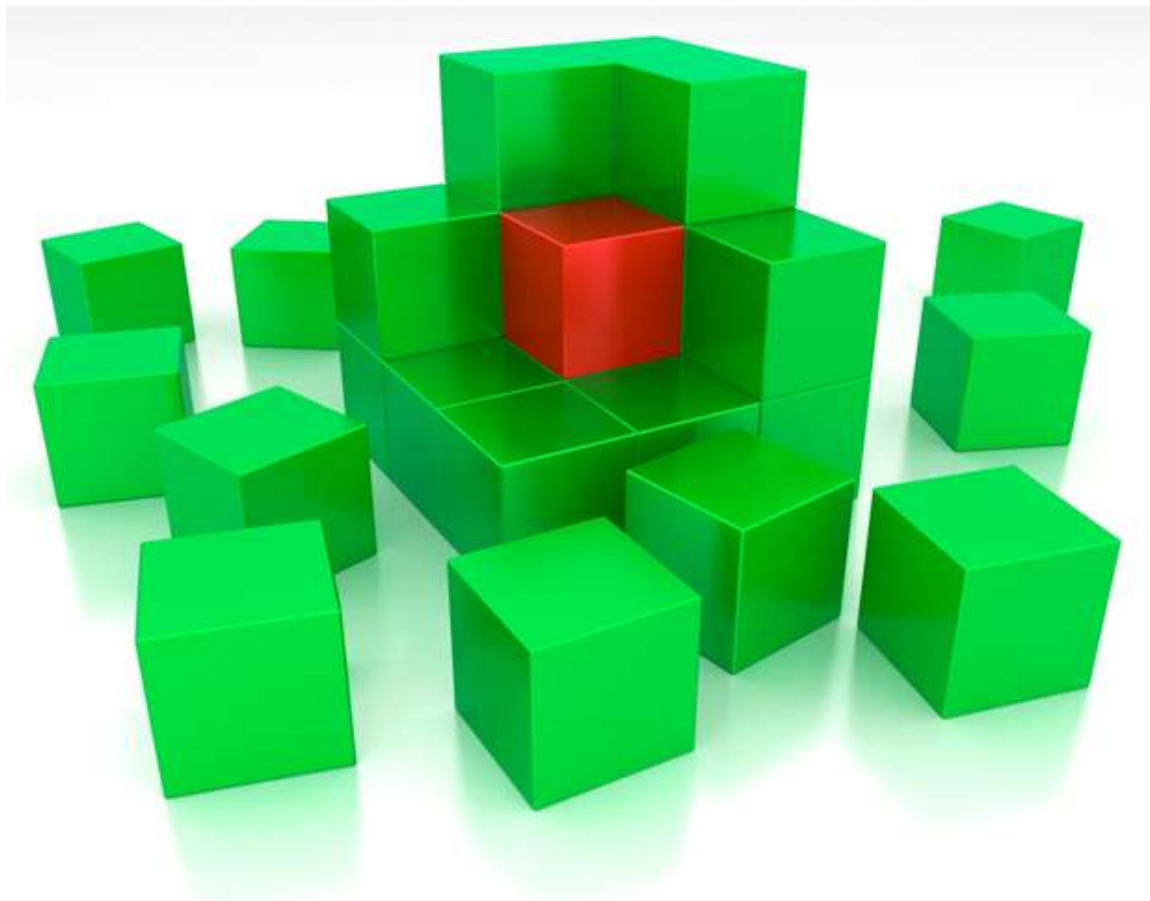




Sector Specific Inventory & Institutional Strengthening for PPP Mainstreaming to Government of Karnataka

Karnataka Public Works Department

Pre-Feasibility Report on Rehabilitation/Up gradation of Core Road Network in Karnataka on PPP Basis



Submitted By
Deloitte Touche Tohmatsu India Private Limited
July 2012

ACRONYMS

ADB	Asian Development Bank
BOT	Build Operate Transfer
CRN	Core Road Network
FY	Financial Year
Gol	Government of India
GoK	Government of Karnataka
IRR	Internal Rate of Return
KSHIP	Karnataka State Highways Implementation Project
MDR	Major District Roads
NH	National Highways
NPV	Net Present Value
PCU	Passenger Car Unit
PPP	Public Private Partnership
PWD	Public Works Department (Karnataka)
SH	State Highways
SRN	Strategic Road Network
TPC	Total Project Cost
VGf	Viability Gap Funding
WB	World Bank

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1 Executive Summary

Background

1.1.1 The analysis conducted in this report draws up the perspective development & financing plan for up gradation / improvement of Core Road Network corridors. The plan is expected to identify overall Core Road Network financial requirement after considering projects already being planned for up gradation by KSHIP / KRDC through various modes including funding from World Bank/ADB and those already considered under EPC mode.

1.1.2 Scott Wilson with ADB-TA was appointed by Government of Karnataka / KSHIP to prepare a Detailed Master Plan identifying the Core Road Network (CRN) for the State based on detailed technical analysis of road network in terms of weighted scoring against the parameters i.e. traffic, connectivity, other transport Infrastructure, Industrial Parks and Development Corridors, Mining, Tourism and Agricultural Centres. In the process Scott Wilson has identified 24,225.6 km under CRN in its report submitted to KSHIP.

1.1.3 The CRN is further sub-divided into Class A and Class B. Class A comprises of 28 corridors which include 13 North–South and 15 East–West corridors and balance length is in Class B.

CRN Considered for Analysis

1.1.4 This analysis is based on the CRN identified in Scott Wilson Report which is covering a length of 24225 Km. In the CRN, 4491 km is covered under National Highway which would be developed under NHDP, 4707 is already development or proposed for development by different agencies and remaining 15008 km have been considered for this analysis. A map of CRN is provided in **Annexure A** and the details of the projects already development or proposed for development by different agencies are provided in **Annexure B**.

Packaging of Projects

1.1.5 In the report submitted by Scott Wilson, they have not undertaken packaging of CRN i.e. no specific packages have been identified in the Class and Class B CRN for which financial viability assessment may be carried out However, an effective financial analysis can be undertaken only when packages are identified in the CRN. While such packaging of projects requires detailed technical study, for the purpose of this analysis packages have been identified based on principles provided below:

- In general, with few exception, the length of each package has been considered between 100 – 150 Km.
- All corridors for Class A are covered for packaging.
- In Class B, only those sections have been covered for packaging which have a daily traffic of more than 6000 PCUs. However, for balance length in Class B, financial analysis has been undertaken for the purpose of estimation of size & funding requirements.
- In Class B packages have been identified so that one package does not cover more than one State Highway.
- In Class B, MDRs have not been considered for identification of packages

1.1.6 Based on above mentioned assumptions 68 packages (covering the length of 6712 km) have been identified for analysis - 55 packages (covering the length of 5950 km) in Class A

and 13 packages (covering the length of 762 km) in Class B. The detailed summary of Packages Identified for further analysis on BOT (Toll) basis is provided in **Annexure C**.

1.1.7 Furthermore, as per the general norms, toll plaza locations in any package are identified where the traffic is highest, subject to general principles relating to distance between any two toll plazas. In view of this fact, after identification of packages, the toll plaza locations have been identified based on following principles:

- Toll plaza has been considered in each package with a minimum distance of 50 km between two toll plazas, with few exceptions.
- Toll plaza locations identified at the point of highest traffic subject to above principle.
- As mentioned above, highest traffic on each Toll Plaza has been considered for the analysis.

1.1.8 It is to be noted that such packaging and identification of Toll Plaza locations is indicative and is only for the purpose of analysis. Actual packaging and identification of locations of toll plazas shall be undertaken after detailed technical and traffic study.

Other inputs and assumptions

1.1.9 The analysis also uses various other inputs and assumptions relating to tollable traffic, per PCU toll rate, debt equity structure, cost of upgradation per km etc. The same have been discussed and described in the report and summary is provided below:

Table: Key Assumptions

Parameter	Value
Concession Period	30 years for BOT (Toll) & 12 years for BOT (Annuity) & Hybrid model
Construction Period	2 Yrs
Traffic	From Scott Wilson report
Tollable Traffic	74% (average percentage for State Highways in Karnataka)
Traffic Leakage	10%
Traffic Growth Rate	5% per yr
Inflation	5%
Toll Rate	Rs. 0.64 per PCU per KM (FY2013) – based on Karnataka Toll Policy and general traffic profile on State Highways
Construction Cost	Rs. 2.5 cr per km (two laning) Rs. 5 cr per km (four laning)
Debt Equity ratio	70: 30 (Debt: Equity)
Cost of Debt & Debt Tenure	13% per annum for 13 yrs
Routine Maintenance	Rs. 1 Lakh per km (FY13) for two lane and Rs. 2 Lakh per km (FY13) for four lane
Periodic Maintenance	Rs. 21 Lakh per km (FY13) for two lane and Rs. 42 Lakh per km (FY13) for four lane
TPC	115% of EPC Cost

Parameter	Value
Depreciation & Taxation	As per current set of rules & policies
Target Equity IRR	Around 15%
VGF	During construction period only
Premium	Escalated by 5% every year

Results and Inferences

1.1.10 From the 15008 km, 6712 km is analysed on BOT (Toll) basis in which 2378 km has been found viable with upto 60% VGF. It is to be noted that while the limit of VGF is generally 40% of TPC, here we have considered viability upto 60% VGF because of following reasons:

- Traffic growth rates have been considered 5%. However, based on traffic studies to be conducted the same can be adjusted and can be expected to be higher
- It is generally seen that bidders apply various financial structures and cost saving / cash flow management mechanisms, which enhance their returns. Thus, the quotes from bidders might be better compared to the general expectation of the Government
- This analysis is on normative basis and after detailed technical and traffic study the situation might change. It is expected that for most of the projects, if detailed and accurate analysis is undertaken after sometime, the traffic would be higher which might increase the viability

1.1.11 The Balance length of 12630 km which is not viable on BOT (Toll) basis could be developed on different mode viz BOT (Annuity), Hybrid Annuity and EPC and the same has been analysed based on mentioned model summary is in given in.

1.1.12 The Total Fund Requirement for the Improvement / Up gradation of whole Core Road Network is calculated assuming that the length covered under National Highway would be developed by NHAI thus the approximate cost of 4491 km is not considered. Average construction cost for 2-laning has been considered as Rs. 2.5 cr. However, the Total Project Cost in case of PPP Projects is higher by about 15% compared to the construction cost owing to cost factors like Interest During Construction, cost of financing, contingency, safety fund etc. Since some part of the road might be developed on BOT (Annuity / Hybrid) mode and some on EPC mode, the average per km cost for improvement / up gradation is considered as INR 2.75 cr, as most of the road upgradation requirement is of two-laning. The cost estimates are given in tables below:

Table: Total Cost for the Up gradation of CRN

Particulars	Length (Km)	Cost (INR Cr.)
National Highways	4491	NA
Already developed or under process	4707	12944 (based on normative assumption)
To be developed	15008	41570
Total	24225	54216

As mentioned in above table the total cost of INR 41,570 Cr is required for the further development

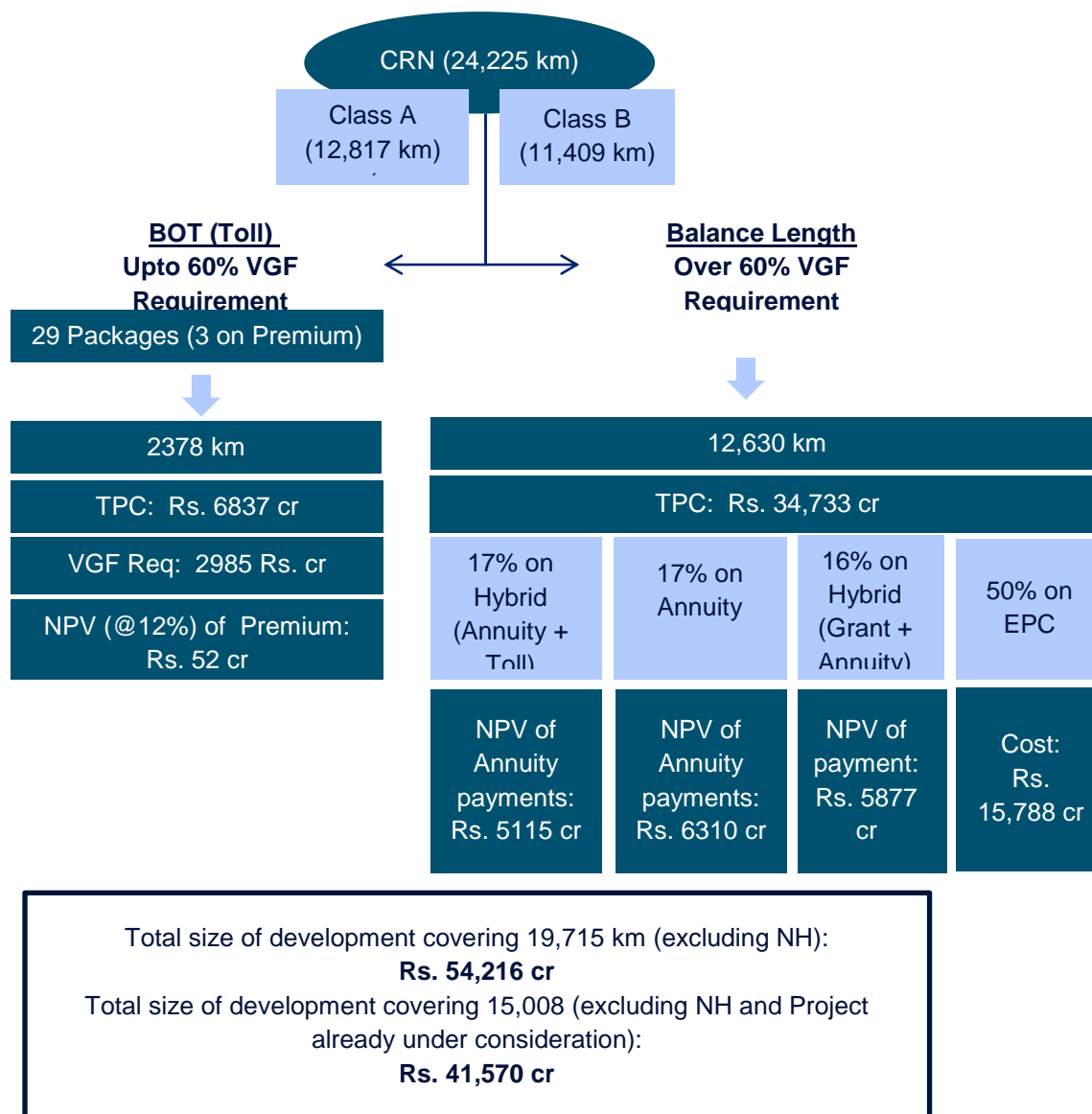
1.1.13 Improvement / up gradation on BOT (Toll) and BOT (Annuity) can be the first priority and can be develop in next three – four years.

1.1.14 We expect that the balance roads which are not viable on BOT (Toll) basis would be developed as mix of BOT (Annuity), Hybrid (Toll + Annuity), Hybrid (Grant + Annuity) and EPC mode. Most of the stretches to be upgraded are for two-laning with only very small portions proposed for four-laning. The length covered under each mode and respective fund requirement is given in table below:

Table: Total Fund requirement

Mode of Development	Grant	Annuity	EPC	Total	NPV @ 12%
Hybrid (Annuity +Toll) 17% of unviable Length (More than 4000 PCUs)		11355		11355	5115
BOT (Annuity) 17% of unviable length	-	14010	-	14010	6310
Hybrid (Grant +Annuity) 16% of unviable length	2905	6598	-	9503	5877
EPC mode 50% of unviable length	-	-	15788	34868	15788
Total	2905	31963	15788	69736	33090

1.1.15 A chart illustrating the same is provided below.



1.1.16 The summary of Net Fund Requirement from Government for Improvement / up gradation of Balance Core Road Network which required improvement / Up gradation is given below:

Table: Summary of Net Fund requirement

Mode of Payment	Value (INR Cr)	NPV @ 12%
Grant	5890	5890
Annuity	31963	14397
EPC	15788	15788
Premium	(284)	(48)
Total	53357	36027

- 1.1.17** As per the summary provided in above table, the expected total fund requirement for development of Balance CRN would be around INR 53360 Cr. over next 30 years i.e. about INR 36,000 Cr. in NPV terms (@12%). Over and above such costs, Government funding would also be required for acquiring land for Right of Way (ROW) and utility shifting for upgradation of roads. Based on discussions with PWD, KRDC and KSHIP officials, it is understood that such land for ROW is already available with Government for many roads.
- 1.1.18** List of 29 projects viable on PPP (Toll) basis is provided in **Annexure F**.

2 Introduction

2.1 Assignment Background

- 2.1.1** M/s Deloitte Touche Tohmatsu India Private Limited (“Deloitte”) has been appointed by the Infrastructure Development Department (“IDD”), Government of Karnataka to carry out consultancy services for “Institutional Strengthening & Sector Specific Inventory for PPP Mainstreaming” for Public Works Department (“PWD”).
- 2.1.2** As part of the assignment, 5 projects have been identified for undertaking pre-feasibility studies. One of the pre-feasibility study is to undertake Financial Analysis of the Core Road network (CRN).
- 2.1.3** This analysis has been undertaken with substantial help from PWD, KRDC and KSHIP.



2.2 Objective of the Assignment

- 2.2.1** The analysis draws up the perspective development & financing plan for up gradation / improvement of road corridors. The plan is expected to identify overall financial requirement for upgradation of the Core Road Network , to a minimum of two-lane standards, after considering projects already being planned for up gradation by KSHIP / KRDC through various modes including funding from World Bank/ADB and those already considered under EPC mode.
- 2.2.2** This analysis is expected to provide overall perspective of CRN in terms of capacity and financial requirements & possible approach for development.

2.3 Sector Overview

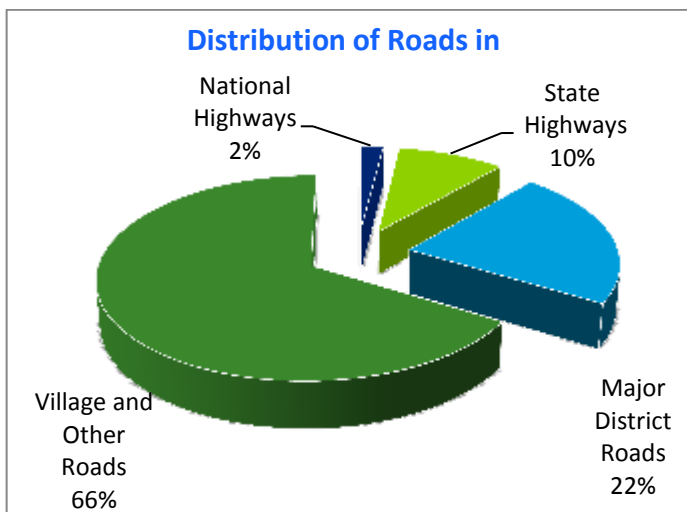
- 2.3.1** Karnataka is well connected to its six neighbouring States and other parts of India through 14 National Highways; it accounts for about 6% of the total NH network in India. It's District Centres and other major towns are linked through 146 State Highways. The category wise summary of Karnataka Road Network is given in table and figure below.

Table: Karnataka Road Statistics

Category	Length (km)
National Highways	4,459
State Highways	20,819
Major District Roads	49,476
Village and Other Roads	147,212
Total	221,966

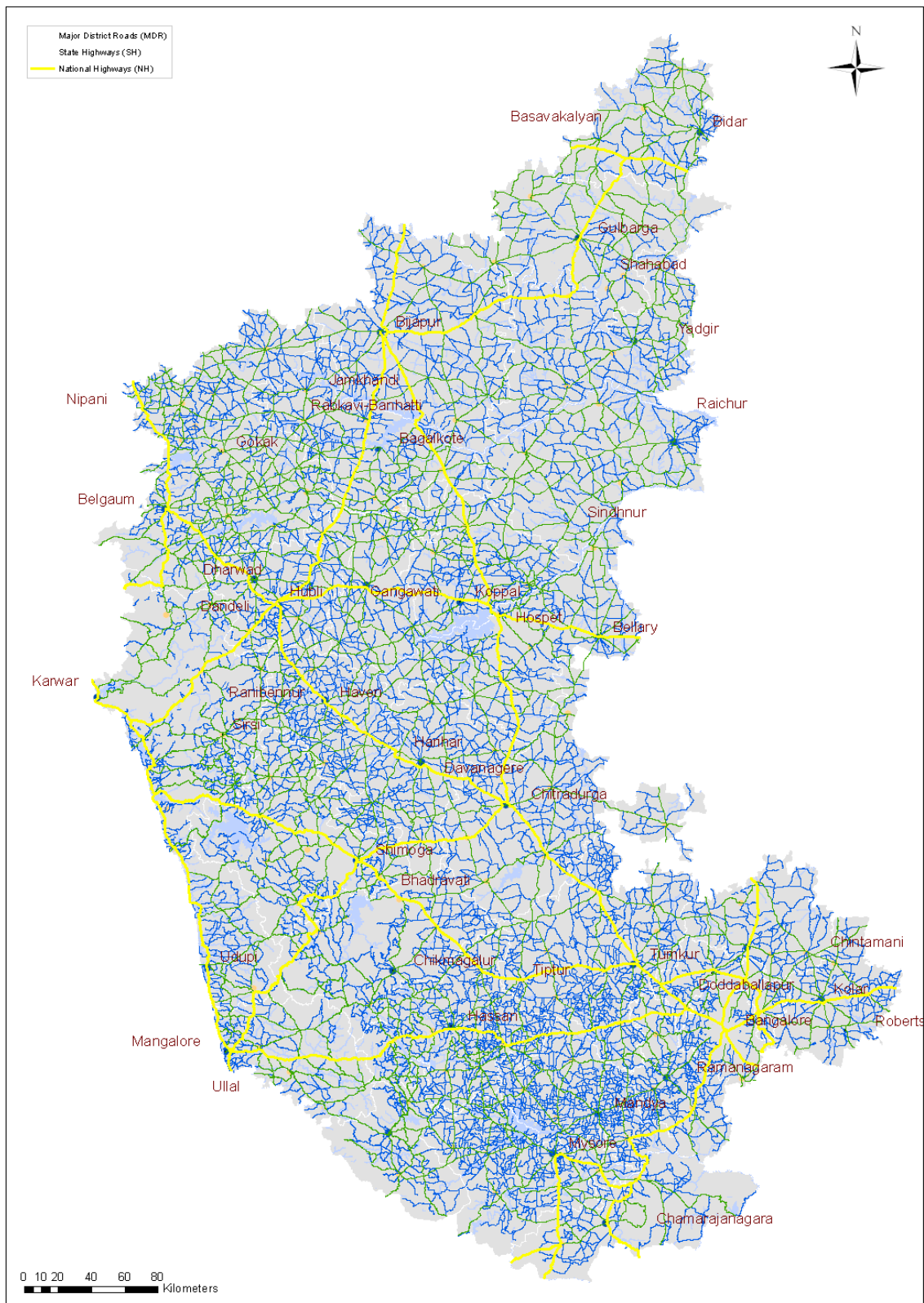
Source: Karnataka State PWD, February 2011

Figure: Percentage Distribution of Road Network in Karnataka



A snapshot of the road network in Karnataka is also provided on next page for reference.

Figure: Karnataka Road Network (NH, SH, MDR)

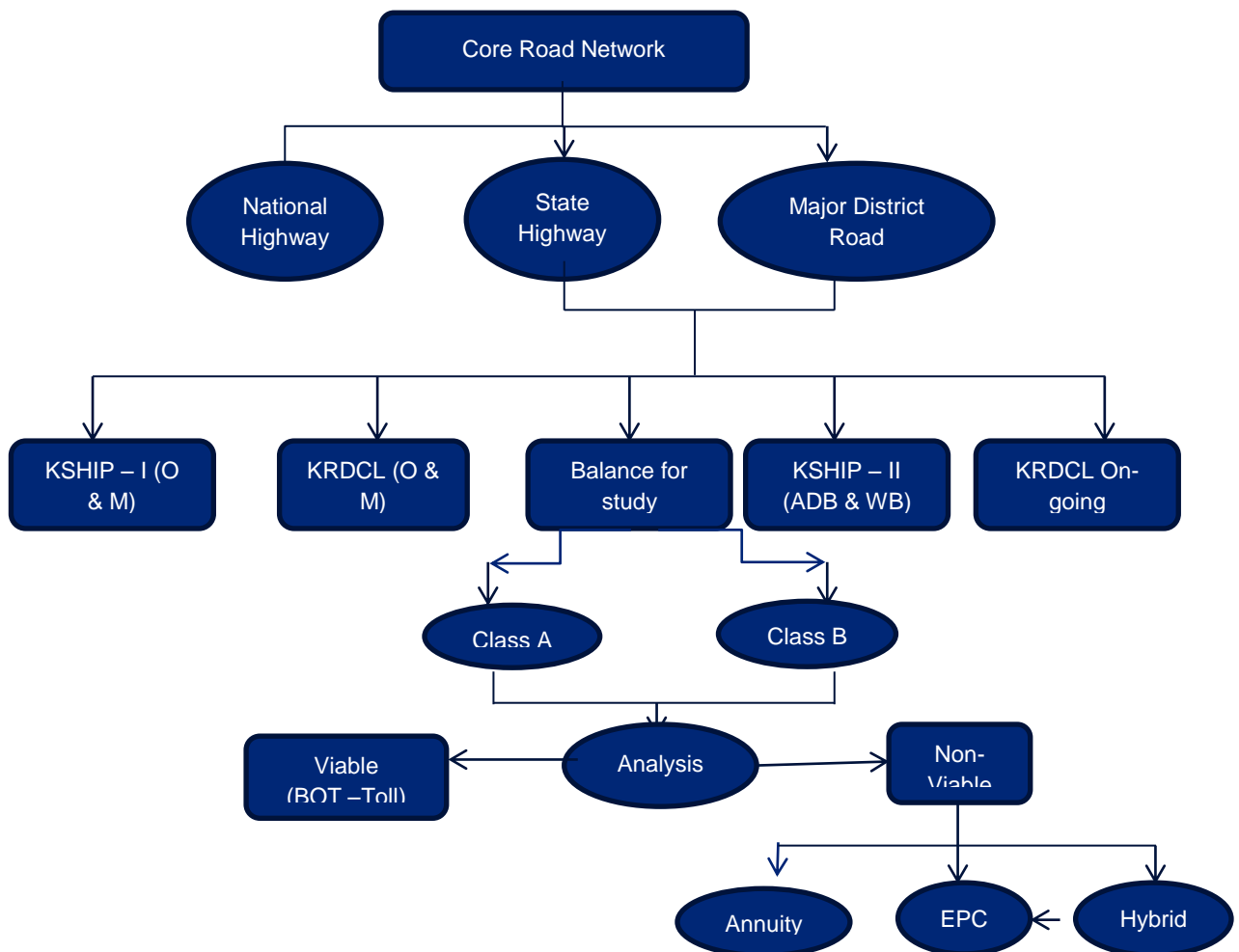


Village Roads are not shown on the above map for purposes of clarity. Source: Scott Wilson Report

3 Approach & Methodology

- 3.1.1 To understand the existing projects as well as the proposed plans, Deloitte had meetings with Principal Secretary PWD, Additional Secretary PWD, MD – KRDC, Chief Engineer – South, Chief Engineer – North, Chief Engineer – KRDC, Project Director – KSHIP & other key department / agency representatives to understand existing projects and proposed plans.
- 3.1.2 Based on the discussions and the key information requirements identified, key data has been provided to us for the assessment carried out in this report. Deloitte perused the Scott Wilson report and based on the further discussion with stakeholders CRN identified by Scott Wilson has been considered for prefeasibility study. Length covered under committed projects, already developed projects and National Highways has been deducted from total CRN and packages of balance CRN have been developed and assessed based on certain assumptions provided in this report.
- 3.1.3 The analysis results have been categorised in different categories based on VGF and fund requirement for improvement / up-gradation have been assessed. The broad methodology is illustrated below.

Figure: Approach for Financial Analysis



4 Toll Policy

4.1 Toll Policy of Karnataka

4.1.1 Government of Karnataka (GoK) notified the rate of Toll to be collected as Toll or User Fee for using a section of SH or MDR to be developed under PPP. Some key highlights of Toll Notification issued by GoK are as under:

- This notification provides the definitions of key terms like “public funded projects” and “private funded projects” etc.
- The Base Year is defined from 1st April 2008 to 31st March, 2009. Category wise Toll Rate is given below in Table

Table: Base Toll Rates

Type of Vehicles	Basic Toll Rate (Rs. Per Km. and per trip) (4 Lanes & above)	Basic Toll Rate (Rs. Per Km. and per trip) (2 Lanes)
Car, Jeep, Van or Light Motor Vehicle	0.65	0.50
Light Commercial Vehicle, Light Goods Vehicles or Mini Bus	1.05	0.75
Bus or Truck	2.20	1.50
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (three to six Axles)	3.45	2.25
Over-sized vehicles (seven or more Axle)	4.20	1.50

- This notification also provides the provisions for yearly revision of Toll Rates which is dependent on the WPI.

The methodology for calculation of Revised Toll Rates is provided below.

Table: Revision of Toll Rate

Basic wholesale Price Index for the year ending 31 st December, 2008 (WPI as on 27-12-2008 is 229.50)	WPI (A)
Wholesale Price Index for the year ended 31 st December, 2009	WPI (B)
Formula for calculation New Toll Rate (w.e.f. 01-03-2010)	Basic Toll Rate X WPI (B) / WPI (A)

Illustration (for Cars):

Toll Rate for Year 2013 (1st April, 2012 to 31st March, 2013) for Car = 0.65 (basic toll rate) X (WPI of year ending on Dec 2012/229.50)

- Daily Passes & Monthly Passes: the exempted Toll Rate is provided below for daily & monthly passes:

Table: Discounts in Toll Rate

Amount Payable	Maximum no. of one way Journeys allowed	Period of validity
One and half times of the fee for one way journeys	Two	Twenty four hours from the time of payment.
Two-third of amount of the fee payable for fifty single journeys	Fifty	One month from date of payment.

- Local Traffic: Local traffic exempted from paying tolls.
- The Toll Fee as well as passes notified under this notification shall be rounded off and levied in multiple of the nearest rupees five.
- Over-loading: Without prejudice to the liability of the driver, owner or a person in charge of a mechanical vehicle, which is loaded in excess of the permissible load specified category under this notification, shall be liable to pay fee at such rate which is applicable for the next higher category of mechanical vehicles.
- The notification also lists down the vehicles that are exempted from paying the Tolls.

4.2 Comparison with other Toll Policies

4.2.1 Karnataka Toll Notification is slightly different than other states and National Highways Toll Notification. We have compared the key aspects of the Karnataka toll policy with the National Highways toll policy as well as the toll policy for Andhra Pradesh, Orissa and Rajasthan. The summary of comparison of key provisions is provided in table below:

Table: Comparison of Karnataka Toll Notification

Sl	Aspect	Toll Notification as published by Karnataka Public Works, Ports & Inland Water Transport Secretariat	New Toll Policy as applicable for National Highways	Toll Policy as approved by Government of Andhra Pradesh for SH	Toll Policy as approved by Government of Orissa for SH	Toll Policy as approved by Government of Rajasthan for SH
1	Different Base Rate of Fee depending on lanes.	Different rates are specified for 4-lane and above and 2-lane roads.	Different rates are specified for 4-lane and above and 2-lane roads.	Rates are only mentioned for 4-lane roads.	Different rates are specified for Single lane, Intermediate lane, 2-lane and 4-lane roads.	For two lanes or more lanes the toll rates will be same.
2	Different treatments for structures e.g. bridge, Tunnel etc.	No such different treatments is prescribed for structures e.g. bridges, tunnel etc.	The toll rates for structures (only if the cost is more than INR 50 crores) are different from rest of the project highway, but will be levied together with the rest of the project highway at the same toll plaza.	No such different treatments is prescribed for structures e.g. bridges, tunnel and etc.	The toll rates for structures (only if the cost is more than INR 10 crores) are different from rest of the project highway, but will be levied together with the rest of the project highway at the same toll plaza.	The toll rates for structures including bypass (only if the cost is more than INR 5 crores) are different from rest of the project highway, but will be levied together with the rest of the project highway at the same toll plaza.
3	Different treatments for bypasses.	No such different treatment is prescribed for bypass.	The toll rates for bypasses (only if the cost is more than INR 10 crores) are different from rest of the project highway, but will be	No such different treatment is prescribed for bypass.	The toll rates for bypasses are different from rest of the project highway, but will be levied together with the	Same as structure toll rate

SI	Aspect	Toll Notification as published by Karnataka Public Works, Ports & Inland Water Transport Secretariat	New Toll Policy as applicable for National Highways	Toll Policy as approved by Government of Andhra Pradesh for SH	Toll Policy as approved by Government of Orissa for SH	Toll Policy as approved by Government of Rajasthan for SH
			levied together with the rest of the project highway at the same toll plaza.		rest of the project highway at the same toll plaza.	
4	Annual Revision Date	Annual revision of rate of fee under this rule shall be effective from 1 st April every year.	Annual revision of rate of fee under this rule shall be effective from 1 st April every year.	Base rate is fixed as on the date of start of tolling. The revision of toll rates shall be done on the very same date every 2 year INR	Annual revision of rate of fee under this rule shall be effective from 1 st April every year.	Annual revision of rate of fee under this rule shall be effective from 1 st April every year.
5	Methodology for annual revision of Toll Rates	<p>The calculation of Revised Toll Rates is provided below.</p> <p>Toll Rate for year B = $\text{[Basic Toll Rate} \times \frac{\text{WPI-B}}{\text{WPI-A}}]$ WPI-A = WPI of the year ending on 31st Dec, 08 i.e. on 27th Dec, 08 and equal to 229.50 WPI-B = WPI of the year ending on 31st Dec of the preceding year. Basic Toll Rates are as mentioned in the</p>	<p>The calculation of Revised Toll Rates is provided below.</p> <p>Toll Rate for year B = $\text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI B}-\text{WPI A}}{\text{WPI A}} \right\} \times 0.4$ <p>The rates specified for Base Year shall be increased without compounding, by three per cent. each year with effect from the 1st day of April, 2008 and such increased rate shall be deemed to be the base rate for the subsequent years.</p> </p>	<p>The calculation of Revised Toll Rates is provided below.</p> <p>Toll Rate for year B = $\text{[Basic Toll Rate} \times \frac{\text{WPI-B}}{\text{WPI-A}}]$ WPI-A = WPI at the time of fixing the base toll rate. WPI-B = WPI at the time of revision. Basic Toll Rates are fixed at the time of start of tolling.</p>	<p>The calculation of Revised Toll Rates is provided below.</p> <p>Toll Rate for year B = $\text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI B}-\text{WPI A}}{\text{WPI A}} \right\} \times 0.4$ <p>The rates specified for Base Year shall be increased without compounding, by three per cent. each year with effect from the 1st day of April, 2011 and such increased rate shall be deemed to be the base rate for the subsequent</p> </p>	<p>The calculation of Revised Toll Rates is provided below.</p> <p>Toll Rate for year B = $\text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI B}-\text{WPI A}}{\text{WPI A}} \right\} \times 0.4$ <p>The rates specified for Base Year shall be increased without compounding, by three per cent. each year with effect from the 1st day of April, 2011 and such increased rate shall be deemed to be the base rate for the</p> </p>

SI	Aspect	Toll Notification as published by Karnataka Public Works, Ports & Inland Water Transport Secretariat	New Toll Policy as applicable for National Highways	Toll Policy as approved by Government of Andhra Pradesh for SH	Toll Policy as approved by Government of Orissa for SH	Toll Policy as approved by Government of Rajasthan for SH
		notification.	<p>WPI-A = WPI of the week ending on 1st week of Jan 2007 i.e. on 7th Jan, 07 and equal to 208.70</p> <p>WPI-B = WPI of the week ending on 1st week of that year i.e. on 1st week of Jan.</p>		<p>years.</p> <p>WPI-A = WPI of the week ending on 1st week of Jan 2010</p> <p>WPI-B = WPI of the week ending on 1st week of that year.</p>	<p>subsequent years.</p> <p>WPI-A = WPI of the week ending on 1st week of Jan 2010</p> <p>WPI-B = WPI of the week ending on 1st week of that year.</p>
6	Rounding-off of the Toll Rates	The fee as well as passes notified by this notification shall be rounded off and levied in multiple of the nearest rupees five.	The fee as well as passes notified by this notification shall be rounded off and levied in multiple of the nearest rupees five.	The fee notified by this notification shall be rounded off and levied in multiple of the nearest rupees one. The fee for passes will be rounded off to the nearest rupees five.	The fee notified by this notification shall be rounded off and levied in multiple of the nearest rupees one.	The fee as well as passes notified by this notification shall be rounded off and levied in multiple of the nearest rupees five.
7	Levying fees for Local Users	Local non-commercial users are exempted.	A monthly pass of INR. 150/- for the Base Year will be levied to the local non-commercial users as defined in the RFP. This fee will be revised annually and rounded off to the nearest 5 rupees as per the provision provided in the fee	Car/Jeep/Van (non-commercial) are exempted. Car/Jeep/Van (commercial): INR150/- per month for 0 to 20 Km from fee collection booth.	A monthly pass will be levied to local users.	Local non-commercial users are allowed to use monthly passes.

SI	Aspect	Toll Notification as published by Karnataka Public Works, Ports & Inland Water Transport Secretariat	New Toll Policy as applicable for National Highways	Toll Policy as approved by Government of Andhra Pradesh for SH	Toll Policy as approved by Government of Orissa for SH	Toll Policy as approved by Government of Rajasthan for SH
			notification.	Trucks: INR 25/- per crossing for 0 to 20 Km from fee collection booth.		
8	Exempted vehicles	Tractor trailers carrying agricultural produce are exempted from the toll payment. School buses are not exempted from paying toll.	Tractor trailers carrying agricultural produce are exempted from the toll payment. School buses are not exempted from paying toll.	Tractor trailers carrying agricultural produce are exempted from the toll payment. However a vehicle for agricultural produce being used by a trader will be levied toll. School buses are exempted from paying toll.	Two wheelers, Three Wheelers, Bus and Mini Bus are exempted.	Two wheelers, Tractor without trailers and tractor with trolley carrying agricultural produce are exempted from the toll payment.
9	Rate of fee for overloading	Without prejudice to the liability of the driver, owner or a person in charge of a mechanical vehicle, which is loaded in excess of the permissible load specified category under this notification, shall be liable to pay fee at such rate which is applicable for the	Without prejudice to the liability of the driver, owner or a person in charge of a mechanical vehicle, which is loaded in excess of the permissible load specified category under this notification, shall be liable to pay fee at such rate which is applicable for the next higher category of mechanical vehicles.	Without prejudice to the liability incurred under the Applicable Laws by any person driving a vehicle that is loaded in excess of the permissible limit set forth in such laws, the Concessionaire may, in its discretion, recover an additional fee. The Additional Fee shall not	Without prejudice to the liability of the driver, owner or a person in charge of a mechanical vehicle, which is loaded in excess of the permissible load specified category under this notification, shall be liable to pay fee at such rate which is applicable for the next higher category of	Without prejudice to the liability of the driver, owner or a person in charge of a mechanical vehicle, which is loaded in excess of the permissible load specified category under this notification, shall be liable to pay fee at such rate which is applicable for the

SI	Aspect	Toll Notification as published by Karnataka Public Works, Ports & Inland Water Transport Secretariat	New Toll Policy as applicable for National Highways	Toll Policy as approved by Government of Andhra Pradesh for SH	Toll Policy as approved by Government of Orissa for SH	Toll Policy as approved by Government of Rajasthan for SH
		next higher category of mechanical vehicles.		<p>exceed:</p> <p>(a) 50% (fifty per cent) of the Fee if the overloading of such vehicle exceeds 10% (ten per cent) of the permissible load but is not greater than 20% (twenty per cent) thereof; and</p> <p>(b) 100% (one hundred per cent) of the Fee if such overloading exceeds 20% (twenty per cent) of the permissible load:</p> <p>The above penalties would be in addition to the penal action under the applicable laws.</p>	mechanical vehicles.	next higher category of mechanical vehicles.

4.3 Key Observations on Comparison of Toll Policies

4.3.1 As mentioned in the above table, we have undertaken a comparison of five different Toll Policies of Road & Highways sector including the Toll Policy of Karnataka and NHAI. After the comparison, we have some observation related to Karnataka Toll Policy and some of important observations are as under:

- **Fee revision:** As per the notification, the user fee is revised on 1st April of every year. The fee revision is dependent on WPI of the last week of the preceding year. This provision makes the toll revision totally dependent on the movements of WPI which means the revenue realized by the Concessionaire is completely exposed to the WPI risk and hence increases the total risk perception of the project to the Concessionaire. The Toll Notification for National Highways in India includes a fixed component 3% annual revision and 40% of change in WPI.
- **Defining Local Traffic:** The Notification does not provide the definition of Local Traffic and it refers to the Concession Agreement for the same. GoK may decide to include the definition of the same to make the clauses more clear.
- **Toll Fee for Local Traffic:** The Notification exempts Local Traffic from using Toll Fee. However; GoK may decide to include provisions for Local Passenger Traffic to pay tolls and the rates for the same.
- **Location of Toll Plaza:** The notification does not provide any restrictions or any provisions on location of Toll Plaza (it refers to the MCA on the same). However; GoK may restrict locating the Toll Plaza within 10 kilometers of urban limits on similar lines to the Toll Notification used for Tolling on National Highways.
- **Structures:** The Toll Notification published by GoI for tolling on NHs has the provisions of differential toll rates for structures with costs more than a threshold amount compared to roads. The provisions also define the structures to avoid any doubts. This differential toll rates makes the project more viable as it boosts the revenue realized by the Concessionaire. However, while making provisions for the same, willingness of the users to pay the higher charges has to be taken into consideration.
- **Bypasses:** The Toll Notification published by GoI for tolling on NHs has the provisions of differential (i.e. 1.5 times of normal Highways) toll rates for bypasses with cost more than Rs. 10 Cr. This differential toll rates makes the project more viable as it boosts the revenue realized by the Concessionaire. However, while making provisions for the same, willingness of the users to pay the higher charges has to be taken into consideration.

5 Identified Core Road network (CRN)

5.1.1 As a part of the strategy formulated in the year 1999-2000, KPWD, undertook the World Bank-financed road project, the Karnataka State Highways Improvement Project (KSHIP- I; Loan: US\$360 million) through which about 2,413 Km of SHs was improved. With the intention of developing further lengths of the SHs, the State Government mooted a Second Karnataka State Highway Improvement Project (KSHIP-II) to cover 3,411 Km of SHs at an estimated cost of Rs. 6,246 Crore (US\$ 1.6 billion, approx.). In 2009, PWC was appointed under a World Bank funded study for identifying Strategic Road Network (SRN). In the end of 2009, Scott Wilson with ADB-TA was roped in to prepare a Detailed Master Plan identifying the core road network (CRN) for the State based on detailed technical analysis of road network in terms of weighted scoring against the parameters i.e. traffic, connectivity, other transport Infrastructure, Industrial Parks and Development Corridors, Mining, Tourism and Agricultural Centres.

5.1.2 In its analysis, Scott Wilson has used some weightage parameters of District and Talukas which reflects the importance and the usage of the network. Weightage and score given by Scott Wilson for each factor are provided below:

Table: Criteria for CRN Identification

Sl. No.	Connectivity Parameter	Sub-Component		Score for Sub-Component	Weight for Parameter
		(i)	(ii)		
A. CONNECTIVITY					
1	Population	Urban Centers	Metro Cities	20	12%
			Cities	15	
			Towns	10	
			Most / More Backward Taluks	5	
		Administrative Centers	State capital	20	
			District capital	15	
			Taluk capital	10	
			Military Operational Areas	5	
2	Transport	Connectivity to NH		20	15%
		Connectivity to SH		15	
		Connectivity to Inter State Roads		15	
		Connectivity to Sea Ports		20	
		Connectivity to Airports		10	

Sl. No.	Connectivity Parameter	Sub-Component		Score for Sub-Component	Weight for Parameter
		(i)	(ii)		
		Connectivity to Rail Hubs / Major stations		15	
		Connectivity to Toll Roads		5	
3	Industrial	Industrial Areas/Micro & Small Enterprise		40	12%
		SEZs (Operational Notified, or Planned)		35	
		Suvarna Karnataka Industrial Corridors		25	
4	Mining	Major locations		70	3%
		Minor Locations		30	
5	Tourism	Most Important Locations		50	12%
		More Important Locations		30	
		Important Locations		20	
6	Agriculture	Belgaum, Bagalkote, Davanagere, Mandya, Mysore Districts	Based on the Annual Productivity of major agricultural commodities (Tonnes /Sq m) (includes only paddy, cereals, pulses, grains, oil seeds, cotton, sugarcane, fruits & vegetables, nuts and spices.)	45	6%
		Bellary, Bidar, Haveri, Hassan, Shimoga		25	
		Raichur, Dharwad, Udipi, Koppal, Bangalore (R), Bijapur, Chamrajnagar, Dakshin Kannada		20	
		All Other Districts		10	
B. TRAFFIC VOLUME					
7	Traffic Volume (PCU - 2010)	<= 1,000		10	40%
		1001 – 2000		20	
		2001 – 4000		30	
		4001 – 6000		40	
		6001 – 8000		50	
		8001 – 10000		60	
		10001 – 15000		70	
		15001 – 20000		80	

Sl. No.	Connectivity Parameter	Sub-Component		Score for Sub-Component	Weight for Parameter
		(i)	(ii)		
		20001 – 30000		90	
		> 30000		100	
			Total		100%

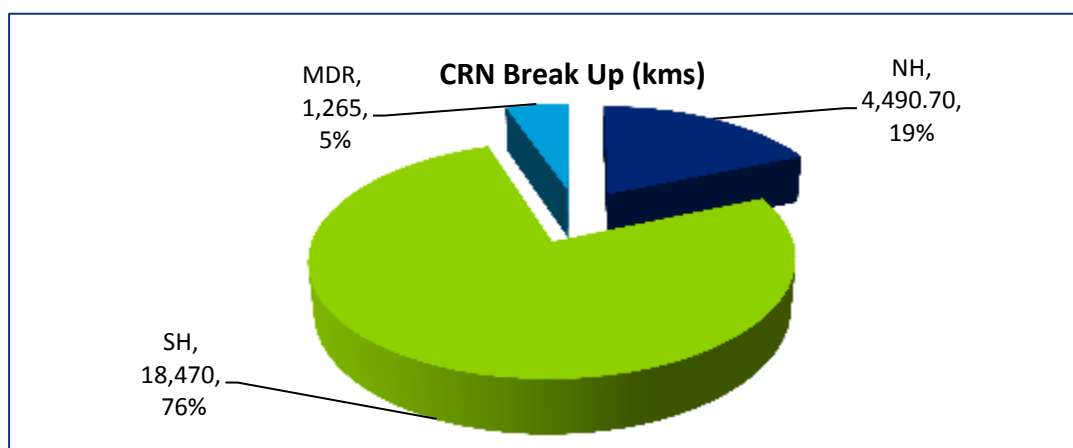
Source: Scott Wilson Report

5.1.3 Based on the above mentioned scoring criteria, Scott Wilson has identified 24,225.6 km under CRN. Further, based on the scoring and connectivity of Taluk headquarters they have classified CRN in two classes (A & B) to prioritise the investment. Class “A” road is classified considering to ensure connectivity to taluka headquarters throughout Karnataka and balance CRN has classified under Class ‘B’. In this regard the final report was submitted on February 2012. A copy of this report has been provided to us by KSHIP and the same has been used as the base for undertaking the financial analysis, as explained in this report. The CRN also includes the KSHIP – I, KSHIP – II and KRDCCL projects. The summary of CRN, as identified by Scott Wilson, is given –in table and figure provided below.

Table: Core Road Network

Administrative Class	Corridor Length (km)		Total (km)
	A	B	
NH	3,738.4	752.3	4,490.7
SH	9,001.6	9,468.3	18,469.9
MDR	76.6	1,188.5	1,265.0
Total	12,816.55	11,409.05	24,225.6

Figure: CRN Break up



- 5.1.4** A map of Karnataka Core Road Network (CRN) is provided in Annexure A for reference.
- 5.1.5** Based on the above mentioned composition the Scott Wilson has classified Class A CRN into 28 corridors which includes 13 North–South and 15 East–West corridors. Details of the same along with the 1.1.1CRN proposed under Class B has been provided in **Annexure B**.
- 5.1.6** An overview of the approach followed by Scott Wilson for identification of CRN and its classifications is provided below for reference, as extracted from copy of Scott Wilson report provided by KSHIP.

Source: Copy of Scott Wilson Report on Identification of CRN provided by KSHIP

Threshold for Inclusion of Roads in CRN

All roads considered as candidates for inclusion in CRN satisfied one or more of the CRN criteria. A threshold point had to be established to ensure that the CRN was sustainable in terms of maintenance. This threshold point was established based on presumed routine maintenance (non-Plan) budget availability.

It is estimated that the total regular maintenance budget available to PWD for 2011-12 will be Rs. 6,700 million. The CRN should be given a higher maintenance priority as it carries the bulk of the road traffic. Accordingly, about 50% of that total available budget has been earmarked for the CRN, although the CRN only constitutes around 27% of the total PWD network.

Also it is estimated that only 16,535 km length of CRN needs to be attended to for regular maintenance with the assumptions that about 2,000 km length of CRN will be earmarked for PPP with tolling, and another 1,200 km length will be taken up for periodic maintenance.

PWD has also indicated a 20% increase to maintenance budgets for future years.

It was calculated that a CRN network of 16,534 kilometers is supportable; this represented a threshold CRN score of 36.5 for inclusion of candidate roads. Thus, all candidate links that scored over 36.5 according to the criteria, were included in the initial CRN. This results in a total CRN of 24,225.6 km.

Classification of CRN into Class A and Class B

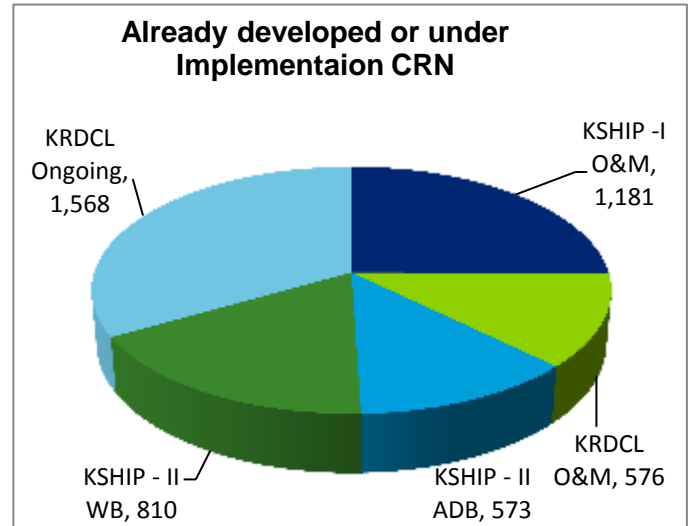
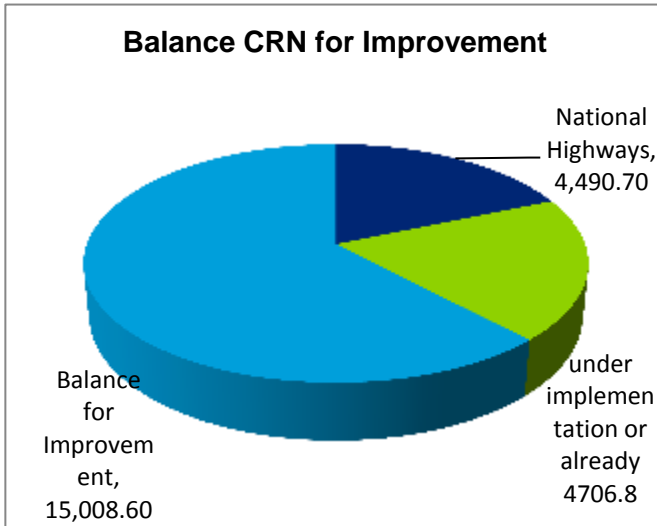
The classification was based on the CRN scores for each link, which included objective analysis of socio-economic data – population, income, agriculture, industry, tourism, development indicators for taluks etc. Also, because traffic is included in the CRN criteria, the CRN scores reflect actual patterns of usage by road users. These “A-Class” roads naturally form major corridors for traffic in the state, and only minor adjustments had to be made in order to achieve continuity. These have been assigned unique numbers as described in the main Report. A threshold score of 65 was used to establish these “A-class” roads or corridors in the CRN, with all other CRN roads being designated as “B-Class”.

6 Committed Projects

- 6.1.1** This section describes various projects which are either developed or are being planned to be developed by KSHIP and KRDCCL. As per our discussions with PWD, such projects have not been considered for this financial analysis.
- 6.1.2** The details of projects which are either developed or are being planned to be developed by KSHIP and KRDCCL are provided in **Annexure C**. After deducting all those projects which are under implementation under KSHIP - II or KRDCCL and those which are identified for O&M in Scott Wilson report we have finalized the Balance CRN for study. A category wise detail summary of those sections against each link ID of CRN is providing in **Annexure B**.
- 6.1.3** Projects which have been identified for O&M in Scott Wilson report include those which are either developed under KSHIP – I and those developed by KRDCCL. We understand that for the O&M projects KRDCCL would be the implementing agency.
- 6.1.4** Similarly, since National Highways are managed by NHAI, the same have not been considered for this analysis. The table and charts provided below provides summary of such identification of balance CRN for analysis.

Table: Core Road Network considered for Analysis

Administrative Class	Corridor Length (km)		Total (km)
	A	B	
A: Total	12,816.55	11,409.05	24,225.6
B: NH	3,738.4	771.5	4,490.7
C: Total length under implementation or already developed (as below)	3128.2	1578.6	4706.8
Identified for O&M (a+b)	1666.1	90.5	1756.6
O&M (developed under KSHIP – I) (a)	1142.8	37.7	1180.5
O&M (developed under KRDCCL) (b)	523.3	52.8	576.1
KSHIP - II ADB	143.2	429.9	573.1
KSHIP - II WB	709.3	100.3	809.6
KRDCCL Ongoing	609.6	957.9	1567.5
Balance (A-B-C)	5,949.95	9,058.92	15,008.6



6.1.5 Some portion of committed projects might not be forming part of CRN and such portions could not be identified in the CRN links. In case there are some smaller projects being developed on EPC basis by PWD and such stretches form part of CRN then the same may be considered for further upgradation as part of PPP packages. If such small stretches form part of packages which are viable, in this regards we assume that some portion would not be the part of CRN and balance which are the part of CRN can be treated as sweeteners of that project on PPP (Toll) basis, and these stretches do not require further upgradation, then these can enhance viability of the PPP packages further, as is the practice followed by NHAI.

7 Inputs & Assumptions

7.1 Methodology for calculation of Tollable Traffic

7.1.1 The base traffic for this analysis has been taken from Scott Wilson report. The State Highways wise traffic detail is provided for year 2010 in Scott Wilson report. However, as per the Toll Policy of Karnataka, certain categories of vehicles are not required to pay toll and thus they do not form part of the tollable traffic. The Scott Wilson report provides traffic details for each link id in PCUs and separate counts for each vehicle category are not provided. In view of this, using the PWD traffic data for 2010 for all State Highways, we have calculated average tollable traffic as percentage of total traffic. Such average percentage has been used for financial analysis of CRN. It may be noted that for each package the traffic profile would be different, which can be ascertained only after a detailed traffic study.

7.1.2 The table below provides the calculation used for estimation of tollable traffic in total traffic. Based on the data provided by KPWD, 153 State Highways traffic has been considered for the purpose of per PCU toll rate calculation which is covering the length of almost 21650 km.

Table: Average Tollable Traffic Calculation

Category	Tollable Traffic on all State Highways in Karnataka									Non Tollable Traffic on all State Highways in Karnataka							Total	
	Car & Jeeps	Vans & Tempos	Mini Buses	Buses	LCV	2 Axle Rigid	3 Axle Rigid	Multi Axle	Tractors with Trailors	Two Wheelers	Auto Rikshaw	Pedal Cycle	Cycle Rickshaw	Horse Drawn	wooden wheel	Rubber Tyre	Total Tollable Traffic	Total Traffic
PCU Factor	1	1	1.5	3	1.5	3	3	4.5	4.5	0.5	1	0.5	2	4	8	6		
Traffic (No.)	751105	274994	106566	231938	236888	498077	264269	100711	276339	1473977	479803	399012	10596	4779	47702	49541	2740887	5206297
Traffic (PCU)	751105	274994	159849	695814	355332	1494231	792807	453200	1243526	736989	479803	199506	21192	19116	381616	297246	6220857 (A)	8356325 (B)
Average % of Tollable Traffic																	A/B = 74%	

Source of Traffic: PWD

7.2 Methodology for Calculation of Per PCU Toll Rate

7.2.1 The Toll Policy of Karnataka provides per km toll rates for each category of vehicle. However, since we are using traffic in PCU terms, an equivalent per PCU per km toll rate has been calculated for financial analysis. Such per PCU per km toll rate would vary based on composition of traffic on a particular stretch and such composition can be ascertained only after a detailed traffic study. In view of this, the per PCU per km toll rate is calculated based on the category wise break up of traffic data for year 2010 of all State Highways in the state of Karnataka. Based on the data provided by KPWD, 153 State Highways traffic has been considered for the purpose of per PCU toll rate calculation which is covering the length of almost 21650 km.

7.2.2 As mentioned above, for the purpose of per PCU toll rate calculation, traffic figures for all the State Highways in Karnataka, as provided by PWD, have been considered. Out of this total traffic the categories of vehicles which can be tolled as per the Karnataka toll act have been identified and based on the toll rate provided in Karnataka Toll Policy for 1st April, 2008 to 31st March, 2009, the total toll revenue has been calculated and per PCU toll rate has been worked out.

Table: Per PCU Toll Rate Calculation

Category	Car & Jeeps	Vans & Tempos	Mini Buses	Buses	LCV	2 Axle Rigid	3 Axle Rigid	Multi Axle	Tractors with Trailors	Total
Traffic	751105	274994	106566	231938	236888	498077	264269	100711	276339	2740887
PCU Factor	1	1	1.5	3	1.5	3	3	4.5	4.5	-
Toll Rate	0.5	0.5	0.75	1.5	0.75	1.5	2.25	3	2.25	-
Total PCU	751105	274994	159849	695814	355332	1494231	792807	453199.5	1243526	6220857 (A)
Total Revenue	375553	137497	79924.5	347907	177666	747116	594605.3	302133	621762.8	3384163.5 (B)
Per PCU Toll Rate (B / A)	INR 0.544 (1 st April, 2008 to 31 st March, 2009)									

Source of Traffic: PWD

7.3 General Assumptions for Financial Model

7.3.1 Various other key assumptions have been considered for financial analysis of CRN. These assumptions pertain to cost estimates, financial structuring & associated costs, construction and concession periods, macro-economic indicators, target returns etc, and have been arrived at based on prevailing economic condition, market scenario and industry norms. Key assumptions have been described in table provided below.

Table: Key Assumptions for Financial Analysis

Parameter	Value
Concession Period	30 yrs for BOT (Toll) & 12 years for BOT (Annuity) & Hybrid model
Construction Period	2 Yrs
Traffic	Weighted Average for each Corridor (as per Scott Wilson report)
Tollable Traffic	74%
Traffic Leakage	10%
Traffic Growth Rate	5% per year
Inflation/ Change in WPI	5% per year (change in WPI per year)
Toll Rate	Rs. 0.64 per PCU per KM (FY2013)
Construction Cost	Rs. 2.5 cr per km (two laning) Rs. 5 cr per km (four laning)
Debt Equity ratio	70: 30 (Debt: Equity)
Cost of Debt & Debt Tenure	13% for 13 yrs
Routine Maintenance	Rs. 1 Lakh per km (FY13) for two lane and Rs. 2 Lakh per km (FY13) for four lane
Periodic Maintenance	Rs. 21 Lakh per km (FY13) for two lane and Rs. 42 Lakh per km (FY13) for four lane (every five years)
TPC	115% of EPC Cost
Depreciation & Taxation	As per current set of rules & policies
Target Equity IRR	Around 15%
Premium	Escalated by 5% every year

8 Analysis of Class A Corridors

8.1.1 As mentioned in the earlier portion of this report, Scott Wilson has done the packaging of Class A into 28 corridors which includes 13 North–South and 15 East–West corridors. For the purpose of this analysis, all section which are under implementation or are already developed by different agency are removed from the respective corridors. The details of the same are provided in **Annexure B**. As a result of the same 25 corridors remain which can be considered for analysis. The Financial analysis summary of those 25 corridors based on the assumptions provided in Chapter 7 is given in table below:

Table: Financial Analysis of CRN Network Class A

Corridor Name	Balance Length	VGF Requirement
CNS1	212.1	More than 80%
CEW2	107	More than 80%
CNS3	185	60% - 80%
CEW4	210.4	More than 80%
CNS5	484.4	More than 80%
CEW6	105	More than 80%
CNS7	449.3	More than 80%
CEW8	-	-
CNS9	501.9	More than 80%
CEW10	225.4	60% - 80%
CNS11	-	-
CEW12	27.2	More than 80%
CNS13	417.6	More than 80%
CEW14	211.2	60% - 80%
CNS15	375.9	60% - 80%
CEW16	407.4	60% - 80%
CNS17	138	More than 80%
CEW18	325.9	More than 80%
CNS19	390	More than 80%
CEW20	-	-
CNS21	89.3	60% - 80%
CEW22	357	60% - 80%
CNS23	37.4	40% - 60%
CEW24	36.2	60% - 80%

CNS25	24.8	20% - 40%
CEW26	43.5	More than 80%
CEW28	320.2	60% - 80%
CEW30	131.9	More than 80%
Grand Total	5950	

8.1.2 Above results are summarised in table below. The results are categories into different categories of VGF requirement and it is evident that only 2 corridors out of 25 are found to be viable on PPP (toll) basis with requirement of less than 40% VGF.

Table: Summary of CRN Network Class A Analysis

VGF Range	No. of Corridors	Length Covered (km)
20% - 40%	1	24.8
40% - 60%	1	37.4
60% - 80%	9	2019.3
More than 80%	14	3931.70
Total	25	5950

8.1.3 In above analysis, full corridors from Class A have been considered for analysis. However, various stretches in such corridors might show varying results with respect to the viability assessment result of their parent corridor. Thus, it is imperative that packages of suitable lengths are identified in the CRN and then analysis is undertaken for such packages.

9 Project Packaging

9.1 Packaging of Balance CRN

- 9.1.1** It is to be noted that the length covered under each corridor is quite large and thus there is possibility that some stretches in the corridors might show different pattern in viability once the packages / projects are identified and analysed on standalone basis. Also, such large lengths are not practical for awarding as single project and thus have to be packaged as projects of suitable lengths. While, packaging of projects requires detailed technical study, for the purpose of this analysis packages have been identified based on principles provided below:
- In general, with few exception, the length of each package has been considered between 100 – 150 Km.
 - All corridors for Class A are considered for packaging.
 - In Class B, only those sections have been covered for packaging which has more than 6000 PCU. Since, broadly only those projects are viable (up to 60% grant) on PPP (toll) which are having 6000 or more PCUs
 - In Class B packages have been identified so that one package does not cover more than one State Highway.
 - In Class B, MDRs have not been considered in the packaging for the purpose of analysis on BOT (Toll) basis.
- 9.1.2** Based on above mentioned assumption 68 packages (covering the length of 6712 km) are identified for further analysis, 55 packages (covering the length of 5950 km) in class A and 13 packages (covering the length of 762 km) in class B. The detailed summary of Packages Identified for further analysis on BOT (Toll) basis is provided in **Annexure D**.
- 9.1.3** Furthermore, as per the general norms, toll plaza locations in any package are identified where the traffic is highest, subject to general principles relating to distance between any two toll plazas. In view of this fact, after identification of packages, the toll plaza locations have been identified based on following principles:
- Toll plaza has been considered in each package with a minimum distance of 50 km between two toll plazas, with few exceptions.
 - Toll plaza locations identified at the point of highest traffic subject to above principle.
 - As mentioned above, highest traffic on each Toll Plaza has been considered for the analysis.
- 9.1.4** It is to be noted that such packaging and identification of Toll Plaza locations is indicative and is only for the purpose of analysis. Actual packaging and identification of locations of toll plazas shall be undertaken after detailed technical and traffic study.

10 Financial Feasibility Analysis on BOT (Toll) Basis

10.1 Results of the Analysis

10.1.1 The Financial analysis of all packages which are identified for the analysis on BOT (Toll) basis considering the assumption provided in chapter 7 of this report. Each package wise result is given in table below the detailed summary of the analysis is provided in **Annexure E**:

Table: Results of Financial Analysis of Packages

(Note: Package names starting with "P" indicate package from Class A and the names starting with "B" indicate package from Class B)

Packages	Length	Results
P1	109.5	More than 60%
P2	102.6	More than 60%
P3	107	More than 60%
P4	89.7	More than 60%
P5	95.3	50% - 60%
P6	104	More than 60%
P7	42.9	More than 60%
P8	63.5	More than 60%
P9	136.1	More than 60%
P10	105.9	50% - 60%
P11	54.1	More than 60%
P12	56	20% - 40%
P13	76.7	50% - 60%
P14	96.6	More than 60%
P15	109.2	20% - 40%
P16	114.2	More than 60%
P17	130	More than 60%
P18	125	More than 60%
P19	80.1	50% - 60%
P20	141	More than 60%
P21	108	20% - 40%
P22	112.9	More than 60%
P23	140	More than 60%
P24	104	50% - 60%
P25	143.4	50% - 60%

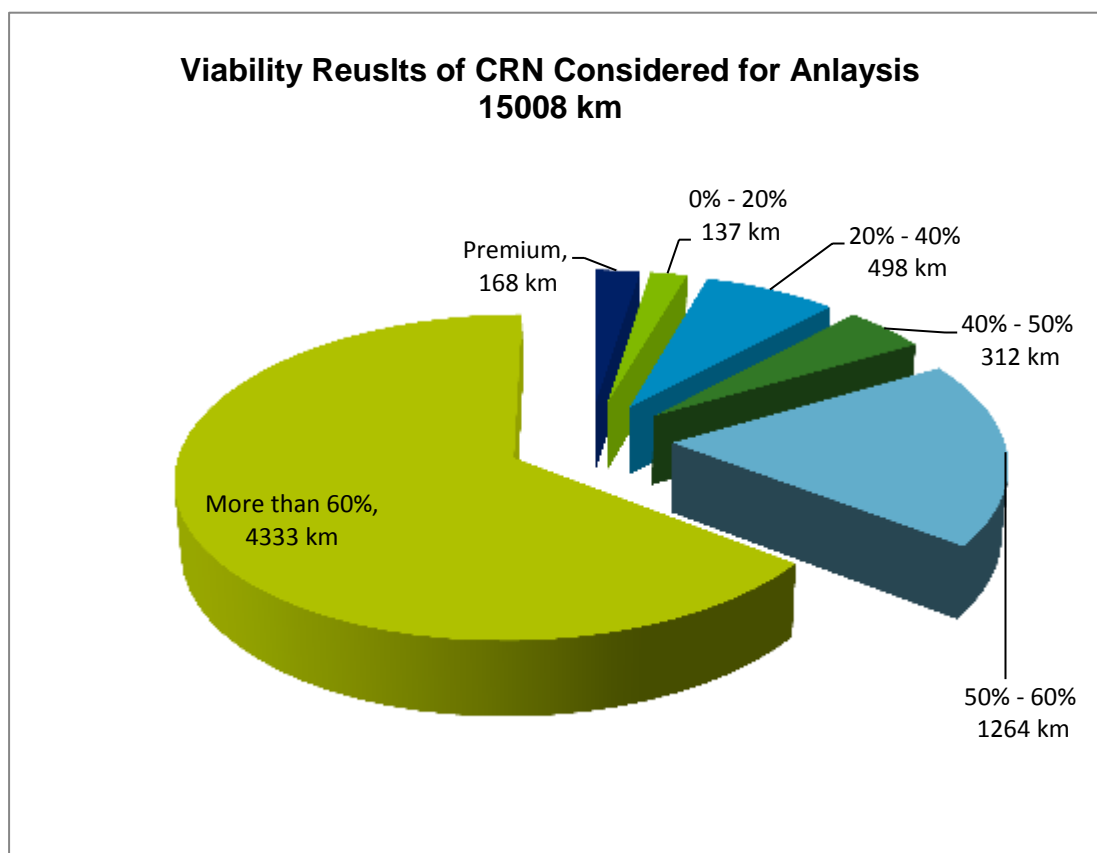
P26	102.8	More than 60%
P27	121.3	50% - 60%
P28	129	More than 60%
P29	91.7	More than 60%
P30	137.2	0% - 20%
P31	122	More than 60%
P32	139	40% - 50%
P33	113.4	More than 60%
P34	123.5	More than 60%
P35	153	50% - 60%
P36	97.2	More than 60%
P37	157.2	More than 60%
P38	138	More than 60%
P39	137.6	More than 60%
P40	188.3	More than 60%
P41	125.1	More than 60%
P42	136.6	More than 60%
P43	128.3	More than 60%
P44	89.3	More than 60%
P45	143.2	More than 60%
P46	94.4	More than 60%
P47	119.4	More than 60%
P48	52.4	Premium
P49	36.2	More than 60%
P50	24.8	20% - 40%
P51	42.5	More than 60%
P52	95.3	More than 60%
P53	121	More than 60%
P54	110.7	20% - 40%
P55	131.9	More than 60%
B1	106.0	50% - 60%
B2	52.9	20% - 40%
B3	61.5	50% - 60%
B4	55.6	50% - 60%
B5	84.5	Premium
B6	59.7	50% - 60%
B7	54.7	40% - 50%
B8	30.9	Premium
B9	50.0	40% - 50%
B10	43.1	50% - 60%
B11	36.7	20% - 40%
B12	58.1	50% - 60%
B13	68.0	40% - 50%

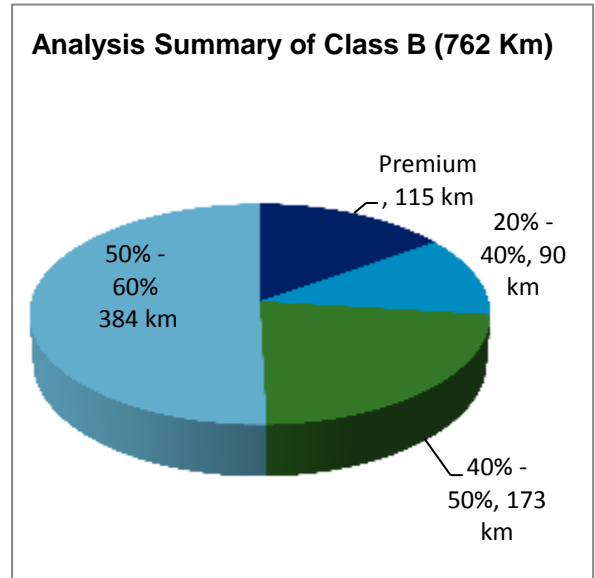
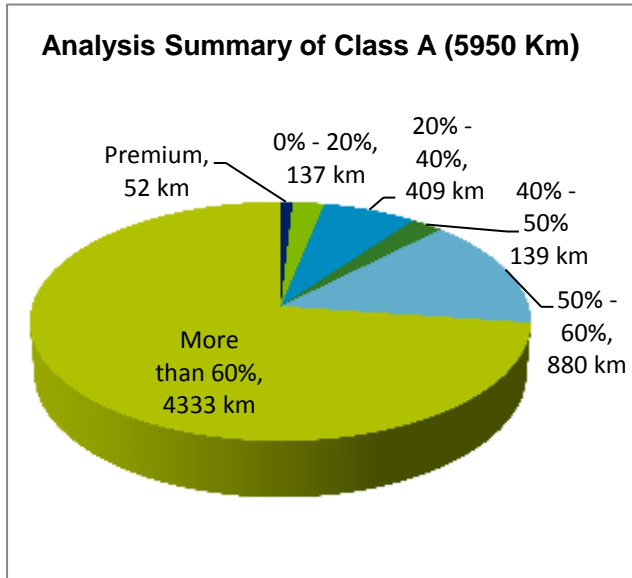
10.1.2 Based the on the results given in above table, all 68 packages are categorised in five different buckets on the basis of Premium and VGF requirement. The summary of all results are given in table and figure below:

Table: Summary of Results of Financial Analysis of Packages

VGF Range	No. of Packages (Class A)	No. of Packages (Class B)	Length Covered (km) – Class A	Length Covered (km) – Class B
Premium	1	2	52.40	115.40
0% - 20%	1	-	137.20	-
20% - 40%	5	2	408.70	89.63
40% - 50%	1	3	139	172.70
50% - 60%	8	6	879.7	384
Sub Total	16	13	1617	761.7
More than 60%	39	-	4333	-
Total	55	13	5950	761.7

Note: The viability of packages might change after detailed traffic study and technical study.





It is to be noted that the three stretches which are viable with premium/revenue sharing with GOK are having their in the traffic range of 13000 PCUs to 18,000 PCUs. Considering the two lanes with paved shoulder capacity the capacity augmentation would be required in next few years.

10.2 Summary of Results

Table: Summary of Financial Analysis on BOT (Toll) basis

CRN Coverage				Coverage of Analysis for Viability on PPP(Toll) Basis		Viability with provision of Premium to GoK				Viability with up to 20% VGF			Viability with 20% to 40% VGF				
Type	Total Length (km)	Length Deducted (Km)	Length considered for Analysis	No. of packages identified	Length covered by the Identified Packages (km)	No. of Packages	Length under Packages (Km)	Premium first year (Rs Cr)	Total Premium during CP (Rs Cr) (Not NPV)	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)
	A	B	$C = A - B$	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Class A	12,817	6,867	5,950	55	5,950	1	52	1	80	1	137	394	74	5	409	1,175	408
Class B	11,409	2,350	9,059	13	762	2	115	3	204	-	-	-	-	2	90	258	95
Total	24,226	9,217	15,009	68	6,712	3	168	4	284	1	137	394	74	7	498	1,433	503

10.2.1 It is to be noted that while the limit of VGF is generally 40% of TPC, here we have considered viability upto 60% VGF because of following reasons:

- Traffic growth rates have been considered 5%. However, based on traffic studies to be conducted the same can be adjusted and can be expected to be higher
- It is generally seen that bidders apply various financial structures and cost saving / cash flow management mechanisms, which enhance their returns. Thus, the quotes form bidders might be better compared to the general expectation of the Government
- This analysis is on normative basis and after detailed technical and traffic study the situation might change. It is expected that for most of the projects, if detailed and accurate analysis is undertaken after sometime, the traffic would be higher which might increase the viability

Table: Summary of Financial Analysis on BOT (Toll) basis

Type	Viability with VGF from 40% to 50%				Viability with VGF from 50% to 60%				Balance Length	
	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)	Balance Length (km)	EPC cost of balance length (Rs. Cr)
	R	S	T	U	V	W	X	Y	Z	AA
Class A	1	139.00	400	162	8	879.7	2,529	1,391	4,333	10,833
Class B	3	172.70	497	213	6	384.0	1,104	646	8,297	20,743
Total	4	312	896	375	14	1,264	3,633	2,036	12,630	31,575

10.3 Sensitivity Analysis

10.3.1 Traffic growth rate is a key factor in the viability of a highway project. In the above analysis 5% traffic growth rate (CAGR) has been considered. Assuming the industrial development and in result traffic growth rate of Karnataka. In view of the same, packages have been analysed at different level of traffic growth rates. The summary of the analysis is given in table below:

Table: Analysis Summary with 6% Traffic Growth Rate

Viability with up to 40% VGF												
	Viability with provision of Premium to GoK				Viability with upto 20% VGF				Viability from 20% to 40% VGF			
Type	No. of Packages	Length under Packages (Km)	Premium first year (Rs Cr)	Total Premium during CP (Rs Cr) (Not NPV)	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)
	A	B	C	D	E	F	G	H	I	J	K	L
Class A	1	52	3	232	3	273	784	77	4	412	1,185	337
Class B	2	115	7	486	-	-	-	-	5	262	754	246
Total	3	168	11	718	3	273	784	77	9	675	1,939	583

Viability with more than 40% VGF										
	Viability with VGF from 40% to 50%				Viability with VGF from 50% to 60%				Balance Length	
Type	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)	Balance Length (km)	EPC cost of balance length (Rs. Cr)
	M	N	O	P	Q	R	S	T	U	V
Class A	6	707.70	2,035	932	8	865.5	2,488	1,383	3,640	9,099
Class B	1	43.10	124	60	5	340.9	980	514	10,547	26,367
Total	7	751	2,159	992	13	1,206	3,468	1,897	14,186	35,466

Table: Analysis Summary with 7% Traffic Growth Rate

Viability with up to 40% VGF													
	Viability with provision of Premium to GoK				Viability with upto 20% VGF				Viability from 20% to 40% VGF				
Type	No. of Packages	Length under Packages (Km)	Premium first year (Rs Cr)	Total Premium during CP (Rs Cr) (Not NPV)	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)	
	A	B	C	D	E	F	G	H	I	J	K	L	
Class A	3	300	10	682	5	437	1,256	193	6	708	2,035	722	
Class B	2	115	12	815	2	90	258	45	3	173	497	123	
Total	5	416	23	1,497	7	527	1,514	237	9	880	2,531	845	

Viability with more than 40% VGF										
Type	Viability with VGF from 40% to 50%				Viability with VGF from 50% to 60%				Balance Length	
	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)	Balance Length (km)	EPC cost of balance length (Rs. Cr)
	M	N	O	P	Q	R	S	T	U	V
Class A	6	707.70	2,035	932	8	865.5	2,488	1,383	3,640	9,099
Class B	1	43.10	124	60	5	340.9	980	514	10,547	26,367
Total	7	751	2,159	992	13	1,206	3,468	1,897	14,186	35,466

Table: Analysis Summary with 5% Traffic Growth Rate and 12% Equity IRR

Viability with up to 40% VGF													
	Viability with provision of Premium to GoK				Viability with upto 20% VGF				Viability from 20% to 40% VGF				
Type	No. of Packages	Length under Packages (Km)	Premium first year (Rs Cr)	Total Premium during CP (Rs Cr) (Not NPV)	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)	
	A	B	C	D	E	F	G	H	I	J	K	L	
Class A	2	189.6	6	375	2	135.50	390	29	6	671.10	1,929	545	
Class B	2	115	10	684	1	37	106	20	4	225.63	649	167	
Total	4	305	16	1,060	3	172	495	49	10	897	2,578	712	

Viability with more than 40% VGF										
	Viability with VGF from 40% to 50%				Viability with VGF from 50% to 60%				Balance Length	
Type	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)	Balance Length (km)	EPC cost of balance length (Rs. Cr)
	M	N	O	P	Q	R	S	T	U	V
Class A	7	740.20	2,128	963	6	669.4	1,925	1,057	3,544	8,861
Class B	6	383.97	1,104	518	-	-	-	-	10,547	26,367
Total	13	1,124	3,232	1,481	6	669	1,925	1,057	14,091	35,228

Table: Analysis Summary with 7% Traffic Growth Rate and 12% Equity IRR

Viability with up to 40% VGF													
	Viability with provision of Premium to GoK				Viability with upto 20% VGF				Viability from 20% to 40% VGF				
Type	No. of Packages	Length under Packages (Km)	Premium first year (Rs Cr)	Total Premium during CP (Rs Cr) (Not NPV)	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)	
	A	B	C	D	E	F	G	H	I	J	K	L	
Class A	8	737.3	45	2,963	6	707.70	2,035	295	9	960.80	2,762	839	
Class B	6	323	25	1,640	1	55	157	12	6	383.97	1,104	294	
Total	14	1,060	69	4,604	7	762	2,192	306	15	1,345	3,866	1,133	

Viability with more than 40% VGF										
	Viability with VGF from 40% to 50%				Viability with VGF from 50% to 60%				Balance Length	
Type	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)	No. of Packages	Length under Packages (Km)	TPC of Packages (Rs Cr)	VGF Amount Required (Rs. Cr)	Balance Length (km)	EPC cost of balance length (Rs. Cr)
	M	N	O	P	Q	R	S	T	U	V
Class A	4	528.10	1,518	723	8	836.7	2,406	1,342	2,179	5,449
Class B	-	-	-	-	-	-	-	-	10,547	26,367
Total	4	528	1,518	723	8	837	2,406	1,342	12,726	31,816

11 Financial Feasibility Analysis on other modes

11.1 Analysis of Balance CRN not viable on BOT (Toll) mode

11.1.1 It is to be noted that in above analysis many projects are not achieving 15% Equity IRR up to 60% VGF on BOT (Toll Basis). Such balance lengths can be developed on Annuity or EPC mode or through Hybrid models where toll collections are not be considered as a source of revenue for the project. The balance length of the packages, which is not viable on BOT (Toll) basis, is 12630 km. In this section of the report complete 12,630 Km have been analysed on BOT (Annuity), BOT (Hybrid Annuity) and EPC basis.

11.2 Analysis on BOT (Hybrid - Annuity & Toll) Mode

11.2.1 Some of the key Characteristics of Hybrid (Annuity & Toll) Mode are provided below.

- This mode is the mix of Toll and Annuity.
- The Concessionaire will construct the road as in case of BOT (Toll) and BOT (Annuity).
- Finance arrangement would be done by concessionaire.
- The Concessionaire will Operate & Maintain the Project stretch and Toll Plaza till the expiry of the Concession Period.
- Concessionaire will collect User Fee from the users and will also receive a fixed semi-annual annuity amount, which is pre-decided before the execution of the Concession Agreement, during the operation period, till the expiry of the Concession Period.

11.2.2 As mentioned above, in this model the mode of revenue generation would be Toll Revenue and an additional Annuity payment during operation period. The project has been analysed considering the assumption for financial analysis as provided in this report. Road stretches which have at least four thousands PCUs have been considered for this analysis. And based on assumption mentioned above, this analysis is covering a length of 2154 Km with a TPC of INR 6192 Crore. The summary of the analysis is given below:

S. No.	Particulars	Results
1	Equity IRR	15%
2	Project IRR	12.33%
3	Semi-annual Annuity (INR Cr.)	567.76
4	Annuity (%of TPC)	9.17%
5	Total Annuity during the Concession Period (INR Cr.)	11355
6	NPV of Annuity (@ 12%) (INR Cr.)	5115

11.3 Analysis on BOT (Annuity) Mode

11.3.1 Some of the key Characteristics of Annuity Mode are provided below.

- The Concessionaire will be constructing the Project.
- Finance arrangement would be done by concessionaire.
- No support will be provided to the Concessionaire as Viability Gap Funding (VGF).
- The Concessionaire will operate & maintain the Project stretch till the expiry of the Concession Period.
- However; Concessionaire will not operate and maintain the Toll Plaza.
- Concessionaire will not collect toll from the user and will receive a fixed semi-annual annuity amount, which is pre-decided before the execution of the Concession Agreement, during the operation period, till the expiry of the Concession Period.

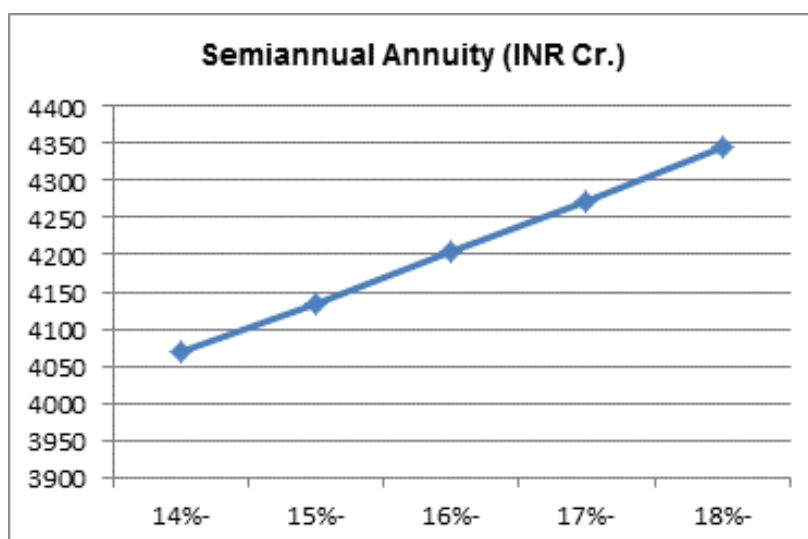
11.3.2 As mentioned above, total balance length 12,630 km is considered for the analysis which is having a Total Project Cost of INR 36,311.25 Crore. The analysis has done considering the assumptions provided in this report.

11.3.3 The semi-annual annuity has been calculated considering the Equity IRR of 15%, since the project would be awarded based on competitive bidding the concessionaire might look for different level of Equity IRR. Thus in the table below the semi-annual annuity is calculated for different level of Equity IRR. The detailed analysis summary is provided in **Annexure E**

Table: Summary of Financial Analysis on BOT (Annuity) basis

Equity IRR	14%	15%	16%	17%	18%
Semiannual Annuity (INR Cr.)	4,069	4,134	4,204	4,273	4,344
% of TPC	11.20	11.39	11.58	11.77	11.96
Total Annuity (INR Cr.)	81,370	82,687	84,070	85,450	86,870
NPV of total Annuity (INR Cr.)	36,652	37,245	37,868	38,489	39,129

Figure: pattern of Semi-annual Annuity at different level of Equity IRR



11.4 Analysis on BOT (Hybrid - Annuity & Grant) Mode

11.4.1 Some of the key Characteristics of Hybrid (Annuity & Grant) Mode are provided below.

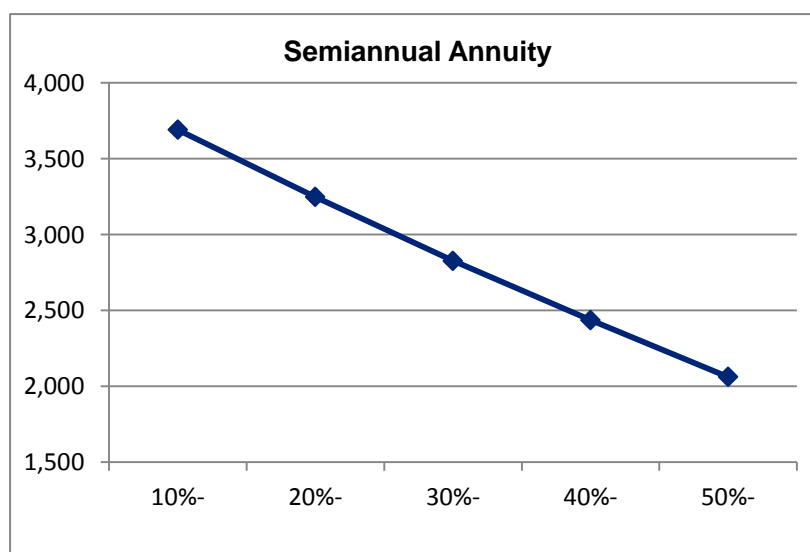
- This mode is the mix of VGF and Annuity.
- The Concessionaire will construct the road as in case of BOT (Toll) and BOT (Annuity).
- Finance arrangement would be done by concessionaire.
- During Construction a monetary support will be provided to the Concessionaire as Viability Gap Funding (VGF).
- The Concessionaire will operate & maintain the Project stretch till the expiry of the Concession Period.
- However; Concessionaire will not operate and maintain the Toll Plaza.
- Concessionaire will not collect toll from the user and will receive a fixed semi-annual annuity amount, which is pre-decided before the execution of the Concession Agreement, during the operation period, till the expiry of the Concession Period.

11.4.2 As mentioned above, in this model the mode of revenue generation would be Annuity payment and an additional VGF during construction. The project has been analysed considering the assumption for financial analysis as provided in this report. As mentioned above, this analysis is covering a length of 12630 Km with a TPC of INR 36311.25 Crore. The project has analysed at different level of VGF support and the summary of the analysis is given in table below:

Table: Semi-annual Annuity in respect with Grant

Grant	10%	20%	30%	40%	50%
Grant (in value)	3,631.13	7,262.25	10,893	14,525	18,156
Semiannual Annuity	3,691	3,248	2,827	2,436	2,062
% of TPC	10.17%	8.94%	7.79%	6.71%	5.68%
Total Annuity (INR Cr.)	73,824	64,950	56,548	48,719	41,245
NPV of Total Annuity (INR Cr.)	33,253	29,256	25,471	21,945	18,578

Figure: Semi-annual Annuity in respect with VGF %



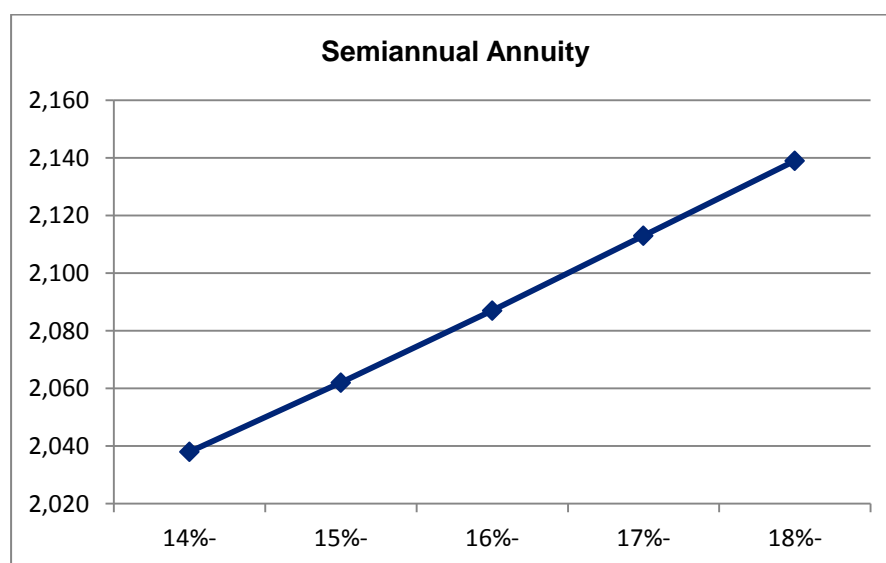
11.4.3 The semi-annual annuity has been calculated considering the Equity IRR of 15%, since the project would be awarded based on competitive bidding the concessionaire might look for different level of Equity IRR. Thus in the table below the semi-annual annuity is calculated for different level of Equity IRR.

Table: Semi-annual Annuity in respect with Equity IRR

Equity IRR	14%	15%	16%	17%	18%
Grant (in value with 50%)	18156	18156	18156	18156	18156
Semiannual Annuity	2,038	2,062	2,087	2,113	2,139
% of TPC	5.61%	5.68	5.75%	5.82%	5.89%

11.4.4 In the above analysis the 50% of upfront grant is considered based on the World Bank Hybrid Annuity Assumption. However, the maximum limit of upfront decided for highways project by Planning Commission & B K Chaturvedi Committee is 40%.

Figure: Semi-annual Annuity in respect with Equity IRR



11.5 Fund Requirement on EPC mode

11.5.1 As mentioned in the earlier part of this report, 12630 km is not viable on BOT (Toll) basis and the same could be developed on EPC mode. The fund requirement details at different % of length covered for development on EPC mode is given in table below:

Table: Fund requirement on EPC mode

% of CRN (which is not viable on BOT (Toll) mode)	100%	75%	50%	25%
Length	12630	9472.5	6315	3157.5
Total Fund Requirement	31,575	23,681.25	15,787.50	7,893.75

12 Conclusion

- 12.1.1** This analysis is based on the CRN identified in Scott Wilson Report which is covering a length of 24,225 Km. In the CRN, 4491 km is covered under National Highway which would be developed under NHDP, 4707 is already development or proposed for development by different agency and remaining 15008 km is identified which required improvement / up gradation.
- 12.1.2** Out of the 15008 km, 6712 km is analysed on BOT (Toll) basis in which 2378 km is viable. The Balance length of 12630 km which is not viable on BOT (Toll) basis could be developed on different mode viz BOT (Annuity), Hybrid Annuity and EPC and the same has been analysed on all given mode in earlier part of this report.
- 12.1.3** The Total Fund Requirement for the Improvement / Up gradation of whole Core Road Network is calculated assuming that the length covered under National Highway would be developed by NHA thus the cost of 4491 km is not considered. Some part of the road would be developed on BOT mode and some on EPC mode thus the average per km cost for improvement / up gradation is considered as INR 2.75 cr. The cost requirement is given in table below:

Table: Total Cost for the Up gradation of CRN

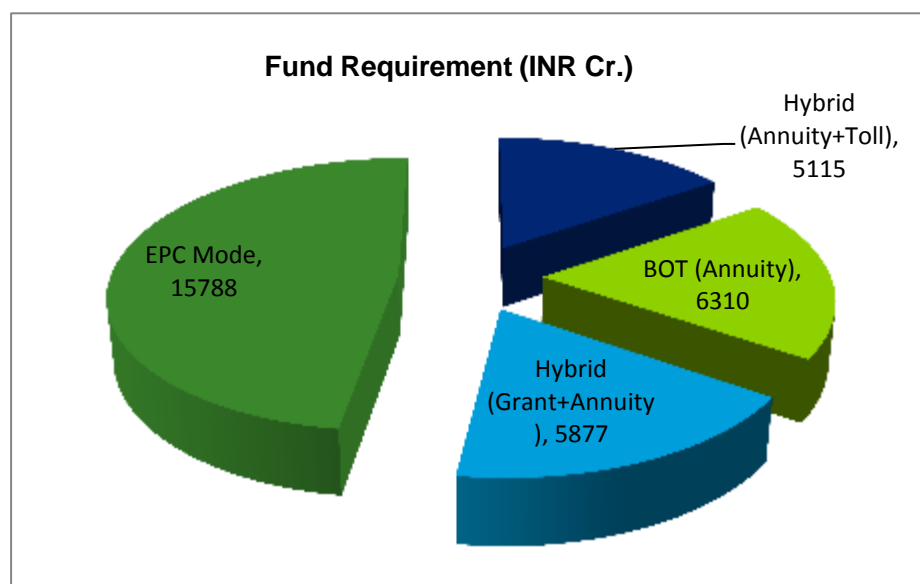
Particulars	Length (Km)	Cost (INR Cr.)
National Highways	4491	NA
Already developed or under process	4707	12944 (based on normative assumption)
To be developed	15008	41570
Total	24225	54216

- 12.1.4** As mentioned in above table the total cost of INR 41,570 Cr is required for the further development.
- 12.1.5** We assume that Improvement / up gradation on BOT (Toll) and BOT (Annuity) would be the first priority and can be developed in next three – four years.
- 12.1.6** We expect that the balance road which is not viable on BOT (Toll) basis can be developed as mix of BOT (Annuity), Hybrid (Toll + Annuity), Hybrid (Grant + Annuity) and EPC mode. For developing a perspective, some assumption has been taken regarding extent of use of these modes. The length covered under each mode and respective fund requirement is given in table below:

Table: Total Fund requirement

Mode of Development	Grant	Annuity	EPC	Total	NPV @ 12%
Hybrid (Annuity +Toll) 17% of unviable Length (More than 4000 PCUs)		11355		11355	5115
BOT (Annuity) 17% of unviable length	-	14010	-	14010	6310
Hybrid (Grant + Annuity) 16% of unviable length	2905	6598	-	9503	5877
EPC mode 50% of unviable length	-	-	15788	34868	15788
Total	2905	31963	15788	69736	33090

Note: the NPV has been calculated only for Annuity payment.

Figure: Total Fund requirement

12.1.7 The summary of Net Fund Requirement from Government for Improvement / up gradation of Balance Core Road Network is given below:

Table: Summary of Net Fund requirement

Mode of Payment	Value (INR Cr)	NPV @ 12%
Grant	5890	5890
Annuity	31963	14397
EPC	15788	15788
Premium	(284)	(48)
Total	53357	36027

12.1.8 As per the summary provided in the above table, the expected total fund requirement for development of Balance CRN would be around INR 53360 cr over next 30 years i.e. about INR 36000 cr in NPV terms (@12%). Over and above such costs, Government funding would also be required for acquiring land for Right of Way (ROW) and utility shifting for upgradation of roads. Based on discussions with PWD, KRDC and KSHIP officials, it is understood that such land for ROW is already available with Government for many roads.



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