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Road Infrastructural Delivery in Ghana: Trends and Projections

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***Abstract*— Road sector development requires huge capital investment. The government of Ghana however, is constrained with limited financial, technological, and other requisite resources. These have over the years hampered its effort to provide adequate infrastructure to ensure comfort and economic growth. The paper discusses the trend in the development of the road network in Ghana for the past decade, identifying and ranking the key factors that affect the delivery of road infrastructure projects in Ghana. The paper adopts a mixed approach with the distribution of 105 questionnaires to construction clients, professionals and experts in the built environment receiving a response rate of 91%. Secondary information was sourced from articles, journals, reports, and historical documents from the agencies relevant to the study. Findings from field studies indicate that funding is a dominant challenge hindering the delivery of road infrastructure in Ghana. Currently, the approximate ratio of tarred to un-tarred road network is 18.7% to 81.2%. At the current rate of 7.13% per annum, all things being equal, it would take country close to 2 decades to meet its road needs. To close the gap in the road sector, road financing in Ghana would require a joint effort from both the public and private sector to take advantage of the private sectors adequate resources in terms of finance, technology and expertise.**

***Index Terms*— Private sector, road financing, public sector public procurement partnership.**

I. INTRODUCTION

Road infrastructure is vital indicator of every nation's economic growth. Investment in road transport makes up a large proportion of public expenditure in many developing countries [1].Road Infrastructure may be considered to be one of the skeletal framework on which a society is built and in Ghana, it forms a formidable part of the Ghana Shared Growth and Development Agenda [2] as a key focus area addressing infrastructure and human settlement. Road transport is the dominant mode of transportation in Ghana and has been identified as one of the catalysts in creating wealth. Development in road infrastructure creates opportunities for people to access various economic and social resources. It facilitates the movement of people, goods and services. It also provides vital and complementary services to all sectors of the economy including tourism, mining, health, trade, education, agriculture, energy among others. Road infrastructure Projects are capital intensive and usually takes huge percentage of national budget. However, the need for its investment cannot be underestimated due to its enormous contribution to the national economic growth. Its provision takes due cognizance to issues bordering on time, scope, cost and quality [3].

Road infrastructure is very essential for the growth of every economy. Development in road infrastructure creates opportunities for people to access various economic and social resources. Road networks facilitate the movement of people, goods and services for several diverse purposes. It provides service to other sectors such as tourism, mining, health, trade, education, agriculture, energy among others. Restriction of accessibility limits efficient factor mobility, and defers the transfer of human and material resources to places where they can be employed most productively. It has been estimated that road transport accounts for 94% of freight ton-miles and about 97% of passenger miles in Ghana [4].

With an approximate Gross Domestic Product (GDP) of 39.2 billion US dollars [5], Ghana still suffers road and other infrastructure deficit. The Government is the main financier of road infrastructure development in Ghana. This fund comes from three main sources; the Consolidated Fund, the Ghana Road Fund and Donor Funds. The main sources of inflows into the Consolidated Fund are Taxes, Fess, Charges and government income from undertaking economic activities [6]. The Government of Ghana requires huge fund to close its infrastructure gap. According to the World Bank report, Ghana will need not less than 2.5 billion US dollars annually for the next ten years to close its infrastructure gap. Comparing this huge expected financial commitment to the Ghana government balance sheet, it will be very difficult for the government to close its road infrastructure gap.

II. EMPIRICAL REVIEW

Though the road sector development requires huge investment capital, the government of Ghana is however constrained with limited financial, technological, ineffective procurement strategy and other infrastructural development resources. These have over the years hampered its effort to provide adequate infrastructure to ensure comfort and economic growth. The central government usually undertakes projects without any form of formal partnership. [7], postulates that the traditional design-bid-build procurement strategy which is mostly engaged in Ghana has been identified to produce unsatisfactory results as it is characterized by delay in delivery, quality deficiency and cost overrun. The research further holds that road projects scheduled to be completed in one year tend to be delivered in six to seven years with substandard quality and huge cost overrun due to financial, technical and management challenges among others. This normally disrupts or nullifies the original objective of the proposed project. Road infrastructure consist of highway networks, including structures (bridges, tunnels, culvers, retaining walls, etc), signage and markings, electrical

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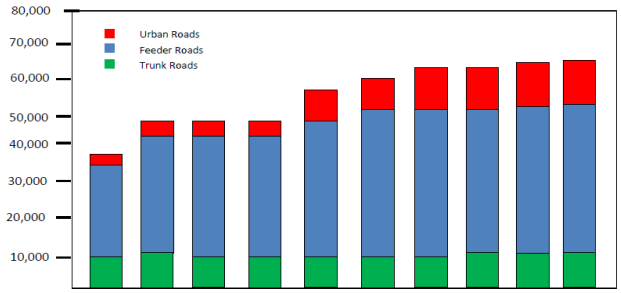
systems (street lighting and traffic lights), edge treatment (curbs, sidewalks, landscaping), and specialized facilities such as road maintenance depots and rest areas that support mobility of goods, services, human capital etc, for diverse purposes. Roads that need to be considered in effecting an integrated transport system can be categorized into the following: Local, Arterial and National roads [8].

2.1 Trend of Road Development in Ghana

The network distribution by class remained at 19% trunk roads, 63% of feeder road and 18% urban roads. The total portfolio of roads stood at 37321km in 2000 and grew up to 67450km in 2009. This represents an annual average growth of 182.2km, 1801.9km and 171.7km for urban, feeder and trunk road respectively within the years of 2000 to 2009. As at 2009, the total length of paved and unpaved road in Ghana stood at 12442km and 53863km respectively. The figure 1 illustrates the total network size by road type from 2000 to 2009.



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Urban Roads	2,200	3,365	4064	5013	4796	5576	9764	9764	12400	12400
Feeder roads	23999	32597	32597	32595	38561	40862	40671	42010	42194	42209
Trunk Roads	11122	12688	12656	12696	12700	12781	12786	12549	12697	12839

Figure 2.1 The trend of road infrastructure development from 2000-2009
Source: MRH, Road Infrastructure Development Annual Report, 2011.

These roads apart from their surface nature, suffers from congestion in terms of very high traffic density in major urban centers, rapid deterioration (with only 41% of the road network in considered in fair), and poor connectivity in rural areas, where only one fourth of rural population live within 2km of an all season road. While continued expansion of the network is desired, priority should be given to improving roads quality through the introduction of improved/latest construction technology, better maintenance and regulation, decongesting urban traffic (in Accra first), and improving rural connectivity. Overall, Ghana has allocated substantial resources to the road sector in recent years; it spends on average 1.5% of GDP on roads [4].

2.2 Financing Road Infrastructure Projects in Africa

Generally, the central government is responsible for the development, expansion and maintenance of road infrastructure for the benefit of all its citizens. The road infrastructure needs are prepared by the government's road or transport ministry or agencies and submitted to the government finance agencies for funding consideration. In many countries roads infrastructure are funded by the central government through revenue generations, donor support in the form of loan or grants from bilateral and multilateral Donor Agencies and the road fund. Ghana road provision and maintenance funding is of no difference.

The government is the main financier of road infrastructure development [2]. The government's main source of funding for the road sub-sector are the road fund, the Consolidated Fund and the donor Funds. The main sources of inflows into the Consolidated Fund are Taxes, Fess, Charges and government income from undertaking economic activities. Fuel levy, road tolls, bridge tolls, ferry tolls, road use fees, vehicle registration fees and International transit fees are also the various constituents of road fund contribution [6].

According to [9], most of Ghana's road network development has been accelerated through bilateral and multilateral Donor Agencies supports, with road infrastructure funding acquired in the form of loans or grants from agencies such as IDA – (International Development Association of the World Bank), AfDB (Africa Development Bank), OECF (Overseas Economic Co-operation Fund of Japan), EU (European Union), KFW (Kreditanstalt fur Wiederaufbau- Bank for Reconstruction), ECGD (Export Credit Guarantee Department of UK), JICA (Japan International Co-operation Agency), BADEA (Arab Bank for Development in Africa), OPEC (Organisation of Petroleum Exporting Countries), DANIDA (Danish Government) and Saudi Fund

The Donor Agencies contribution to the Ghana government's road infrastructure development cannot be underestimated. In the case study of Road Funds in Ghana, Malawi and Tanzania, it was reported that, the overall Government of Ghana (GOG) road sector funding from 1996 to 2001 was US$ 1,121 million and Donor Funding represent about 44%, which is US$ 496.00 million [10].

In 2010, the federal government of Nigeria and state and local governments spent about $160 billion to build, operate, and maintain roads. Almost all of those infrastructure projects were undertaken using a traditional approach in which a state or local government assumes most of the responsibility for carrying out a project and bears most of its risks, such as the possibility of cost overruns, delays in the construction schedule, and, in the case of toll roads, shortfalls in the road's revenues [12].

2.3 Road Infrastructure Gap in Ghana

The length of the main (primary and secondary) network is more than adequate to achieve regional and national connectivity. The record on road network quality is quite reasonable, with 75 percent of the paved network is in fair condition and another 74 percent of the unpaved network is also in fair condition [11]. Road infrastructure gap is the different between the road infrastructure required to support economic growth and the road infrastructure available. It is measured by accessing the road infrastructure investment required for the present and future needs and the capacity of the present and the future economic budget to provide. From the table 4 below on the infrastructure plans Consultative Group Meeting, June 19, 2012, US$ 5,497 million is required to close the road infrastructure gap in Ghana. The amount is to be invested in expansion in length and number of lanes, up-grading of road pavement and road furniture (drains, signage etc.) and improved inter-connectivity of roads in all

the three road sectors namely Highways, Urban and Feeder Roads across the country [4].

Table.1 Infrastructure Investment Plans 2012-17 (US$ million)

Sector	Required investment in million dollars
Generation	1,980
Transmission	903
Distribution	1,000
Roads	5,497
Ports	674
Rails	2,832

Source: [4]

2.4 Causes of Road Infrastructure Deficit

Road infrastructure deficit in many developing countries can be a symptom of low economy due to fiscal constraints and other several factors. It is noted that 35 percent of the infrastructure funding gap which includes road can be attributed to inefficiency in the existing spending, poor governance, poor planning of investments, under-investment in maintenance or lack of maintenance, under-charging for services and operating inefficiencies [12]. Other factors which have contributed to road infrastructure deficit in Ghana may be discussed as follows:

 [12] Hold that the lack of long term Strategic Development Plan as a nation has serious repercussion on our development. The country over the years has moved from one policy document to the other. From GPRS I, GPRS II and now GSGDA and all these policy documents have different development agenda and different policy direction. The development plan of this country is politically lead, thus each political party when voted into power does what it feels or deems convenient for it at that particular point in time. This makes certain development infrastructures that do not fit into the plans of the current government loose. Mostly, road infrastructure projects are initiated by governments as part of their development agenda but when it is not completed within the tenure of office of that particular government then it risks being abandoned if it does not fit into the development agenda of the succeeding government. This is simply because, there is no long term strategic development plan or legislation that compels all governments no matter which political party it is from to commit itself to the completion of projects initiated by the previous government [12].

 According to [6], the use of ineffective procurement strategy, has been a major factor resulting in road infrastructural deficit. The governments of Ghana have not adopted an effective procurement strategy that encourages private sector to combine effort financially with the public sector to enhance the effort of the government in road infrastructure provision. Most of the procurement strategies adopted by the government are those whose funding are one sided, mostly the public sector (government). Resource from the public sector for purposes of undertaking projects of this nature are inadequate and thus leaves most road infrastructure projects abandoned or uncompleted. The right procurement strategy that the government can adopt to ensure that road projects are effectively completed are the ones that is able to efficiently combine resources from both the private and public sector towards the completion of road projects. When such procurement strategies are adopted, it will boost the government effort financially towards road infrastructure development.

 Technical and financial challenges of resettling homes or houses affected during road design and construction is another factor deterring major road development. Roads infrastructure development mostly affect homes and properties especially during expansion or construction of new roads, and there is often the need to compensate or resettle those affected families. However, the financial resource needed for resettlement purpose sometimes poses a challenge to the government. Resettlement programs are very expensive and may require financial resource that may be more than the actual road construction cost. When the government realizes the cost of resettlement and the actual road construction cost to be too much, this discourages the government from undertaking such projects. This is simply because there is very limited financial resource available to meet those demands [12].

 Poor Commitment to road Infrastructure as a result of rising pressures to satisfy other sections of the economy is another factor resulting in road deficit in Ghana. Mostly, road infrastructure projects are deferred or abandoned due to the fact that there is rising pressure to develop other sector of the economy. The government sees it relevant to invest in sectors of the economy that will generate enough revenue for the country. For instance, the government may see it necessary to invest in the agricultural sector rather than transportation. This is simply because enough foreign exchange is accumulated through exports of agricultural produce rather than the returns that roads will bring into the economy [12].

 The challenge of cultural and Traditional influence on development has a resultant effect in road infrastructural deficit in Ghana. Values, Norms and Ideologies embodied in culture and traditions mostly impede certain developmental projects especially road infrastructure. This is because roads may be designed to pass through certain traditionally sacred places like cemeteries, shrines, church, mosques, trees and mountains etc. but these does not make the execution of such road projects easy because, the chiefs and other traditional stakeholder who are custodians of such traditionally sacred landmarks usually do not allow the government to undertake the project even though they know very well the importance and benefit they will derive from the road projects [12].

 Corruption can be witnessed from the project inception up to completion. Contracts are awarded to only contractors who are the current government affiliates or favourites. The system popularly described as ‘whom you know’. These contractors are mostly not qualified to undertake such projects and they end up doing shoddy work. Hence projects undertaken by such contractors deteriorate in no time. Bribery has become the order of the day and people from all walks of life use their position to acquire wealth. Government officials and politicians who have been entrusted to seeing to ongoing road projects demand tips (bribes) from the local stakeholders before they perform or attend to their requests when

development projects are to be constructed in their regions. Corruption is said to be the abuse of public power for private benefit [7]. Also, some road contractors influence the road project supervisors by giving them bribes to keep their mouth shut and eyes closed for them to do shoddy work. These cause completed projects to deteriorate easily in no time.

 Inadequate Finance: There is huge road infrastructure deficit or gap needed to be closed in Ghana ranging from feeder roads, urban roads and highways. However, road infrastructure development is capital intensive and requires huge financial resources to be able to close or fill this gap. Though, the government of Ghana is trying its best to meet road infrastructure demands but it seems to be moving on a snail's pace. This is due to the fact that, the government is faced with fiscal challenges which make it budgetary constrained and always relies on bilateral and multilateral donor agencies assistance [12].

2.5 Effects of Road Infrastructure Deficit

One can argue that, the high price of food items or farm products in the urban centers cannot only be attributed to the higher demand of food items in urban centers but rather due to poor and expensive transport accessibility. If farmers are not able to distribute their product due to transport problems, the majority of the other economic sectors such as education, defense and security, health, governance, communication etc. would be indirectly affected. These have motivated many countries to invest huge resources into improving, expanding, maintaining and modernizing road infrastructure through several innovative procurement strategies. Road infrastructure deficit has serious repercussions on the economy as it affects productivity, revenue loss and results in diminishing effect on the gross domestic product of the economy and pose a threat to the achievement of the millennium development goals.

Table 2: Detail of questionnaire distribution, rate of return and response

Cat	Nomenclature	Questionnaire Issued	Questionnaires Received	Percentage of total questionnaire	Response Rate (%)
A	Road Agencies	30	30	28.6	100
B	Local Consultant	55	50	47.1	90.9
C	Ministry of Finance and Economic Planning	15	15	14.1	100
D	Donor Institution	15	10	10.2	100
	Total	115	105	100	91.3

Source: Field Survey, August, 2012.

III. METHODOLOGY

Research design is a plan or blue-print of how a researcher intends to conduct the research [14].The research question(s) of every study determines the type of research design to be used for data collection. This means that, for this study, whatever research method employed should assist in answering the key research question: what is the trend of road infrastructural delivery in Ghana. The questionnaire was designed according to the objectives of the study. The main instrument sought to identify the main factors that affect road infrastructural deficit in Ghana. To this end 30 factors were listed for respondents to rate on a Likert scale with 5 being very high and 1being very Low. A total of one hundred and fifteen (115) questionnaires were administered to four categories of respondents in the road sector, namely road agencies, local consultants, the road sector ministry and donor funding agency. Out the number distributed, one hundred and five (105) were received representing a response rate of 91.3%. [15], in accessing construction delays and their causative factors in Nigeria held that "the result of a survey could be considered as bias and little value if the return rate was lower than 30-40%". This assertion indicates that the response rate of 91.3% was adequate for the analysis as indicated in table 1 above.

IV. DATA ANALYSIS

There are several factors that affect project delivery with respect to time, cost and quality. Several researchers such as [16], [17], and [18], have discovered a lot of factors that affect the delivery of projects as indicated in the literature review. To determine the relative ranking of importance with respect to project delivery in Ghana, the relative importance index formula was adopted. Findings from the survey reveal that, availability and adequacy of funding is ranked first on key factors affecting delivery of road infrastructure. This is primarily as a result of the source of funding for the construction of roads in the country and its attendant problems of bureaucracies and meeting of conditions for loan and grant agreements. As a result road infrastructures are either abandoned midway during implementation, or original road designs are altered.

Table 3. Rank of Factors Affection Road Infrastructure Provision

Srl	Factor	Degree of relative importance quoted by the respondent					Respon se	ΣW	RII = (ΣW/S*N)	Rank
		5	4	3	2	1				
1	Availability of fund	70	20	9	4	2	105	467	0.89	1
2	Type of procurement system for the project	50	35	9	6	5	105	434	0.83	2
3	Project characteristics	10	15	30	20	30	105	270	0.51	25
4	Client representation characteristics	42	24	24	10	5	105	385	0.73	9
5	Project team performance (experience)	25	12	25	43	0	105	420	0.80	5
6	Contractor's characteristics	32	36	23	2	12	105	421	0.80	4
7	Design Team characteristics	24	12	13	1	55	105	264	0.50	27
8	External Conditions	16	13	32	3	64	105	298	0.57	20
9	Project Manager's Competence	35	35	16	14	5	105	396	0.75	8
10	Top Management support	30	25	39	6	5	105	384	0.73	10
11	Project manager's coordinating and leadership skills	21	16	2	45	21	105	286	0.54	21
12	Monitoring and Feedback by the participants	32	19	40	10	4	105	380	0.72	12
13	Decision making	10	21	16	33	25	105	273	0.52	23
14	Coordination among project participants	3	34	10	32	26	105	271	0.52	24
15	Client or owners' competence	12	2	4	40	47	105	207	0.39	29
16	Social Condition	23	12	30	14	26	105	307	0.58	17
17	Economic condition	30	42	20	8	5	105	399	0.76	7
18	Climatic Condition	20	24	23	22	16	105	325	0.62	15
19	Availability of plants and equipment	33	25	15	30	2	105	372	0.71	13
20	The condition of the ground	20	23	14	29	19	105	311	0.59	16
21	Availability and quality of construction materials	17	23	23	12	30	105	300	0.57	19
22	Disputes and conflicts	32	24	29	18	3	105	382	0.73	11
23	Availability of labour and productivity	21	9	14	21	40	105	265	0.50	26
24	Nature of project planning	13	19	22	20	31	105	278	0.53	22
25	Nature of technology	25	28	30	20	2	105	369	0.70	14
26	Political interest in the project	60	17	18	0	0	105	422	0.80	3
27	The proposed project completion schedule or date	20	19	18	25	23	105	303	0.58	18
28	Means of communication.	30	39	27	5	4	105	401	0.76	6
29	Environmental regulations	23	21	1	19	30	105	303	0.58	18
30	Acts of God	13	12	14	40	26	105	261	0.50	28

Source: Field survey, August, 2012

$$\text{Relative Importance Index } (\mathbf{RII}) = \frac{\Sigma\ \mathbf{W}}{\mathbf{A} \times \mathbf{N}}$$

Where,

W = the weighting given to each factor by respondents, ranging from 1 to 5,

A = the highest weight (i.e. 5 in the study), N = the total number of samples.

V. DISCUSSIONS.

For the successful delivery of road infrastructure projects, it is very important to know the key factors that affect their successful delivery. The identification and studying of these factors will enable one propose a suitable strategy to control the implementation of such project. It is indicated that, generally, the evaluation dimensions in any project correspond to the traditional constraints of time, cost and

quality parameters [19]. However, there are factors several factors that affect project delivery with respect to time, cost and quality. Several researchers such as [16], [17], and [18], have discovered a lot of factors that affect the delivery of projects. Since the year 2000, a concerted effort has been made all over the world to determine remedies to the issues of project delays. Based on the field survey and analysis of responses, it has been revealed that the availability of fund is the main factor affecting the road delivery in Ghana. Some 95% of respondents rated the above factor as a highly significant factor affecting the road infrastructure provision. The above affirms the research by [17] and [19], who upheld that the deficit in road delivery was mainly caused by lack funds and cash flow challenges and Ghana is not an exception. Another factor which was rated as highly significant is the procurement system adopted in the delivery of road projects.

With the current traditional design bid-build system, the delivery at the road sector is at a snail pace. The above situation can only be turned around with the concerted efforts of the public and the government. The political will and interest of government was ranked as third highest factor affecting the delivery of road projects in Ghana. It is interest to know the way some projects are abandoned midstream when there is change in government, with the national development turning on the wheels of the political manifesto of the newly incumbent government in Ghana. The situation has seriously affected the delivery of numerous project nationwide with large tax payers money sinking through the drain when such projects are abandoned due to lack of political will. At 5% level of significance, 94% of respondents held that contractors characterization was a major factor affecting the road infrastructure delivery. Other factors ranked in descending order are Project team experience and performance, project coordination and communication, economic factors. From previous research, [18], and [7], all affirmed these factors as significant affecting the road infrastructure provision. [12] in his effort to examine influences on project delivery time, compiled some factors that affect project delivery, identified by the following researchers and authors; [15] in Nigeria; [20] in Canada, [19] in Ghana, and [18] in India. These factors are: Availability of fund; type of procurement system for the project; Project characteristics; client representation characteristics; project team performance (experience); client representative's characteristics; contractor's characteristics; Design Team characteristics; external conditions; project Manager's Competence; top Management support, project manager's coordinating and leadership skills; monitoring and Feedback by the participants; decision making; coordination among project participants; client or owners' competence; social condition; economic condition; climatic condition; availability of plants and equipment; the condition of the ground; availability and quality of construction materials; disputes and conflicts; availability of labour and productivity; nature of project planning; environmental regulations; nature of technology; political interest in the project.; the proposed project completion schedule or date; means of communication [22].

VI. CONCLUSIONS

As already discussed, the importance of road infrastructure cannot be overemphasized. Road is one of the most important contributor of economic growth. The lack of modern infrastructure which includes road is a major challenge to many developing countries' economic development and constitutes a major impediment to the achievement of the various projected development goals. This is a serious development constraint, especially in countries, where transport cost is a major determinant of prices of basic goods and services. There is an urgent need for road maintenance, reconstruction, expansion among others in several countries. This is an evidence to what pertains in many Sub-Sahara African countries, where on average about one-fourth of the entire network are in poor condition and require urgent interventions to prevent the networks from complete collapse [21]. The problem of road deficit is apparently pervasive in all developing countries. Inadequate road infrastructure leads to road accident, traffic congestion (which causes waste of fuel, increase travel time and global warming) and other economic and social losses. Extensively, the cost of road infrastructure deficit can be felt in almost all sectors of national economy.

Some of the economic sectors which may experience the major impact include agriculture, health service, education, defense and security service, governance etc. This is because most of the activities of these sectors rely on road transport particularly in the developing countries. In agriculture for instance, the majority of farmers are located in the rural areas with less competitive market price for farm products. These compel them to transport their products to the urban centers where demand is higher for better sales value. Road infrastructure investment has massive rippling effect not only on economic growth but also in the area of poverty reduction. Road infrastructure and transport services connect towns and cities, facilitating the movement of people and goods and boosting trade. It is therefore not surprising that 87.6% of respondents affirmed their belief that inadequate road infrastructure leads to growth of poverty in Ghana. The remaining 12.6% felt other factors (corruption and lack of political will) were rather responsible for the poverty situation in the country. Based on the forgone, it has been established that the causes of road infrastructure deficit includes: the lack of long term strategic development plan, the use of ineffective procurement strategy, technical and financial challenges, poor commitment to road infrastructure, cultural and traditional influence on development, corruption, inadequate finance. The average annual total road development from 2000 to 2009 is represented by 7.11%, declining from 30.36% in 2001, to 6.76% in 2008. Considering the current growth rate, all things being equal, it would take the nation over 20 years to reach optimum road development with respect to urban road network. To enhance accelerated growth in the road sector, there us the need for a concerted effort by all stake holders. The public and for the that matter the road user must be read to pay more and tolls for the use of the road and the private sector should be ready to partner the government in the accelerated growth through direct investment and financing using the public private partnership scheme. Finally the government should put in procurement structures with open arms to the private sector by removing all bottle necks.

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