end of tenure). Such forms include the *Design-Build-Operate (DBO)*, *Design, build, finance, operate and manage/maintain (DBFO, DBFOM)*, *Buy/lease, build and operate (BBO)*, *Design, build and operate and transfer (BOT)* (Burger and Hawkesworth, 2011; Buerthey and Asare, 2014).

However, although PPP models are varied, they have unique characteristics. In their studies on the adoption and sustainability of PPPs in infrastructure investments in Romania, China and Belgium, Pârvu and Voicu-Olteanu (2009), Feng et al. (2015) and Hueskes et al. (2017), respectively, used document analysis and case studies to identify various attributes of PPPs, stating that they:

- are contractual agreements between a public agency (or government – federal, state, or local) and one or more private sector entity;
- are long-term in nature (typically about 20-40 years);
- transfer general responsibility of service delivery to a private company;
- transfer certain risks to the private sector;
- focus on the specification of project outputs rather than project inputs; and
- integrate or “bundle” different functions into a single contract such as design, construction, financing, maintenance and/or operation.

These unique characteristics of PPPs exist in infrastructure projects and taking cognizance of the associated risks during planning contributes to ensuring sustainability of the subject projects.

3.1 Assuring sustainability of road transportation infrastructure through sustainable PPPs

Risks that can occur in the life cycle of road infrastructure project include common and PPP-specific risks. The common risks that arise, regardless of the structure of ownership, financing and operation are technical, engineering design, construction risk, cost escalation, revenue (demand and price volatility), force majeure, political, environmental and operating risks (Farlam, 2005; Pantelias and Roumboutsos, 2015). The PPP-specific risks are related to the type of PPP implemented, the scope of and country of development (Glaister et al., 2010; Pantelias and Roumboutsos, 2015). PPP road projects have to contend with pre-investment risks; however, operation phase risks are equally a concern if not more, because the projects have to be sustained to be able to perform as expected and desired. Such operation phase risks include cost overrun (high operating costs), quality performance, revenue, competition and network risks. These have to be assessed at the planning stage in order to make provisions and decipher strategies to manage the risks at the operation stage, especially since some of these risks are difficult to assign a priori (Pantelias and Roumboutsos, 2015). This underlies the importance of feasibility studies that include evaluation of possible configurations of procurement and financing structures and especially considerations to ensure that they are sustained throughout the project.

Having PPP models that bundle infrastructure design, construction, finance and operation into a single long-term contract with a private concessionaire encouraged as a way to transfer risk from the public to the private, increasing accountability and ultimately, assuring performance (Siemiatycki, 2010). In addition, the bundling of various functions into one long-term contract could make it in the interest of private partners to take life-cycle costs into account, since it provides an incentive to think, “beyond the design stage and build in operational and maintenance costs which may cost more initially but result later in lower operating and running costs, and so deliver cost effectiveness over time (Hueskes et al., 2017). Incentives for low cost construction are thus aligned, thereby minimising lifetime costs of operations. In this sense, sustainability goals can be achieved.

3.2 PPP sustainability factors for road infrastructure delivery

As earlier stated, PPP-specific risks relate to the type of arrangement, country (political) and size of project. Therefore, PPPs can succeed given certain conditions and appropriate circumstances with regard to governance strategies and the objectives of the partnership (Liyanage et al., 2015; Hueskes et al., 2017). Hence, PPP governance and partnership factors which can influence the sustainability of road infrastructure, including risk sharing, bidding, decision-making, and so on, are identified and discussed hereunder.

3.2.1 Private partner selection considerations

Considerations here have to do with the bidders and negotiations and legal adherences during the tendering process as well as specification of penalties for non-compliance at any stage of the road infrastructure development process (Liyanage et al., 2015). The procurement process to short-list and select concession companies, termed special purpose vehicles (SPV), to construct, manage and operate the road projects should be open, competitive and involve state-owned development institutions (Carter, 2015; Liyanage et al., 2015). This will ensure that the public sector has enough control to supervise the services, safeguard public interests and justify investments in a particular project over other priority areas (Levitt and Eriksson, 2016). In addition, the SPV concession must be owned and governed by its initial investors for an extended time period, including design, construction and a ramp-up period of several years of operation and maintenance (Levitt and Eriksson, 2016). Moreover, selection of experienced and committed concessionaire is vital in ensuring performance of road networks (Carter, 2015). This is because committed concessionaires will likely be concerned about the welfare of the users in addition to recouping their capital.

3.2.2 Appropriate risk and benefit allocation

Consideration of how much risks have been transferred to the private sector or borne by the public sector, for instance, lower traffic demand or non-repayment of debt or cost recovery is important (Feng et al., 2015; Liyanage et al., 2015). Benefits achievable by or accruable to the partners, on the other hand, also need to be specified early on in the contract depending on measurable, achievable, realistic and time-bound objectives (Liyanage et al., 2015). Concurring with these views, in a case study analysis of a PPP mechanism adopted in the provision of an expressway in China, Shen et al. (2016) stated that a risk-based concession time period should be used in developing a PPP contract so that the benefits will be commensurate with the risks to various parties in the project.

3.2.3 Clearly defined or unilaterally specified responsibilities, control, rules and procedures

The concerned parties need to be clear on specification of deliverables, reference design or rigid tender specifications, minimum standards for condition of infrastructure, roles and responsibilities of different parties involved, performance targets, penalties for non-compliance, and procedures for amendments, dispute resolution or termination, renegotiations (if any) (Liyanage et al., 2015). For sustainability of road quality and thus asset value, specification of the standards for infrastructure maintenance is paramount. The division of responsibilities of the private and public partners should be governed in an elaborate and precise performance contract stipulating the responsibilities of the parties in operation and maintenance of the road infrastructure assets (Levitt and Eriksson, 2016). This will also assist in establishing boundaries of control by both parties and providing monitoring and efficient road transport infrastructure management while in operation.

3.2.4 Choice of source of finance considering cost

The sources of finance as well as the cost of obtaining such finance for road projects need to be considered in road project developments. The funding of road infrastructure projects implemented under PPP conditions can be done on the basis of project financing. Project financing simply refers to the financing of projects depending on project cash flows for repayment, as defined by the contractual relationships within a subject project (Khmel and Zhao, 2016). It entails lending against future cash flows of a project that is legally and economically self-contained and lends itself to governance by a SPV (Pantelias and Roumboutsos, 2015). Project finance is usually used to raise money from banks on a limited or non-recourse basis to fund capital-intensive projects while providing a lower risk-adjusted cost of capital than other forms of corporate financing (Finnerty, 2013; OECD, 2014).

Toll roads are usually financed through these non-recourse loans that are secured against future toll revenue only and with no other collateral and so the repayment of loans depends on precise traffic estimates and revenue obtainable from the users (Welde and Odeck, 2011). Financing new infrastructure through user fees is increasing worldwide and cost recovery for a private investor is only possible through toll roads or user fees. Traffic forecasting is complex and adding tolls increases the uncertainties in cost recovery (Welde and Odeck, *ibid.*). Moreover, the financial burden or responsibility of maintenance lies on the cash flow from the road investment while in operation, as evinced in Figure 1.

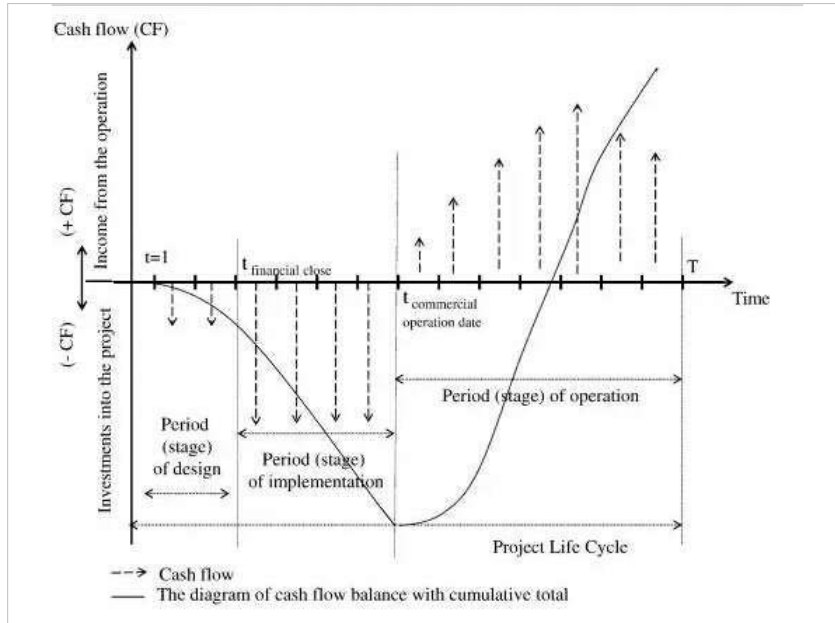


Figure 1: Cash flow projections in the life cycle of a typical PPP project (Source: Khmel and Zhao, 2015)

During the design and implementation stages of the project, the sponsor’s own funds invested as capital (corporate financing, that is, from the investor’s own balance-sheet resources), as well as debt and/or budget financing are sufficient for activities at these stages; whereas, the constant cash flows generated in the operation phase are used to pay off debts and generate revenue (Khmel and Zhao, 2016). In addition, discounts and medium term notes and letters of credit may also be used for payment during the operation period, but for capital investments along the line such as capacity expansion, capital market instruments including bonds and shares may be used. It is also important to define the cost of a particular source of finance, especially in cases where debt represents the entire capital of the project, but borrowers require capital (necessary (Khmel and Zhao, 2016). In other words, the financial resources available to an investor are defined by their nature (credit and/or equity), with the distinction drawn from whether priority claims in corporate finance or residual claims in project cash flows are received (OECD, 2015).

3.2.5 Incentivising private consortia

Planned managerial actions in the planning stage should be put in place to mitigate occurrence of risks. The private sector can be incentivised via risk transfer and guarantees based on expected functional output specifications (Liyanage et al., 2015). Risk transfer by means of non-financial contract is widely used as a means of managing risks in project finance in the event of poor cash flows from the investment (OECD, 2014). Transferring risks means “to shift risks from some participants in the project to others, assuming they will manage the risks better and that the risk

level will be lower (Sudić et al., 2013). In addition, if risks occur for instance, benefit shortfall from underestimated demand for the road network services (that cannot be controlled), some form of indemnification or guarantee can be paid to the SPV or private sector partner (OECD, 2014). These contingencies should be worked into the contracts at the onset. For instance, government guarantees have been used to attract private investors' participation into build-operate-transfer (BOT) road projects (Feng et al., 2015). According to Feng et al. (ibid.), different types of guarantees influence the quality, charge and capacity (demand) of road projects. For instance, a minimum guarantee increases toll charge while decreasing road quality and a price guarantee decreases toll charge and increases road quality and capacity. In addition, a contract with flexibility, whereby the parties agree on ex post optimal adjustments according to the observed demand curve, could be used to assure an investor of a secure investment (Tan and Yang, 2012).

Concurring with these views, Zhang and Chen (2013) opined that concessions should be maneuvered to provide the concessionaire with necessary recourses against decisions of the financial regulator and incentives to continuously improve efficiency, cost-effectiveness and quality of service, attract private funding, technology, knowledge and expertise and good performing concessionaires can be reconsidered during periodic rebidding based on record of good operations.

3.2.6 Loyalty and trust

According to Christina et al. (2016: 905), trust is a social and psychological construct which is used to define the nature and quality of relationships between actors in a system and reflects the extent to which one party is willing to accept another's vulnerability in a relationship based on beliefs about honesty, fairness and altruism of another. It is a psychological state which includes the intention to accept vulnerability, based on positive expectations of each other's intentions or behaviour (Lousberg and Noorderhaven, 2014). Trust between partners in a PPP relationship is regarded as one of the most critical factors for the success or sustainability of road projects especially in the event of a more hands-off approach by the government (Lousberg and Noorderhaven, 2014; Hueskes et al., 2017). However, it is linked to interests and the level of transparency. Transparency necessitates an open approach to decision-making, which allows for the establishment of a mutual trust between partners in a PPP (Zhang and Chen, 2013).

Trust is fostered by personal contacts, the sharing of meanings and perceptions and jointly defining and tackling problems in relation to varied interests and can be deliberately increased by enhancing transparency (Lousberg and Noorderhaven, 2014). Lousberg and Noorderhaven (ibid.) demonstrated the stochastic nature of trust in the course of a project (life cycle). The authors opined that as a project progresses, partners tend to develop opportunistic behaviours that seek to fulfil their personal interest or it could be compromised due to conflicts over risks, revenues and costs. Greater openness and transparency or clarity of interests is necessary to improve trust. Both sectors must have mutual trust and act responsibly to achieve common goals without putting self-interest above all (Botlhale, 2016). These views were echoed in Christina et al. (2016) in which it was

reported that trust is especially important in PPPs given the high levels of uncertainty and complexity which characterize them and the power differentials which exists among government, SPVs and the community/members of the public.

3.2.7 Joint decision making

Involving private sector in contract structuring and encouraging participation of members of the public for which the infrastructure is being provided is essential in ensuring performance of road projects (Carter, 2015; Hueskes et al., 2017). The public needs to be consulted because they are the ones who would eventually pay for the services and they should understand what a proposed development is all about and what needs of theirs would be fulfilled, both in the short run and long term. Thus, sharing system-related information with the public, consultation regarding fees and increments, involving locally-based project companies/contractors, involving private sector in operations/reality checking of outcomes, involving the public in planning for discounted user charges, getting the local community to understand why the project is being done, and so on, influence road project performance (Devkar et al. 2009; Glaister et al., 2010; Carter, 2015; Mišić and Radujković, 2015; Osei-Kyei and Chan, 2016).

From the thematic content analysis of literature from eighteen articles focused on road transport delivery using PPPs, the top four factors identified were joint decision-making, private partner selection considerations (including open and competitive bidding, selection of experienced and committed concessionaire, etc), incentivising private sector investors, and choice of financing considering cost. These findings are summarised in Table 1.

4. CASE STUDY

Following the identification of the seven factors from the thematic analysis, the case studies were conducted to verify if the most frequently occurring factors were relevant within the African context.

4.1 Case 1 – N4 toll road, Maputo corridor

The N4 toll road was one of the Maputo Development Corridor projects running from Witbank in South Africa to Maputo in Mozambique. The Mozambique did not have money to improve and maintain its portion of the highway, which had been neglected and damaged in the country's long civil war. The South African government also faced an accrued backlog for road infrastructure in 1997 of R37 billion. The governments of South Africa and Mozambique signed a 30-year concession for a private consortium (made up of three construction companies) to build and operate the road for R3 billion (1996 estimates). The project was financed from 20% equity and 80% debt. Both governments jointly guaranteed the debt and equity because there was considerable user payment and demand risks, given the high toll fees.

Thus, considering the costs and demand risks associated with the projects, both governments jointly decided to finance the projects (joint decision-making). In so doing, responsibilities were

clearly spelt out. Although the project faced challenges and opposition from the users (public) regarding the toll charges, all stakeholders (both governments and the companies) had understood the implications, and commercial risks were shared among partners (Farlam, 2005; Brits, 2010).

With their joint efforts, the parties are able to keep the performance of the N4 toll road on par with world-class standards, with sufficient funding for regular upgrading, rehabilitation and maintenance, as well as traffic and safety management services (Trans African Concessions, 2017).

Table 1: PPP sustainability factors identified from thematic content analysis

Literature source	Year	Joint decision making	Private partner selection considerations	Incentivising private consortia	Choice of finance considering cost	Loyalty & trust	Appropriate risk & benefit allocation	Clearly defined responsibility, rules & procedure
Devkar et al.	2009	X						
Glaister et al.	2010	X	X					
Welde & Odeck	2011				X			
Tan & Yang	2012			X				
Finnerty	2013				X			
Sudic et al.	2013			X				
Zhang & Chen	2013							
Lousberg & Noorderhaven	2014			X	X	X		
Carter	2015	X	X					
Feng et al.	2015			X			X	
Liyanage et al.	2015		X	X			X	X
Misic & Rajukovic	2015	X						
Pantelias & Rouboutsos	2015				X			
Bothale	2016					X		
Christina et al.	2016					X		
Levitt & Eriksson	2016		X					X
Osei-Kyei & Chan	2016	X	X					
Hueskes et al.	2017	X				X		
Frequency		6	5	5	4	4	2	2
Percentage frequency		33	28	28	22	17	11	11

4.2 Case 2 – Senegal’s Dakar-Diamniadio road

With concerns regarding acute congestion in Senegal’s capital city of Dakar, a group of government agencies, companies and international development groups partnered to successfully deliver the first toll road in Dakar-Diamniadio (Gainer and Chan, 2016). A private company contributed a portion of the project cost and then was responsible for maintenance of the highway (in exchange for toll revenues), while the rest of the upfront cost was borne by the government.

The 32-kilometer highway, which opened in August 2013, was successful during implementation because at the planning stage, there were clear and visible benefits, consensus-building and stakeholder engagement, political commitment and proactive implementation by government agencies, strong involvement of development institutions and experienced and committed concessionaire (Carter, 2015). Although risk was a major consideration, the partnership structure, which was a build-operate-transfer, was attractive to private investors. The concessionaire was selected based on experience and sufficient liquidity.

In this case, there was also clear agreement on the risks and responsibilities to be borne by both parties. For instance, the concessionaire bore the traffic risks and was responsible for safety and quality management). In addition, there was communication and understanding between parties and the community as regards the expected impacts of the development (Gainer and Chan, 2016).

Even during the feasibility studies, it was evident that the project was going to be sustainable. Toll sensitivity studies showed that even with a 20 to 30% decline in traffic, the financial rate of return was still guaranteed (African development Bank (AfDB Project Appraisal Report, 2009). Reports indicate that currently, travel time is reduced significantly from 90 to 30 minutes on journeys between the Dakar city and its great suburbs. In addition, there is increase in property values, improvement in accessibility, as well as quality of lives (AfDB, 2018). Further, the project is financially profitable with a financial rate of return of 20.16%, and its sustainability of the investments will be ensured by the PPP formula, whereby the concession was made responsible for the maintenance of the highway and toll equipment (AfDB Project Appraisal Report, 2009).

4.3 Case 3 – The Lekki-Epe toll road concession project

The Lekki Toll Road Infrastructure Project, along 49.4KM of the Eti-Osa Lekki-Epe axis of Lagos consisted of the construction of new highway, culvert structures, provision of street lightings, and construction of two new toll plazas (Olele, 2016). A concession company was obliged to design, rehabilitate, construct, operate, maintain and toll the existing expressway planned for expansion, under a 30-year Concession mandate from the Lagos State Government. The project was successfully undertaken due to an experienced and committed concessionaire, due diligence, and involvement of local lending institutions. The state government’s commitment and support in the loan of N5billion to the concessionaire assisted in the overall financing of the project (Trinity, 2009).

However, the project initially faced challenges as a result of high upfront cost including procurement costs, lack of strong support and commitment from the federal government, change in state government and managing stakeholders (Trinity, 2009; Olele, 2016). Nevertheless, these challenges were overcome partly by the PPP framework that took cognizance of the risks (financial and economic, mostly) of the project (Olele, *ibid.*).

From the three cases studies discussed above, it can be seen that the top two factors established in the literature review were relevant to the success of all the three PPP road projects examined in the case study illustration (Table 2). The table highlights the factors identified from the studies considered. This tends to suggest that joint decision making and private partner selection considerations are the most important factors to consider at the planning phase of road infrastructure projects in order to ensure sustainability of such projects.

Table 2: PPP sustainability factors identified from case studies

Case study	Joint decision making	Private partner selection considerations	Incentivising private consortia	Choice of finance considering cost	Loyalty & trust	Appropriate risk & benefit allocation	Clearly defined responsibility, rules & procedure
Case 1	X	X	X	X		X	X
Case 2	X	X			X	X	X
Case 3	X	X	X	X			

5. CONCLUSION

The study sought to determine PPP factors which should be considered at the planning stage of road projects in order to ensure sustainability during operations. The objective has been met. The most critical factors were joint decision-making and concessionaire selection procedure and considerations. These considerations include the nature of bidding, the level of commitment and experience of the concessionaire and so on. These factors were first identified from a review and thematic content analysis of extant literature. Subsequently, case studies were used to assess the relevance of the factors on successful PPP road infrastructure projects in Africa, in order to establish applicability within the African context. Analysis of the case studies evinced that the factors contributed to success of the projects studied and were therefore applicable to the African context.

The current study provides evidence of the most critical factors that should be considered in PPP road infrastructure delivery in order to ensure sustainability. The findings provide information to guide road transport planners, policy makers and investors in planning for future infrastructure developments. Future research could adopt other research techniques to conduct a similar study and refute or further validate the findings of the current study. Further studies could also focus on

other geographical areas as results may differ and the current case study findings may not be generalizable to other regions.

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