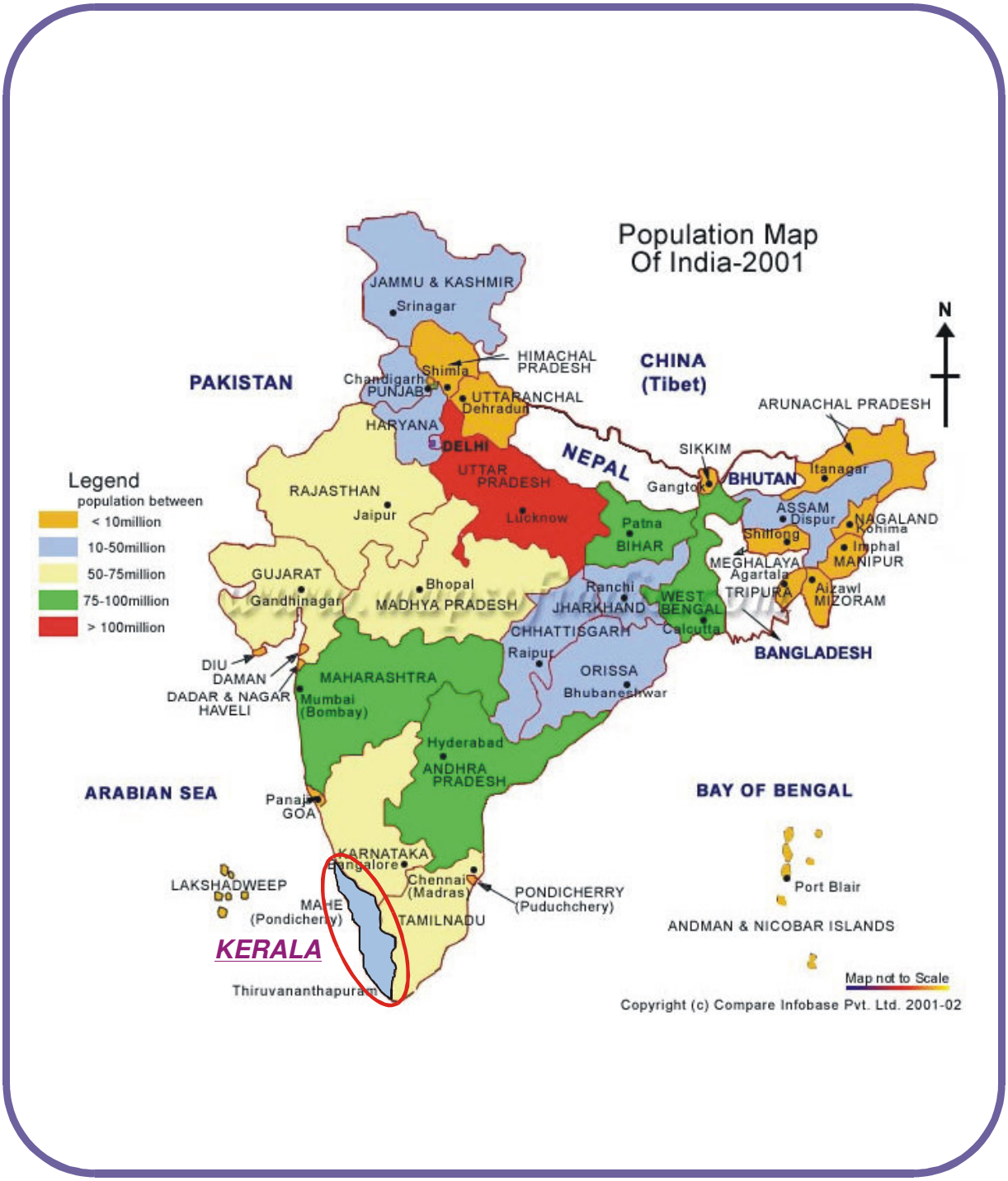

FIGURE 0.1: MAP OF INDIA

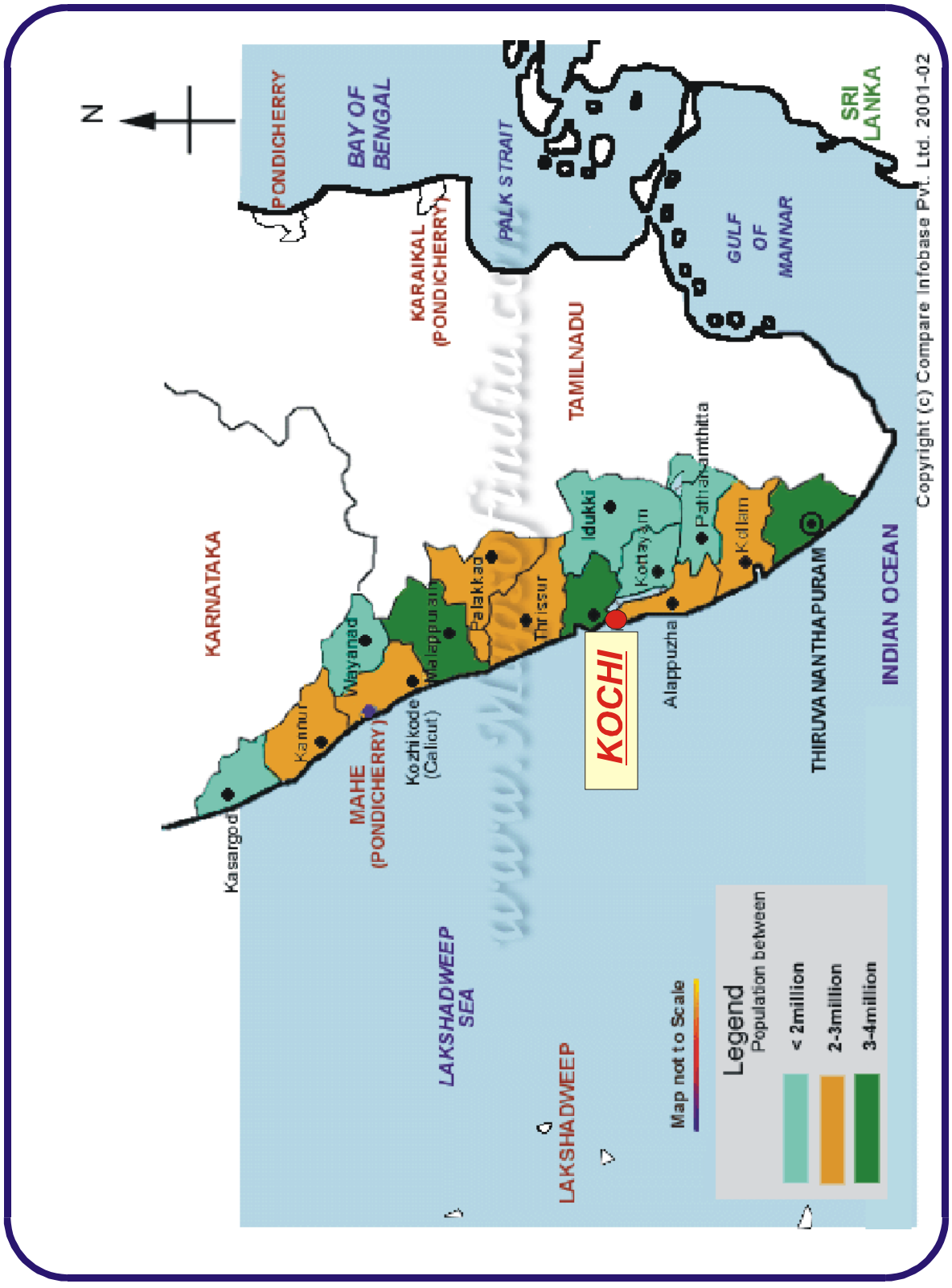

FIGURE 0.2: MAP OF KERALA STATE

EXECUTIVE SUMMARY

0.1 INTRODUCTION

0.1.1. Indian cities are recording a fast growth due to rapid urbanisation, a phenomenon noticed all over the globe. In addition to the metropolitan cities of Delhi, Mumbai, Kolkata, Chennai, Bangalore & Hyderabad, many other cities have crossed the population figure of one million. The urban environment is deteriorating significantly with lack of infrastructure facilities like transport, water supply, and sewerage treatment and also power.

0.1.2. In the absence of efficient public transport, personalised transport, especially two wheelers, cars etc. have been choking the road corridors, causing great concern of increasing air & noise pollution in these new cities.

0.1.3. Kerala State though with its good social development of literacy and quality of life is also emerging into a situation similar to the other metropolitan cities due to lack of basic infrastructure. Kochi the commercial and industrial capital of Kerala has already emerged as one of the metropolitan city with a population of 1.3 million in year 2001 in its urban agglomeration. Several socio-economic and developmental problems are coming to the fore in this city with depleted water supply, uncompromising transport scenario and increased density of population.

0.2. The transport problems of Kochi has attracted the attention of the Government of Kerala and a detailed Comprehensive study on this scenario was taken up by the Greater Cochin Development Authority (GCDA) as early as in 1999 through RITES. RITES report has clearly brought out the need for a Rail based Mass Rapid Rail Transit system

0.3. KONKAN RAILWAY CORPORATION LIMITED

0.3.1. Konkan Railway Corporation Limited (KRCL) is a Government of India undertaking established in 1990, to construct and operate 760 Km West Coast railway line in India connecting the states of Maharashtra, Goa, Karnataka and Kerala. Praised as "**an engineering marvel**", the most modern railway line was completed in December 1997 at a total cost of Rs. 35,550 Millions.

0.3.2. Innovation is a way of life in KRCL. Many innovative methods developed indigenously were used during construction phase to meet the challenges and to complete the project in record time. During operations phase also KRCL developed many innovative practices to keep the costs low with higher performance standards.

0.3.3. The World Bank appreciated the performance of KRCL and mentioned that the Indian Railways shall adopt KRCL's performance as benchmark. Relevant para of the report is enclosed as Annexure 0.1.

0.4. SKY BUS METRO

0.4.1. Sky Bus Metro is latest, economical, eco-friendly, reliable and most innovative but simple technological solution developed by Konkan Railways as a rail based futuristic Urban Mass Transit System. It is free from derailments and collisions and therefore very safe. It can be constructed on the median of the road without affecting road traffic.

0.4.2. The new technology solution of Sky Bus Metro is based on the concept of **Sky Wheels** presented in 1989 at World Congress for Railway Research by Mr. B. Rajaram, Managing Director of KRCL at Bologna University, Italy.

0.4.3. The technologies used are:

- Well-proven rail guided bogie system commonly used for normal railway system.
- 3 ph AC asynchronous electrical motive units– well proven and widely adopted abroad as well as in India.
- Light weight coaches called `Sky Buses' which are suspended from bogies and travel below rail guides, the physics of which can be engineered very easily – shells of coaches and suspension links well proven.
- Pre-fabricated latest construction technologies, which save time and money resulting in easy execution of the project in busy urban areas without disturbing the existing traffic pattern. These structural engineering methods are well proven which do not have any project execution risk attached.
- Information technology tools for economic operations communications and control.

0.4.4. The Sky way consists of a prestressed concrete box structure supported over a series of columns at a height of 10 m above existing road level. Columns will be one metre dia. and 15 mtrs. apart on a pile foundation on the medians of road way. Two rails are fixed with appropriate fastening within concrete box. A proven bogie, which is remotely controlled automatically by microprocessor-based system, can run with the speed of 100 Kmph., with the coach shell suspended below. This coach can carry 300 passengers with air-conditioned comfort and are designed for lighter crush loads as compared to normal rail coach.

0.4.5. Sky Bus Metro is aesthetic and eco-friendly which will never derail or capsize nor collide as it has got exclusive safety features such as derailment arrester, coach protector and swing arrester. It does not have turnouts (points and crossings) but has traversers for change of track. It is a unique mass transit system, which can be constructed within two years in any crowded and congested city. In addition to carrying commuters, the sky bus system can carry containers during the off peak period especially in the night. The capital cost is lowest almost 50 % of elevated system and 25 % of under ground metro for same performance standards.

0.4.6. Technical Feasibility of Sky Bus Metro

0.4.6.1. Bharat Ratna Dr. Abdul Kalam, Former Principal Scientific Advisor, to PMO office and now Honorable President of India has gone through the Sky Bus Metro proposal has stated that Sky Bus Metro (SBM) proposal is "***Technically sound***". He has recommended for the implementation of Sky Bus Metro on Mission Mode in India. The copy of PMO office letter is enclosed as Annexure- 0.2

0.4.6.2. A technical committee consisting of Padma Bhushan Dr Anil Kakodkar, chairman, Atomic Energy Commission, Padma Bhushan Professor P. Ramo Rao, Vice-Chancellor, Hyderabad University and Shri Sudhir Kumar, Commissioner of Railway Safety examined the technology of Sky Bus Metro. The have stated that (SBM) Technology is feasible, cost effective, non-polluting Urban Mass Transportation System with very large saving in fossil fuel consumption. **They have recommended for Quick Implementation of Sky Bus Metro Project.** The copy of technical appreciation report of committee is enclosed as Annexure 0.3

0.4.6.3. 38 leading companies of India have shown their expression of confidence in Implementing of Sky Bus Metro with least technology risk and also expressed to come together to achieve the objective as can be seen from Annexure 0.4.

0.4.6.4. ***Salient features of Sky Bus Metro are given below -***

1.	Gauge	:	Standard Gauge - 1435 mm.
2.	Gradient	:	1 in 60 max.(but can take upto 1 in 25)
3.	Curves	:	Minimum radius of curvature -50 m follows roadway
4.	Platform access	:	Automatic turnstiles
5.	Coach access	:	Automatic doors
6.	Power supply	:	Three phase power supply - converted from 750 V DC 3rd rail
7.	Type of Signaling	:	Moving Block, Auto Driving Device, Anti Collision Device developed by KRCL
8.	Average Speed	:	36 to 47 Kmph depending on Station intervals
9.	Max. Speed	:	100 Kmph
10	Capacity Maximum	:	150X2 passengers at 5.6 persons/sqm
11.	Acceleration	:	1.3m/sec/sec (max)
12.	Frequency of Service/Headway	:	40 Seconds To 1 Minute
13.	Weight (Twin car)	:	Max. 48 T (loaded)
14.	Distance between Sky Stations	:	0.5 Km to 1.2 Km.
15.	Coach	:	Air - conditioned (comfort)
16	Maximum passenger per hour per direction	:	18,000 to 81,000 (1 Sky Bus unit with 60 Second and 3 Sky Bus units with 40 Second headway)
17.	Length x Width	:	9.25m x 3.15 m.
18.	Height	:	2.40 m
19.	Material	:	Steel + Poly-carbonate
20.	Type of propulsion	:	3 ph AC asynchronous motors

21.	Motor Rating	:	4 x 85 KW
22.	Commuter rate of flow from Bus	:	300 Nos. in 15 Seconds
23.	Differently enabled persons	:	Special access facility & audio-visual info.

0.5. PHASING OF THE SKY BUS PROJECT AT KOCHI

0.5.1. Since any urban mass transport project is capital intensive it has to be structured judiciously to meet immediate demands and planned future demand. Since these systems can be upgraded or extended to suit the traffic conditions, the initial length is limited to very intensive corridors where a road based system like bus will alone not be able to manage the traffic without causing severe congestion and delay thereby increased pollution. As has been identified by the RITES study, the corridors on NH 47 between Kalamasseri to High Court, the Marine Drive, the M.G. Road and Valanjaambalam and Vytilla are the corridors where the traffic is likely to reach more than 200,000 per day by year 2005 with an intensity of 20,000 passengers per direction during peak hour. So to manage these corridors, a Mass Rapid Transit System (MRTS) will be necessary to handle such heavy peak hour traffic. The road-based volume of bus system will not be able to handle more than 6,000 to 8,000 per direction in an hour.

0.5.2. Considering this strategy, the first phase of system has been planned from Kalamasseri to South Railway station through Banerjee Road, High Court, Marine Drive and Darbar Hall Road. The traffic intensive area on this alignment is Kalamasseri University Jn., Tollgate, Edapalli, Palarivattam, J.N.Stadium, Kaloor Bus stand, High court and Broad way, Boat Jetty and South station. So by selecting this system along this corridor it is ensured that it covers the CBD entirely and also all the modal transfer points. However, at the starting point of Kalamasseri it has been extended to Industrial Estate to the junction of outer ring road under construction between Kalamasseri and Irimbanam. The reasons for extension to Kalamasseri Industrial Estate are as follows:

1. This system can be extended from Kalamasseri to HMT, KINFRA IT park and the new Co-operative Medical College by another 2Kms when these are fully developed and become intensive traffic areas.

2. Adequate land is available for parking, maintenance depot and the control tower of the Sky Bus system.

3. The Kerala State Electric Board's (KSEB) load despatch centre is located near by from which system can draw high-tension power of 33 KV reliably.

4. Since this being an industrial area, no special permission is required for establishing maintenance workshop installation or change of land use.

5. It provides connectivity to Kalamasseri Railway station when electrified suburban services are introduced in the Railway system.

6. The system can be further extended on the Ring Road to Irimbanam in the South and the airport in the North when demand arises.

0.5.3. The first phase also covers the highly intensive work places like Broad Way, Highcourt, Revenue tower, Corporation of Kochi and provides links to Port Naval Base, Fort Kochi and Thevara. When Goshree bridges are completed this will provide connection to Vypeen, Vallarpadam Container Terminal and Bolghati Island for the households and the industries.

0.6. ENVIRONMENTAL IMPACTS

0.6.1. Environmental Impact Assessment and Environmental Management Plan for Kochi Sky Bus Project has been carried out by M/s. TATA AIG Risk Management Service Ltd. Mumbai.

0.6.2. The environmental assessment study described in detail in the Chapter on Environmental Studies shows that the Sky bus project is one of the most environmentally, friendly modes of transport having a overall positive impact on water, environment and ecology. It will reduce pollution and improve quality of life.

0.7. VIABILITY OF SKY BUS METRO, KOCHI PROJECT

0.7.1. Traffic Potential

0.7.1.1. In order to validate and also to supplement the RITES traffic survey data along the proposed route, a detailed Traffic study was undertaken to assess the potential traffic for the system in Kochi. Detailed traffic study for the project is presented in Section II of the Report.

TABLE 0.1 THE ORIGIN DESTINATION (O-D) ANALYSIS PRESENT THE FOLLOWING RESULTS

Sr.No.	PARTICULARS	TRIPS (Millions)
1	Total Home Based Trips	1.651
2	Work Trips - 65 %	0.965
3	Non Work Trips – 35 %	0.686
4	Total Intra City Trips	0.765
5	Total Inter City Trips	0.240
6.	Total Daily Trips in 2002	2.065

0.7.1.2. We have considered the base year 2002 estimates at 274,000 passenger trips. The traffic is estimated to increase from **358,000 trips per day** during the financial year 2006, i.e., the 1st year of operation, to 442,000 trips per day during FY 2013, the 8th year of operation, at a Compounded Annual Rate of Growth (CARG) of 3.05%.

0.7.2. Risk Assessment & Mitigation measures

0.7.2.1. The key Risk factors are analysed and appropriate risk mitigation measures recommended for the risks encountered are detailed in Chapter No. 10. Of the Report.

0.7.3. Total Capital Cost

0.7.3.1. Based on the detailed study of the 16.05 Km long alignment, technology, availability of infrastructure facilities and level of performance, the total capital cost of the Phase I of Kochi Sky Bus Project is Rs.7,981.3 Millions.

0.7.4. Financial Analysis

0.7.4.1. The project is proposed to be financed by a mix of equity and debt instruments. We consider the following financing structure as prudent.

TABLE 0.3 SKY BUS: PROPOSED FINANCING STRUCTURE

Source of Finance	Rs.(Millions)	Percentage of Total
Equity	3591.60	45
Preferential Shares to NRKs	1835.70	23
Suppliers-Interest Free Loan	159.60	2
Senior Debt	2394.40	30
Total	**7981.30**	**100**

0.7.5. Revenue Projections

0.7.5.1. The revenue profile for the project that has been developed so as to serve as the basis for financial modelling exercise covers broadly four distinct elements:

- Fare box charges or Income from Tickets
- Income from Property Development
- Income from Advertising
- Income from Smart Card/Loyalty card

0.7.5.2. Two distinct revenue models are developed and considered for financial analysis. The models are as given below:

- Individual Ticket Based Structure
- Monthly Card Based Structure

0.7.5.3. Individual Ticket Based Structure

In this structure a uniform fare structure is assumed. ICRA have considered a fare structure of Rs.1.5 per km for the year 2006, the first year of operation of the project, assuming a rate of Rs.1.3 per km increased at an annual inflation index of 4%. The fare box revenue based on the above fare structure and an average trip length of 5 km, in Kochi City, for the first year of operation is Rs.890.07 million.

0.7.5.4. Monthly Card Based Structure

ICRA have also considered a Monthly Card and Monthly Family Card based fare structure. The monthly card is primarily aimed to serve the daily commuters. In case of Monthly Card, the owner can perform one round trip during peak periods of operation (One journey during the morning peak and return journey during the evening peak). The total number of kilometers permitted to travel will be 250 in a month.

0.7.5.4.1. Monthly Family Card will be given to a single family /household in which a family will be given one card for travel on the Sky Bus during peak hours traffic and two Add-on cards for off-peak hours. One of the family members of the Monthly Family Card can travel for 250 KM during peak periods and the other family members can travel 500 KM during the off peak periods. The fare for tourists is considered at Rs.2 per km.

0.7.5.4.2. For the assessment of revenue 40,000 Monthly Cards, 30,000 Monthly Family Cards and 100,000 trips of tourists with average trip length of 5KM is considered. ICRA have considered a charge of Rs 250 for Monthly Card and Rs 650 for Monthly Family Card at present day prices. By increasing the above charges at annual inflation index of 4% and traffic growth at 3.05% the revenue is estimated at Rs 911.7 Million during the first year of operation i.e.2006.

0.7.6. **Total operational and maintenance expenses :** The same during first year of operation (FY 2006) indexed to an inflation rate of 4 % per annum is estimated at Rs. 460.80 Millions.

0.7.7. Royalty to Government of Kerala

0.7.7.1. It is proposed that the GoK will provide Right of Way for the Sky Bus project free of cost for implementing the project. It is proposed that the SPV will make royalty payment to the GoK, for providing right of way, at the rate of Rs.1.5 million per km from the 11th year onwards, i.e., the year after full repayment of Preferences shares and loan is made. The total royalty payment to the GoK during the concession period of 30 years is estimated at Rs.481.50 million.

0.7.8. The summary of the financial projections and analysis for each model is presented below.

0.7.8.1. Individual Ticket Based Structure

TABLE 0.5:FINANCIAL PERFORMANCE (INDIVIDUAL TICKET BASED STRUCTURE)

(Rs. Millions)

Year of operation	**1**	**6**	**10**	**16**	**25**
Year ending March	**2006**	**2011**	**2015**	**2021**	**2030**
Particulars					
Total Revenue	1085.90	1840.30	2560.04	3719.10	5532.50
Total Expenditure	460.80	568.50	671.10	885.0	1246.60
Profit Before Int., Dep. & Tax (PBDIT)	625	1271.80	1889.20	2838.60	4285.90
Profit before Tax (PBT)	-109.70	639.20	1538.90	2562.20	4009.50
Profit after Tax (PAT)	-109.70	591.2	1423.50	1624.50	2531.10

0.7.8.1.1. The Internal Rate of Return (IRR) for the project both on Pre-Tax and Post-Tax basis is at comfortable levels of 16.69% and 15.37%. Equity IRR, i.e., an indicator of shareholder returns, is also at reasonable levels at 17.40%. This indicates that the return to shareholders will be higher that dividend yield.

0.7.8.1.2. The Average Debt Service Coverage Ratio (DSCR) over the period of repayment of debt is 1.58 with Maximum and Minimum DSCR of 2.15 and 1.17 respectively. The DSCR levels indicate that the project has sufficient cash flows for debt servicing and will be in a position to meet all debt obligations to lenders.

0.7.8.2. Monthly Card Based Structure

TABLE 0.6:FINANCIAL PERFORMANCE (MONTHLY CARD BASED STRUCTURE)

(Rs. Millions)

Year of operation	**1**	**6**	**10**	**16**	**25**
Year ending March	**2006**	**2011**	**2015**	**2021**	**2030**
Particulars					
Total Revenue	1107.6	1716.5	2338.2	3101.4	4746.3
Total Expenditure	461.2	566.6	667.8	871.2	123.48
Profit Before Int., Dep. & Tax (PBDIT)	646.4	1149.9	1670.4	2230.2	3511.5
Profit before Tax (PBT)	-88.3	517.3	1320.1	1953.8	3235.1
Profit after Tax (PAT)	-88.3	478.5	1221.1	1229.0	2027.7

0.7.8.2.1. In model II, the Internal Rate of Return (IRR) for the project both on Pre-Tax and Post-Tax basis is at comfortable levels of 15.30% and 14.02%. Equity IRR, i.e., an indicator of shareholder returns, is also at reasonable levels at 15.62%. This indicates that the return to shareholders will be higher that dividend yield.

0.7.8.2.2. The Average Debt Service Coverage Ratio (DSCR) over the period of repayment of debt is 1.46 with Maximum and Minimum DSCR of 1.90 and 1.10 respectively. The DSCR levels indicate that the project has sufficient cash flows for debt servicing and will be in a position to meet all debt obligations to lenders.

0.8. IMPLEMENTATION

0.8.1. Upon acceptance of the recommendations in the Detailed Project Report by Kerala State Government, a Special Purpose Vehicle (SPV) will be formed .The SPV comprising of Govt. of Kerala represented by Ministry of Transport, KSIDC, GCDA, KRCL and key financiers is responsible for raising debt, developing legal frame-work, allocation of roles, physical construction, operation and maintenance of the Sky Bus Metro.

0.8.2. It is envisaged that the construction will be completed within a period of 24 months from the commencement date for construction. The commencement date is defined as the date of handing over of the land required and right of way by the Government of Kerala (GoK) to the Special Purpose Vehicle (SPV) or date of financial closure, whichever is later.

0.9. SUMMARY AND RECOMMENDATIONS

0.9.1. The financial analysis indicates that the proposed project is commercially and financially viable. The sensitivity analysis undertaken indicates that the variation in key project viability indicators does not have any adverse affect on the debt servicing except in extreme conditions. The rationale for using Sky Bus as a mass transportation system for Kochi lies in the fact that it provides an air conditioned system affordable by the masses, increases the quality of life and more importantly reduces the vehicular pollution. Therefore the project demonstrates adequate strength to withstand any variation in key parameters and establishes the feasibility of implementing the Sky Bus project in Kochi with private sector participation on a Build, Own, Operate and Transfer (BOOT) basis.

0.10. THE WAY FORWARD

0.10.1. The Government of Kerala should approve the proposed Kochi Sky Bus project, and suitable resolution/enabling legislation may have to be passed in the Kerala legislature after being ratified by the Cabinet.

0.10.2. We strongly recommend the formation of an SPV (Special Purpose Vehicle) as an appropriate institutional response to the development of the Kochi Sky Bus project. The SPV should be set up by the KSIDC, the nodal agency appointed by the GoK for the project, with initial seed capital. Further, it is also recommended that the proposed SPV should be a company incorporated in India under the Indian Companies Act, 1956, as subsequently modified. The SPV recommended will have the right to build, own and operate the new Kochi Sky Bus project in Kochi for a defined Concession period.

0.10.3. The powers of the SPV incorporated should include the design and implementation of privatization framework inclusive of identification of prospective Developers under the appropriate mechanism/ structural arrangements.

0.10.4. The new SPV Company, after induction of the Developer, would essentially be a joint venture representing the dominant business and strategic interests of private developer on one hand and regulatory interests of Central and State Governments on the other.

0.10.5. The ‘Rights to development’ of ‘Right of Way’ will vest solely in the SPV promoted for the establishment and operations of the transportation system. This enabling resolution/legislation would also empower the Developer to institute proper collaboration mechanisms if deemed necessary including leasing, franchising, joint venture etc. for the development of other facilities in the project apart from the Sky Bus system.