Final Report
Investment Proposal - Ferry Services

RETA 6293: Cities Development Initiative for Asia
June 2010

Pre-Feasibility Study
Urban Transport, Cochin, India

Cities Development Initiative for Asia
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Investment Proposal - Ferry Services

GlobalWorks

Forward

This investment proposal is one of three investment proposals developed under a transport sector pre-feasibility assessment (PFS) for Cochin, India. The PFS was jointly funded by the Cochin Corporation and the Cities Development Initiative for Asia (CDIA), and conducted between December 2009 and June 2010. The outputs of the PFS include an innovative transport sector strategy for Cochin, together with three high-priority transport sector investment proposals for immediate implementation. These proposals include ferry services, priority bus lanes, park and pay and pedestrian over bridges, and pedestrian precincts with supporting park and pay facilities. This report addresses the investment proposal for the ferry services.

The proposal firstly summarizes the status, constraints and challenges facing Cochin's transport sector, leading to a summary of the innovative transport sector strategy which has been developed for the city to meet these challenges. This then leads into a presentation of the proposed ferry service investment proposal, providing technical, financial, economic, and social and environmental safeguard analysis for pre-feasibility due diligence. The proposal also provides a preferred implementation schedule for the initiative, and recommends institutional restructuring and strengthening activities necessary to assure long term viability of the investments. There is considerable public private partnership (PPP) opportunity in the ferry services proposal. The PPP potential is also therefore addressed.

Formulation of this PFS has only been possible due to the vision and leadership provided by the Corporation through the Mayor Professor Mercy Williams. In addition, the support and contributions of Mr R.K. Singh I.A.S., Secretary Local Self Government Department, Dr. M. Beena I.A.S., District Collector, Mr T.K. Jose I.A.S., Managing Director Road and Bridges Development Corporation of Cochin, Mr Ajit Patil I.A.S., Corporation Secretary and former Mayor, Mr K.J. Sohan are gratefully acknowledged by the project team.

Two public stakeholder workshops were held during the course of the PFS. These provided invaluable insights on the issues of most concern to residents and businesses in Cochin. The project team expresses its thanks to all those who attended, participated and contributed in so many ways to the thoughts and strategies developed for this investment proposal.

Table of Contents

Figures

Appendices

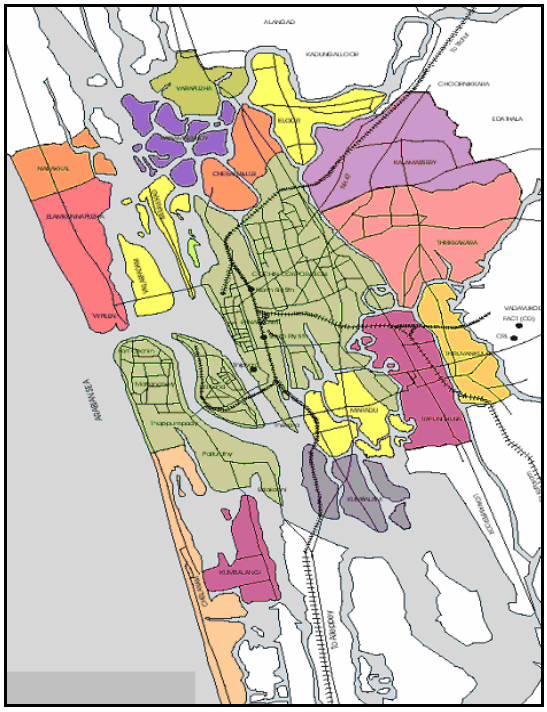
Executive Summary

City and District Profile

Cochin is the second most important port city on the western coast of India. It is located in the Ernakulam district of the central region of the State of Kerala, along the Arabian Sea and Vembanad Estuary. The city is well connected to other parts of the country with transportation systems of air, road, rail and waterways. The National Highway NH-47 passes through the city's central business district (CBD), while NH-49 and NH-17 originate from the city. The Cochin International Airport is located 32 km from the city centre. The Greater Cochin Development Authority (GCDA)[1] covers an area of 732.11 square kilometres (km²) and has a population of 1.933 million, while the Cochin Urban Area covers an area of 345.88 km². The jurisdiction of the Cochin Corporation (Corporation) extends over an area of 94.88 km². In 2001 it had a population of 596,000.

Cochin is unofficially referred to as the 'economic capital' of Kerala by volume of trade. In recent years, the city has witnessed heavy investments, thus making it one of the fastest-growing second-tier metro cities in India. Cochin's urban configuration includes several island residential communities scattered along its western coast and in the backwaters of Kerala. This configuration is unique to Cochin and highlights the crucial role of water transport in providing mobility for these island communities. The city has a long background in the fishing industry and has relied on water transport since the early days of settlement.

The modern development of Cochin has been closely linked to the creation of an all-weather port on Wellington Island in 1940, as well as the extension of rail and road networks to and from the port area. Since then, the area has developed rapidly; attracting industries, commercial establishments, work centres, public/semi public institutions and retail trading centres. This investment proposal for ferry services will dramatically improve water transport services and facilities for Cochin's island communities and mainland residential colonies, significantly enhancing their access to the urban facilities of the growing Cochin urban area.



Cochin's Backwater Network of Island Communities and Surrounding Urbanised Area

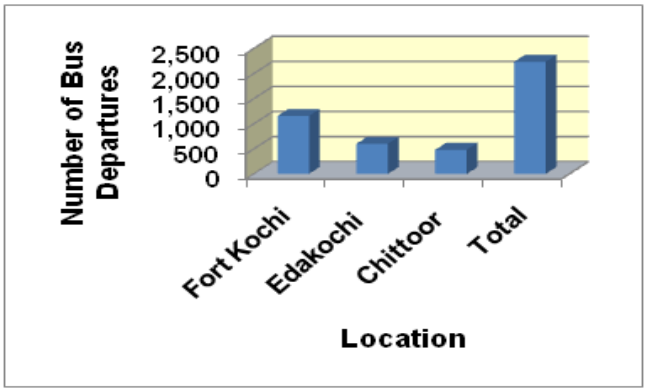
Investment Proposal Rationale

From an urban and transport planning perspective, Cochin is at a crossroads. In the face of increasing levels of congestion, Cochin's urban area continues to expand. The rate of growth in private vehicle ownership, combined with the inadequate road network is unsustainable. The city has grown in a largely unplanned fashion, with major growth along the key highway arterials towards the east. Private sector led development is rapidly outstripping the capacity of the Government sector to provide for the transport sector in the future. Consequently, numerous transport network links and intersections in and near the CBD are either at capacity or exceeding it; a situation will progressively worsen.

[1] The GCDA is the planning and urban development Authority for the metropolitan area of Cochin.

Cochin owes its recent economic development to its island communities; primarily the role of the port in the formation of the harbor, and ongoing developments along the shores of the backwaters. Historically, ferry transport was **the** key mode for passengers and for transporting farm produce and seafood to markets due to the city having an extensive network of water canals which penetrate into the urban area. In fact Cochin has over 60 jetties located in the backwaters. Promoted as a tourist destination, the backwater and island communities have therefore long relied on water transport to access the mainland. With increasing commercial development and rising private vehicle ownership however, there has subsequently been a 'policy shift', resulting in island communities being connected to the mainland with road bridges.

These road connections caused a substantial shift from ferry to road based transport. The continuing modal shift from ferries to the roads sector is exacerbating congestion levels. In 2008, over 2,200 daily bus departures were recorded from key island locations to the mainland (figure opposite) carried passengers, many of whom previously relied on the ferry network. The estimated daily passenger demand for ferry services is 18,000. This is despite ferry journeys taking less than 20 minutes compared with up to one hour by bus. Despite the substantial potential for passenger ferry travel, there is little being done to maintain market share.



Daily Bus Departures:
Island Communities to the Mainland

Vessels are in a poor state of repair; and public jetties and ferry terminals are run down and lack essential modern passenger facilities[2]. With the road connections between the islands and the mainland becoming increasingly congested and in a constant state of poor repair, the option for a revival of the ferry mode is rapidly becoming a reality. Such a revival would provide fast and direct connections, and assist in relieving congestion pressures on key arterials. Improved ferry services will therefore play an increasingly important strategic role in serving the future travel demands and improving the overall mobility of the island residents. This is of crucial importance, as the primary employment areas are located on the mainland, and commuting demands across the backwaters to service these employment activities will increase over time.

This ferry services investment proposal emanates from a wider, strategic review of Cochin's transport sector, undertaken by CDIA at the request of the Cochin Corporation. This review has determined there is an unmet demand for travel between the island communities and the mainland. The target daily capacity of this ferry services investment proposal is 100,000 passengers. This is therefore a substantial investment project. This growth in ferry travel will generate substantial reductions in carbon emissions[3]. With the natural beauty of the backwaters, there is an added opportunity for the tourism market to be developed. Finally, this investment will contribute to delivering an environmentally sustainable transport system which is in accordance with the objectives of National Urban Transport Policy.

Technical Description and Aspects

The ferry services investment proposal comprises ferry and terminal upgrades for five of Cochin's island ferry routes. These routes have been selected due to their significant passenger demand potential, and

[2] Other than at Ernakulam and the High Court.
[3] Especially from Chittoor, on the Goshree Bridge, on the NH47 from Thopumpady and from Thevara.

their overall strategic importance in promoting transport system integration. The five route upgrades include a total of 15 new or improved ferry terminal facilities, and the provision of twelve purpose-built, low wash type catamaran passenger vessels, which are fast, versatile and efficient.

The upgraded terminals will include, (i) floating pontoons with islands, (ii) covered walkways from the vessels to the waiting areas, (iii) either terminal waiting areas or covered 'at-shore' pontoon waiting areas, (iv) pedestrian ramps, and (v) site landscaping and cosmetic improvements. The terminal facilities will be modern and efficient, yet low cost, and provide completely covered walkways to the vessels. The floating pontoons are the basis for the design of all terminals, and are illustrated as follows..

Floating Pontoon

Floating Pontoon with Shore-Based Waiting Area

Vessel Mooring Parallel to the Shoreline

Floating Pontoons

The proposed vessels are low wash type catamarans referred to as Kochi Cats. These purpose built vessels will include the following technical specifications: (i) capacity – 163 passengers, (ii) length, beam and draft are 25.5, 7.6 and 1.42 metres respectively; (iii) clearance – 8 metres;(iv) displacement - 35 tonnes; (v) operating speed – normal at 18 knots, maximum at 25 knots; (vi) hull – aluminium; (vii) deck and upper section – fibreglass. Due to their speed and carrying capacity, and to the efficiency of the pontoon loading/unloading systems, the Kochi Cats will provide a dramatically improved ferry service in terms of safety, comfort, speed and reliability. The Kochi Cats are illustrated as follows.

Kochi Cat

Kochi Cat: Front Loading

Kochi Cat Interior

Kochi Cats

The estimated capital cost of this ferry services proposal is US$ 49.5 million. The location of the proposed five ferry services routes are shown overleaf.

Location of Proposed Ferry Services

Economic Analysis

The economic analysis has identified the following project costs and benefits, and sensitivity analysis;

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Economic Cost-Benefit Analysis

Details	Present Value (Rs. million)[1]
Costs	
Capital costs	1,658
O&M costs	311
Total costs	1,969
Benefits	
Savings in Travel Time Cost - Ferry Users	1,177
Savings in VOC - Ferry Users	2,233
User cost Savings to Parking Users	40
Total Benefits	**3,450**
Economic Return Measures	
Net present value (Rs. Million)	1,481
EIRR (%)	**22**

[1] In 2010 prices
Discounted to 2010 at 12% real discount rate.

Source: Consulta

Sensitivity Analysis

Details	EIRR
Main Evaluation [a/]	22%
Capital Cost Overrun [b/]	19%
Switching Value [c/]	89%
O&M Cost Overrun [d/]	22%
Switching Value[c/]	475%
Decrease in Project Benefits [e/]	18%
Switching Value[c/]	43%
One Year Delay in Implementation	22%
All Four Tests Combined	14%

a/ Base Case
b/ 20% increase in capital cost.
c/ Calculated as the percentage change in a variable required for EIRR to reduce to 12%.
d/ 20% increase in O&M cost.
e/ Decrease in project benefits by 20%.

The evaluation indicates that the ferry services investment proposal is expected to be economically viable, with the calculated EIRR values exceeding the economic opportunity cost of capital. The sensitivity analysis demonstrates the robustness of this result, with the investment proposal being economically viable even when a combination of sensitivity assumptions is tested. The calculated EIRR value is also considered to be conservative, as there are a number of economic benefits that have not been quantified, such as tourism benefits, and reduced pollution leading to a cleaner city.

Financial Analysis

A financial analysis was carried out using existing fares in the range of Rs 6 to 10 depending on the route; existing parking charges of Rs 10 (for cars) and Rs 3 (for two wheelers); and existing commercial

space monthly rents (Rs 500 per square meter). For analytical purposes, an increase of 15% every third year has been considered in respect of fees, parking charges and rents.

The assumptions and approach used in the calculation of the FIRR include, (i) all revenues and costs are stated at constant 2010 prices, (ii) all revenues and costs are calculated on an incremental basis, that is, the difference between "with investment proposal" and "without investment proposal" situations, and (iii) investment proposal capital expenditures are recognized at the time they are incurred during the period of implementation. Sensitivity analyses have also been carried out to determine the possible effects of adverse changes on the investment proposals. The key variables considered in the sensitivity analysis are, (i) 10% increase in capital costs, (ii) 10% increase in operation and maintenance (O&M) costs, (iii) 10% decrease in revenues, and (iv) the worst case scenario. The results of the FIRR calculation and sensitivity analyses are summarized as follows..

FIRR (%) for Ferry Services - Combined for All Routes including Parking Facilities

Component	Base Case	Capital Cost Increased by 10%	O&M Costs Increased by 10%	Project Revenue Decreased by 10%	Project Delay by One Year
All Routes	140%	13.0%	14%	13%	14%
Route 1	14%	13%	14%	12%	14%
Route 2	15%	14%	15%	13%	15%
Route 3	13%	12%	13%	12%	13%
Route 4	12%	11%	12%	11%	12%
Route 5	13%	12%	13%	12%	13%

Source: Consultant Analysis

FIRR Sensitivity Analysis – Low, Moderate and High Cost Recovery

Component	Base Case	Capital Cost Increased by 10%	O&M Costs Increased by 10%	Project Revenue Decreased by 10%	Project Delay by One Year
Lower fee: Low cost recovery	11%	10%	11%	10%	11%
Moderate fee: Moderate cost recovery	14%	13%	14%	13%	14%
Higher fee: High cost recovery	17%	15%	16%	15%	16%

Source: Analysis

The ferry services investment proposal appears financially viable with a combined IRR of 14.0% for the total investment proposal. This FIRR is higher than the Weighted Average Cost of Capital (WACC), which under different financing scenarios ranged from 2.9% to 5.7%. The results of the sensitivity analysis underline the robustness of the investment proposal even under unfavorable scenarios of sensitivity. In all the above scenarios, the returns are also considered sufficient to attract private sector investment if so desired.

Both the economic and financial analyses rely on the assumed patronage being achieved. Further surveys of existing and potential customers will be required to confirm the patronage assumptions before any decision to invest is made.

Financing Options and Public Private Partnerships

There are potentially several public and private sector financing options available for the US$49.5 million required for this proposal. Two public sector options are considered here as well as the option for private sector funding. The first public sector option is through the JnNURM program, which would include grant funding from both the National Government (50%) and State Government (30%); with the balance (20%) to be provided by the Corporation as its own equity provided from its own resources,

from the State Government, or from private modalities. This option would naturally include applications to the National and State Governments, together with convincing justification of the benefits of the investment package and the high priority nature of it.

The second option is to secure international donor funding, such as through the partners of the CDIA. This would include a donor-funded loan or loans, with an equity contribution provided through the Corporation's own resources, the State Government or from private modalities. Such donor funded loans vary in type, duration, repayment schedule, costs, interest rates and other parameters, and would require a detailed proposal which conforms to the application requirements of a particular funding agency. The potential also exists to supplement conventional loan funding by parallel grant funding from donor agencies.

There are also options for private sector funding. Several of Cochin's ferry services are currently operated by the private sector. Although these services face many challenges and only provide a marginal level of service, they do demonstrate that a PPP enabling environment does exist in Cochin, and that the private sector is able to operate in the ferry subsector with some degree of sustainability. In addition, several private sector groups have already expressed interest to run additional ferry routes, further demonstrating the potential for expanded and enhanced PPP involvement in the sector. In the national context, the Indian Government fully recognizes role the private sector can play. As a result, PPP is evolving as a viable option for infrastructure investment and operations, and there is commitment and willingness at all Government levels to promote and support PPP. At the local level, PPP is recognized by the Cochin Corporation as a viable modality for infrastructure investment and provision, and to date there have already been several modest PPP innovations in Cochin's transport sector.

As a consequence, there are a number of viable of options available for the funding and delivery of this proposal. These are summarised below and should be further evaluated by the Corporation during the subsequent feasibility assessment phase;

1. Secure investment financing through Government programs or international donor agency support, while considering further the potential for private sector financing through BOT modalities. .

2. In the event that the investment proposals are financed through Government or international donor agency financing, then consider carefully the various options available under competitively bid, performance based PPP operations contract modalities.

3. Develop the necessary skills and capabilities to properly manage the PPP contracts throughout the procurement, design, build and operations stages of the initiative.

Investment Proposal Benefits

A SWOT analysis has been used to evaluate the strengths, weaknesses, opportunities and threats of the proposed ferry services investment. This analysis is summarized as follows.

Strengths	Weaknesses	Opportunities	Threats
Relatively simple, straightforward project	Popular perception that Government is unable to deliver	Demonstrates that the Corporation can deliver infrastructure projects	Change in Government and transport policies and priorities
Meets a priority need of Cochin's island communities	Potential disjoint in intermodal operations such as ticketing	Pioneering project with substantial expansion and replication potential in Cochin	'Grandfather rights' issues
Supports Cochins transport sector strategy	Perception that this first phase investment is too large	Innovative PPP project for national replication	Increasingly congested sea lanes
Widespread Government and stakeholder support	Local capacity constraints to manage and operate system	Opens up a range of opportunities for island communities	Weather
Supports intermodal transport development		Supports the tourism sector	
Strengthens climate change and climate proofing initiatives			

A PLEST analytical framework has been used evaluate the investment proposal in terms of political, legal, economic, social and technological constraints. This analysis is summarized as follows.

Political	Legal	Economic	Social	Technological
Change in government removes support for initiative	Sea lane restrictions	Temporary displacement of businesses during project construction	Resettlement complaints	New system
Poor perceptions of Government's ability to deliver	Resettlement complaints	Livelihood impacts on the existing private sector ferry operators	Livelihood impacts on the existing private sector ferry operators	More complex operation and maintenance requirements
Route 'cherry-picking'				

Beneficiaries from investments in the ferry network include the general community and current operating staff. The poor and socially excluded island residents will benefit significantly from the investment proposal through, (i) better accessibility to the city, their workplace, and other activity centres, (ii) affordable transport alternatives to travel into the city, (iii) better living conditions and reduced pollution, and (iv) potential employment opportunities arising from investment construction and operations. These benefits have been identified and allocated against the three primary physical components, namely ferry services, ferry terminals and supporting park and ride facilities. The following figure summarizes this information.

Investment Proposal Component	Beneficiaries	Benefits
Ferry Services	Existing Ferry Passengers	– Reduced travel time – Higher trip frequency – Improved service reliability – Enhanced comfort and safety – Convenient modal interchanges – Improved accessibility through route rationalisation
	Passengers Diverting from Road Based Transport	– Reduced travel time – Reduced vehicle operating costs – Higher trip frequency – Improved service reliability – Enhanced comfort and safety – Convenient modal interchanges – Improved accessibility through route rationalisation
	Ferry Operators and Employees	– Better amenities (toilets, washing facilities, drinking water points, rest areas) – Improved commercial facility provision (food outlets, shops) – Improved traffic flow within and around terminals
Ferry Terminals	Ferry Service Passengers	– Improved waiting facilities – Provision of amenities (toilets, drinking water points, rest areas) – Provision commercial facilities (food outlets, shops) – Enhanced passenger comfort – Less congestion – Less noise pollution – Improved streetscapes – Improved passenger safety
	Adjacent Neighbourhood	– Expanded parking facilities – Less congestion – Less noise pollution – Improved streetscapes – Employment opportunities
	Business Community	– Enhanced business and commercial activities – Expanded commercial areas – Replacement of dilapidated stalls – Improved streetscapes
Park and Ride Facilities	Vehicle Users	– Reduced travel time – Reduced vehicle operating costs – Improved parked vehicle safety – Improved travel comfort – More safety during ferry travel
	Adjacent Neighbourhood	– Less haphazard parking – Expanded parking facilities – Less congestion – Less noise pollution – Employment opportunities
	Business Community	– Improved business opportunities – Improved parking – Increased business potential from more convenient parking

Social Due Diligence

The efficiency, reliability and mobility provided by a modern ferry system will have a direct and profound impact on island communities where street systems are narrow and there are limited alternative modes of transport. Improvements in transport and mobility options have been proven to help reduce poverty levels in these often isolated communities. Where new residential colonies are being established along the backwaters, modern water transport facilities provide a viable option for travel to the CBD. The household interview survey undertaken during this study confirmed these observations. Key findings of the social policy analysis are provided on the following figure

Social Policy Analysis: Ferry Services Investment Proposal						
Project Number	**Project Name**	**Stakeholder Consultation**	**Poverty Focus and Poverty Targeting**	**Gender Impact**	**Potential Safeguard Issues**	**Other Social Risks/ Vulnerabilities**
FS1- 01	Route 1	Household surveys and stakeholder workshops. Community consultation.	The investment proposal will assist in addressing mobility for those fishing village residents who must commute to Fort Kochi and Wellingdon Island for employment and other purposes on a regular basis. By hubbing with the Ernakulam service at Fort Kochi, this will offer a convenient transfer to services to the mainland at Ernakulam and High Court, This will improve access to medical and commercial facilities. Will provide improved safety and convenience for those reliant on ferry travel.	Improved access to key employment opportunities in traditional market and port areas. No specific gender impact.	Vypeen Terminal upgrade to be contained within existing site.	Nil apparent
FS1 -02	Route 2	Household surveys and stakeholder workshops. Community consultation	The investment proposal will improve access to Wellington Island and to the mainland by providing more regular and upgraded facilities. With services hubbing at Fort Kochi, passengers will have a convenient transfer to Vypeen Island for future employment opportunities at the LNG plant and the port facilities at Vallarpadam.	Improved access to key employment opportunities in traditional market and port areas. No specific gender impact	Mattancherry and Fort Kochi terminal upgrades to be undertaken in consultation with local street venders and shop owners to ensure impacts on businesses are managed.	Nil apparent
FS1-03	Route 3	Household surveys and stakeholder workshops.	The investment proposal will provide a welcome upgrade of services and facilities for faster and more convenient travel to employment, health and social opportunities on the mainland.	Likely to benefit non private vehicle owners significantly. Generally these will be female.	Terminal upgrades to be contained to reduce the need for land acquisition.	Nil apparent

Social Policy Analysis: Ferry Services Investment Proposal						
Project Number	**Project Name**	**Stakeholder Consultation**	**Poverty Focus and Poverty Targeting**	**Gender Impact**	**Potential Safeguard Issues**	**Other Social Risks/ Vulnerabilities**
FS1 -04	Route 4	Household surveys and stakeholder workshops Community consultation	The investment proposal will provide a quality link into the city centre at Ernakulam. Improved service levels and passenger facilities will enable residents to better access the CBD employment, health and commercial facilities more readily as there will not be a need to interchange onto a bus for a continuation to the CBD center as is the case at present.	Likely to benefit non private vehicle owners significantly. Generally these will be female. Student travel will also be assisted.	Terminal upgrades to be contained to reduce the need for land acquisition.	Nil apparent
FS1-05	Route 5	Household surveys and stakeholder workshops Community consultation	Limited stop ferry services from Chittoor will provide increased trip duration certainty for day labor commuters. At present service levels are unreliable and time consuming. With this new service additional access to the CBD at Ernakulam will be possible.	Day labor and school student travel.	Terminal upgrades to be contained to reduce the need for land acquisition.	Nil apparent

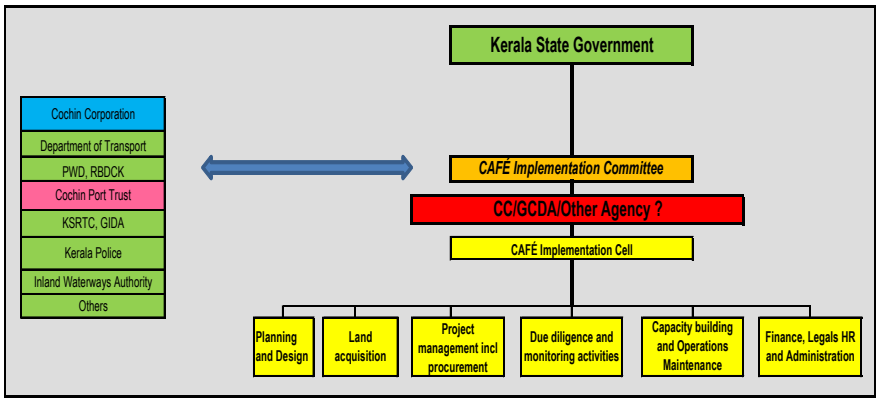
Social Policy Analysis: Ferry Services Investment Proposal

Investment Proposal Institutional Arrangements

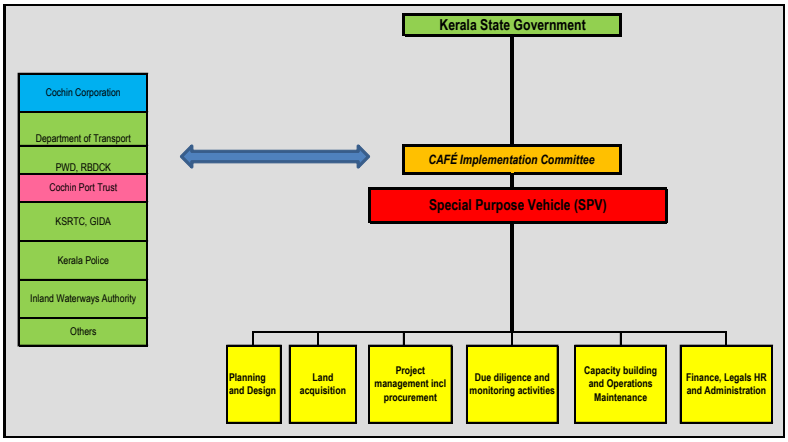
The investment proposal requires an integrated proposal of measures covering demand forecasting, vessel standards, infrastructure design, community engagement, legal and capacity building expertise. These skills are currently lacking in the Corporation. Therefore, for implementation purposes, an institutional structure with these skills and supporting accountabilities will be required. While there is merit in the model which advocates a single all encompassing agency (the Urban Mass Transit Authority model), this is considered premature for Cochin. For the immediate future, there is a recognised value in co-ordination committees in the development and implementation of sector improvements. This is a model which is in place in Cochin and irrespective of the effectiveness of this model, is considered a basis for the immediate future on the basis of it being a familiar model to start with. In addition, such a familiar model gives everyone a sense that their role in the sector is not being diminished.

A co-ordinating committee, nominally referred to as CAFE Implementation Committee (CIC) with the correct level of empowerment is considered be the most practical option for the immediate future. Such a committee would in turn oversee an Agency charged with the delivery of the policies developed and projects sanctioned by the CIC. This Agency could be formed by drawing personel and resources from existing Agencies involved in the transport sector. It would be supported by a CAFE implementation cell, resourced for the specific purpose of front line delivery of the proposal. Alternatively, Special Purpose Vehicle (SPV) could be established by the Corporation with the specific mandate to implement the proposal. These model options are illustrated in the following figures.

CAFE Implementation Cell Model



CAFE Implementation SPV Model



It will be the responsibility of the Corporation to make the decision on the appropriate model for Cochin. Whatever decision is made, the body will need to be the Nodal Agency for all matters relating to the delivery of this proposal and other responsibilities addressing master planning of urban development and the provision of sustainable urban transport outcomes which conform with and support the National Urban Transport Policy.

Climate Change Analysis

The climate change analysis considered emission savings and climate change proofing of the proposal. The emission savings focused only on GHG emissions for the proposal. The climate proofing analysis considered the measures required to offset the effect of climate change on the investment in the proposal. The net total emission savings over a five year period for the proposal is expected to be 38,000 tonnes of CO2. On an annual basis, the net emissions savings will be approximately 7,500 tonnes. The following figure provides a breakdown of the contribution of the elements to this saving.

GHG Emissions Savings Ferry Services Investment Proposal

Package	Passenger trips	Emissions savings (TCO2)		Project Emissions (TCO2)		Net Annual Emissions savings (TCO2)	5 year Net Emissions savings (TCO2)
		Annual emissions savings from modal shift	Annual Emission Savings due to decongestion	Annual Ferry Emissions	Emissions due to construction		
Route 1: Vyppen to Fort Kochi	12,000	1,842	159	59	19	1,923	9,691
Route 2: Mattacncherry, Fort Kochi, Ernakulam and	48,000	5,424	138	825	39	4,697	23,641
Route 3: Edakochi to Thevera	9,000	760	111	83		788	3,941
Route 4: Panchayat Terminal to High Court	12,000	666	78	734		10	49
Route 5: Kumbulam to Chittoor via Ernakulam, High Court and Vaduthala	12,000	733		587		146	732
Total	**93,000**	**9,424**	**486**	**2,287**	**58**	**7,564**	**38,053**

The impact of the effects of Climate Change on the transport sector is summarised in the following figure. This highlights components requiring attention during design and operation of the ferry proposal.

Climate Change Impact on Various Transport Infrastructure Type

Climate Impacts	More Vulnerable Areas	Transportation Mode Impacted	Extent of Impact (Low/Moderate/Severe)
Heat Waves	City Business District (CBD)	Road, Pedestrian	Moderate
Water shortage	CBD, Lower Cochin, Upper Cochin	Road, Pedestrian	Low
Coastal Floods (Sea level rise)	Lower Cochin, Upper Cochin	Road, Pedestrian	Severe
		Water	Moderate
Floods (Extreme Rain)	CBD, Lower Cochin, Upper Cochin	Road, Pedestrian	Severe
		Waterways	Moderate
Cyclone	CBD, Lower Cochin, Upper Cochin	Road, Waterways, Pedestrian	Severe[1]

Based on these anticipated impacts, the climate proofing actions required for the ferries and the complementary land infrastructure for this investment proposal are identified in the following figures.

Adaptation Measure for Ferries/Waterways

Relevant Climate Impacts	Adaptation Measures	Stage of Intervention
Coastal Flood	Enhance flood defenses such as sea walls, protection of coastal wetlands (as buffers)	Planning
	Use of more durable materials in ferries, jetties	Design
	Incorporate higher levels of flooding into future bridge design, pontoons design	Planning, Design
	Build more redundancy into the system – Spare ferries	Planning
Flood (Extreme Rain)	Use of more durable materials in ferries, jetties	Design
	Incorporate higher levels of flooding into future bridge design, pontoons design	Planning, Design
	Build more redundancy into the system – Spare ferries	Planning

Adaptation Measures for Parking Terminals

Relevant Climate Impacts	Adaptation measures	Stage of Intervention
Coastal Flood, Flood (Extreme Rain)	Improve drainage infrastructure to be able to deal with more intense rainfall	Planning
	Audit drains regularly	Operation
	Enhanced pumping to discharge water	Operation
	Provision of storm water utility system as per standards	Planning
	Make flood risk assessments a requirement for all new development	Planning
	Enhance foundations	Design
	Use of more durable materials, such as more corrosion resistant material	Design
	Enhance condition monitoring of sub grade material especially after rains, flooding	Operation

Risks

A number of potential risks have been identified during the PFS, which relate directly to the development and implementation of this investment proposal. While there is widespread support for the overall ferry investment proposal, individual components may be subject to risks during their development and implementation. Subject to the assumptions documented in the PFS, the key risks and potential responses are as follows:

Institutional and Political: The political landscape has numerous weaknesses in relation to the ability to implement projects in a timely and consultative manner. For successful implementation of this initiative, it is essential that this aspect be corrected and remains in a corrected state. Where external union influence, which has the effect of hindering the implementation of the proposal on unsustainable grounds is likely, measures should be put in place to manage this process in a more proactive manner.

Public Compliance and Enforcement: There is a history of non compliance with established regulation. As a result, there is a general acknowledgement within both the private and public sector that public compliance and enforcement is a fluid situation and is available to substantial variations in “interpretation”. It will be therefore be important for this issue to be addressed and corrected so that the public trust in the ferry sector can be reinstated and the market for travel

be re-established and maintained. Regarding service performance, it will be important for the relevant agencies to develop operation and maintenance manuals for the ongoing compliance and enforcement regimes. This will assist in bringing much needed transparency to the process.

Public Confidence and Support: Many of the elements which have sapped public confidence and support are related to the political process and the practice of "settling" disagreements and non compliance issues without the need for litigation. This issue needs to be corrected.

In addition much of the cause of the erosion of public confidence is as a result of the practice of agencies failing to engage the community in a proactive manner and encouraging widespread involvement in project planning, design and delivery. This aspect can be addressed relatively easily through a simple realignment of staff attitudes and practices so that as a first priority, the affected community is consulted early rather than later in the process. In addition, where issues potentially affect the project, genuine and proactive procedures need to be developed as a basis for project delivery. With the community being included as part of the solution, rather than (as is often the current view) being part of the problem, project risks will lessen, both in number and in intensity. Without this support, there could be a risk to the proposal.

Agency Capability: There is a direct relationship between the technical capability of an agency and the ability of that agency to articulate in a clear and logical manner, the benefits of projects and programs. In the context of this proposal, the ability of the Corporation to market it to both investment partners and the public, will be intimately associated with the technical ability of the agency and the staff involved. Unless the Corporation improves its current level of technical capability to plan, design, procure and manage procurement contracts, there may be a significant risk to the project. This risk may manifest itself in funding shortfalls and reduced revenue streams through reduced public support.

Contingent Liability Risk: There is strong potential for this proposal, or at least some routes, being implemented under a PPP model. There are are financial risks in developing and implementing PPP based infrastructure projects. The financial commitment required of the Corporation for this proposal has a fiscal cost and this represents a risk if the Corporation is required to provide an operating subsidy. Any capital cost guarantees if required from the Corporation also create obligations to make payments (even if in extraordinary circumstances). As the ultimate underwriter of a PPP, the Corporation may be faced with assuming the full financial responsibility for the project in the event that the private sector partner withdraws for financial reasons (ie the project is considered poor value for money). Therefore the key challenge for the Corporation is to achieve the right balance between risk and reward.

Overall, the investment proposal risk is rated at this pre-feasibility stage as being low. The proposal does not have any widespread political or institutional opposition, and there is widespread public support for the improvements proposed. In addition, a substantial effort has been directed at assessing the financial capacity of the Corporation to participate financially in the project. None of these have raised any significant concerns from a risk perspective. The key risk is more related to the processes and practices of the Corporation in relation to project preparation and delivery. It is this aspect that will require a focus of attention so that there is ongoing support of the public for the proposal. Risk mitigation will be the key in successful proposal delivery. Whatever mitigation measure is determined, it must be framed to include the principles of openness and transparency, trust, legal soundness, and being good for business. A compromise on any one of these principles could have serious consequences for the delivery of the proposal and its relevant components.

1.0 City and District Profile

Cochin is the second most important port city on the western coast of India. It is located between 9º 52' and 10º 10' North Latitude and between 76º 14' and 76º 21' East Longitude, in the Ernakulam district of the central region of the State of Kerala, along the Arabian Sea and Vembanad Estuary. The city is well connected to other parts of the country with transportation systems of air, road, rail and waterways. The National Highway NH-47 passes through the city's central business district (CBD) while NH-49 and NH-17 originate and radiate outwards from the city. Cochin is 220 km north of Thiruvananthapuram, the State Capital. The Cochin International Airport is 32 km from the city center. The Greater Cochin Development Authority (GCDA) area, which encompasses the majority of the urbanized area, covers 732 square kilometres (km²) and has a population of 1.933 million (19.33 lakhs), while the more centralized Cochin Urban Area covers an area of 346 km². The jurisdiction of the Cochin Corporation (Corporation) extends over an area of 95 km², and in 2001 had a population of 596,000 (5.96 lakhs).

The Corporation area of jurisdiction includes the established urban areas of west Cochin, numerous island communities and those expanding urban areas to the east to include Edapally, Kakkanad, Vytilla and adjoining development sites west of the National Waterway. It includes Kochi Island, Wellingdon Island and the southern extremity of Vypeen Island. The GCDA area extends beyond this to include the islands north to Chittoor and south to Kumbalam as well as mainland areas further north to Alwaye and south to Peta. For the purposes of this investment proposal, both GCDA and Corporation areas of jurisdiction are served.

Cochin's urban configuration comprises island communities along its western coastline and backwaters. These communities have a long background in the fishing industry and have relied on water transport since the early days of settlement. West Cochin, the areas containing these island communities and the western extremity of mainland development remain largely residential with the CBD located between the rail line and the coast. Kerala's dominant industrial zone of Kalamaserry lies to the northeast and is within the commuter shed of Cochin. It is being linked by road and rail to expanded container terminal facilities at Vallapadam in West Cochin

Cochin is unofficially referred to as the 'economic capital' of Kerala by volume of trade. In recent years, the city has witnessed heavy investments, thus making it one of the fastest growing second-tier metro cities in India. Sales tax income generated in the Cochin Metropolitan Area contributes heavily to state revenues. The city's economy can be classified as a business economy with emphasis on the service sector. Major business sectors include gold and textile retailing, spices, seafood exports, information technology (IT), tourism, health services, banking, ship building, and the fishing industry. The economy is mostly dependent on trade and retail activities. As in most of Kerala, remittances from non resident Indians (NRI's) is a major source of income.

The city's hinterland is highly industrialized, with Ambalamugal, Kalamassery and Alwaye containing many well established industries serving the needs of Kerala and neighbouring states. More recently, substantial urban developments such as the one million square feet Lulu shopping complex, Smart City, Cyber City and IT City are extending the urban footprint to the east at a rapid rate. Combined, these developments are helping transform Cochin into an urban area characterized by dense residential, commercial and port related activity in the west while towards the east; development is focussing on a mix of residential, IT employment centres and special economic zones. This development is largely driven by the private sector and without the guidance of a formal planning process.

The Port of Cochin is the third oldest port in India and a major generator of employment for the City and surrounds. Recent construction of the international container transhipment terminal with a planned ultimate annual throughput capacity of 3 million TEU's[4], and the liquid natural gas (LNG) plant on

[4] The term TEU refers to the 'twenty-foot equivalent unit', a measure used for capacity in container transportation.

Vypeen Island, will project Cochin into a major trading hub linking the entire southern India area to international markets in the Middle-East and Europe. Governments' proposals to exploit the full capacity of the port are expected to lead to greater industrialization and employment demand in the city and surrounding areas. Endowed with considerable natural beauty, Cochin also anticipates tourism to continue to grow into a prominent sector. Tourism plays an important role in the economic development of the State and contributes a significant share of the State's economy. Tourism is an alternative economic growth source for Kerala and especially Cochin.

2.0 Investment Proposal Rationale

2.1 City Development Issues and Opportunities

From an urban and transport planning perspective, Cochin is at a crossroads. In the face of increasing levels of congestion, Cochin's urban area continues to expand. The rate of growth in private vehicle ownership, combined with the inadequate road network is unsustainable. Furthermore, the complexity of issues surrounding land acquisition for transport infrastructure suggests that a simple widespread 'road widening' approach is neither practical nor feasible. The urbanization pattern in Cochin is also displaying a trend which many Asian cities are struggling to avoid. New, largely uncontrolled eastern developments are being encouraged without the supporting transport infrastructure to sustain them in the long term; and in the west, population and urban development pressures increasingly impact on Cochin's island communities.

There is no urban or transport master planning being undertaken in Cochin; the city does not even have elementary geographic mapping capabilities. As a result, the city has grown in a largely unplanned fashion, with major growth along the key highway arterials. Private sector led development is rapidly outstripping the capacity of the Government sector to provide for the transport sector in the future. Consequently, numerous transport network links and intersections in and near the CBD are either at capacity or exceeding it; a situation will progressively worsen. Despite the completion of numerous transport studies over the past decade, there is little attention being given to any aspect of the sector that complies with the national urban transport policy.

Cochin owes its recent economic development to its island communities; primarily the role of the port in the formation of the harbor, and ongoing developments along the shores of the backwaters. Historically, ferry transport was **the** key mode for passengers and for transporting farm produce and seafood to markets due to the city having an extensive network of water canals which penetrate into the urban area. In fact Cochin has over 60 jetties located in the backwaters. Promoted as a tourist destination, the backwater and island communities have therefore long relied on water transport to access the mainland. With increasing commercial development and rising private vehicle ownership however, there has subsequently been a 'policy shift', resulting in island communities being connected to the mainland with road bridges. This is highlighted by the examples of the Venduruthy Bridge, and the more recent Goshree Island Bridge, which was constructed in the mid 1990s to connect Vypeen to the mainland.

These road connections caused a substantial shift from ferry to road based transport. The continuing modal shift from ferries to the roads sector is exacerbating congestion levels. In 2008, over 2,200 daily bus departures were recorded from key island locations to the mainland (Figure 1) carried passengers, many of whom previously relied on the ferry network. This is despite ferry journeys taking less than 20 minutes compared with up to one hour by bus. Added to this are the significant number of private vehicles commuting into mainland areas across the bridges. Together these circumstances are adding to Cochin's congestion levels and causing severe environmental pollution.

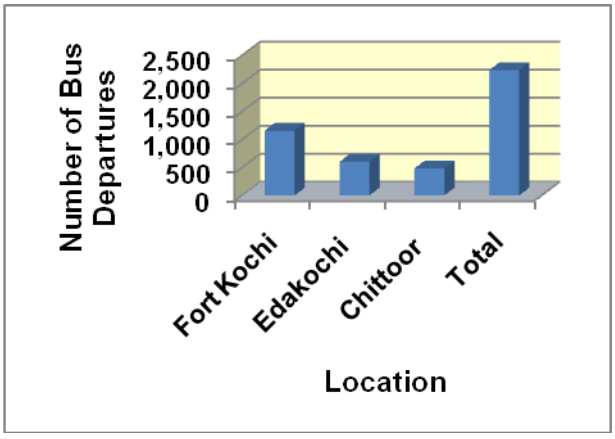


Figure 1: Daily Bus Departures: Island Communities to the Mainland

The modal shift to road has decimated the demand for ferry services. In addition, recent market research confirms that despite heavy demand and willingness-to-pay for improved travel, the decline in the ferry

market also relates to the relatively poor condition and reliability of passenger vessels, the primitive passenger terminal facilities, and the lack of integration with the bus network. Currently, the existing ferry services only cater for an estimated 18,000 passengers per day on the network's five key routes. Of these, some 12,000 passengers travel on the State-run services between Ernakulam, Fort Kochi, Mattancherry and Vypeen[5]. A high frequency, privately operated ferry shuttle operates across the primary shipping channel between Vypeen Island and Fort Kochi. In addition, a passenger ferry service links Ernakulam with island communities to the north at Chittoor, and to the south, locally operated private ferry services ply between various island and backwater communities[6].

Despite the substantial potential for passenger ferry travel, there is little being done to maintain market share. Vessels are in a poor state of repair; and public jetties and ferry terminals are run down and lack essential modern passenger facilities[7]. In addition, several routes on the network operate according to demand and will often only depart when sufficient passenger demand exists. With the road connections between the islands and the mainland becoming increasingly congested and in a constant state of poor repair, the option for a revival of the ferry mode is rapidly becoming a reality. Such a revival would provide fast and direct connections, and assist in relieving congestion pressures on key arterials.

Improved ferry services will therefore play an increasingly important strategic role in serving the future travel demands and improving the overall mobility of the island residents. This is of crucial importance, as the primary employment areas are located on the mainland, and commuting demands across the backwaters to service these employment activities will increase over time. Also, there are major industrial developments on the islands which could benefit significantly from improved ferry services; by enhancing the mobility of a 'backward flow' of workers travelling from the mainland. These developments include the port[8], the liquefied natural gas terminal and the Vallarpadam container transhipment terminal, the latter of which will be directly served through this investment proposal.

Overall, these port and seafaring- based developments highlight Cochin's future strategic role in linking southern India to the Asian, Middle Eastern and European markets. These developments are therefore destined to bring significant future employment opportunities to the area. Island communities and mainland communities close to the backwaters are therefore in a prime position to benefit. Improved ferry transport can therefore help them to better access these opportunities.

2.2 A Strategic Approach

This ferry services investment proposal is one of three proposals emanating from a wider, strategic review of Cochin's transport sector, undertaken by CDIA at the request of the Cochin Corporation. Including a wide range of stakeholders, the review culminated in the following strategic recommendations for Cochin;

1. City vision; to provide a **C**lean, **A**ffordable, **F**ast and **E**fficient transportation system for Cochin (known locally as 'CAFÉ Transport').

2. Policy drivers; (a) promoting a fair and equitable quality of life, and improved access to employment and social services for all Cochin's residents, (b) obtaining greater overall transport efficiency, (c) slowing private vehicle ownership growth, while promoting public transport, (d) encouraging non-motorized travel wherever possible, (e) improving modal interchanges, (f) managing eastern urban expansion while improving western linkages, (g) enhancing public

[5]. There is an increasing market for tourist travel on these services as they link the mainland with the historic centers of Fort Kochi and Mattancherry.

[6] Between Edakochi and Kumbalam; Thevara and North Kumbalam; and Thevara and Nettoor.

[7] Other than at Ernakulam and the High Court.

[8] A primary impetus of the city's growth, the port is a major employer with a workforce of 20,000 employees, sourced from neighbouring island and mainland communities.

awareness so they can be aware of, identify with, and support system improvements, and (h) reducing environmental pollution and improving transportation safety.

3. Target improvement areas; (i) to develop an integrated, pro-poor, safe and cost effective transport plan for pedestrians, public transport, and private vehicles, (ii) formally acknowledge governance shortcomings and commit to improvements, (iii) develop a staged improvement strategy for pedestrian, bus, ferry and rail systems, (iv) establish monitoring and evaluation systems for implementation effectiveness, (v) deliver a transport system which prioritizes climate change improvements, and (vii) identify public private partnership (PPP) opportunities and create a PPP enabling environment.

4. Modal priority; focusing the CAFÉ transport strategy towards modal priority and integration, with an emphasis on people and passengers rather than on vehicles. In this context, the order of modal priority is (i) non-motorized modes, including pedestrian footpaths, overbridges and precincts, supported by modal interchanges and car parks, (ii) public transport, including bus, ferry and rail transport, and (iii) private motorized transport, placed third in importance, and including cars, auto-rickshaws and two-wheeled transport vehicles.

2.3 Rationale for Ferry Improvements

There is an unmet demand for travel between the island communities and the mainland. This is demonstrated by the current network of routes and the constant community requests for improvements to be made in the sector. Furthermore, with the developments at the new container terminal, the LNG plant on Vypeen Island and the continuing influence the port facilities on Wellingdon Island have on the overall economy of the Cochin metropolitan area, the need for a quality ferry network is paramount.

The ferry services investment proposal directly supports Cochin's transport vision, by providing clean, affordable, fast and efficient transport services to island communities, which are primarily residential and include lower income residents. It also accords with key policy drivers, by providing better island community access to mainland employment opportunities and social services; promoting public transport modes; limiting the use of private vehicles; and significantly improving western linkages. These services will also support industrial growth and sustainability on Cochin's islands, by providing better access for employees and commerce in general.

The target daily capacity of the ferry services investment proposal is 100,000 passengers. This is therefore a substantial investment project, which translates to approximately 75,000 avoidable private vehicle trips or approximately 2,500 avoidable bus trips per day[9]. The impact of a reduction of these vehicle flows on traffic is potentially considerable as are the reductions in carbon emissions[10]. With the natural beauty of the backwaters, there is an added opportunity for the tourism market to be developed. Also, an increase in environmentally sustainable transport options being proposed by this proposal is in accordance with the objectives of national urban transport policy.

[9] At an average of 45 passengers per bus.

[10] Especially from Chittoor, on the Goshree Bridge, on the NH47 from Thopumpady and from Thevara.

3.0 Technical Description and Aspects

3.1 Overview

The ferry services investment proposal comprises ferry and terminal upgrades for five of Cochin's island ferry routes. These routes have been selected due to their significant passenger demand, and their overall strategic importance in promoting transport system integration. Cumulatively, the five route upgrades include a total of 15 new or improved ferry terminal facilities, and the provision of twelve purpose-built, low wash type catamaran passenger vessels, which are fast, versatile and efficient. The carrying capacity of the vessels is 163 passengers, operating at speeds of up to 25 knots. The ferry terminals will include floating pontoons to provide level boarding irrespective of tide height, expanded and improved passenger waiting and support facilities, and in some cases, improvements to modal interchange facilities. Cumulatively, the daily capacity of the ferry upgrades is up to 100,000 passengers per day. The overall impacts of the investments are summarized as follows;

1. **Improved passenger ferry travel times and service reliability:** by dramatically reducing passenger travel times when compared with road travel and existing ferry services, as well as improving service reliability,

2. **Expanding travel options by enhancing service levels:** by providing passengers with a regular and convenient additional transport option, which is more attractive than public and private road vehicle alternatives,

3. **Improving travel conditions for passengers:** by providing clean, comfortable and fully serviced passenger terminals, and safe, fast and comfortable vessels, and

4. **Enhancing modal interchange capabilities:** to allow passengers to better access the ferry services from private vehicles and other public transport modes.

These investments will completely replace the ferry services currently operating on these routes, totally eradicating the existing level of poor service delivery. Currently, these routes are constrained by primitive, poorly maintained and neglected terminal facilities and waiting areas, poorly maintained vessels, and the lack of passenger information timetables, information panels, and customer support portals for enquiries and complaints.

From a wider strategic perspective, the proposed investments represent the rebirth of a modern, comprehensive ferry service network in Cochin, intended to add mobility and travel options to the city's transport network as it develops into the future. It is considered a 'first phase' investment program which demonstrates a visible commitment to this important transport mode. It also provides a basis for future network expansion; instilling local understanding and confidence that improved ferry services can be made successful and viable, subsequently providing the impetus to develop and upgrade other routes[11]. Importantly for Government, it also provides a very sceptical public with a demonstration that Cochin's Government cares about the mobility needs of its residents and has the capacity to deliver improvements on time and in accordance with market demands.

The five proposed ferry routes are shown in Figure 2.

[11] There is already interest in Cochin to upgrade and develop new ferry routes, several of which could link to the core network skeleton developed by this investment proposal. An example of this is a proposal by the Thrikkakara Panchayat Residents Association's Apex Council, to link the proposed Vytilla Transport Hub with the future 'Smart City' and the Manakkakadavu and Pazhanganadu Tourism boat jetties, once the Vytilla Hub and Smart City are developed.

Figure 2: Location of Proposed Ferry Services

Terminal facilities are to be developed to cater for a maximum waiting load of 100 passengers per route served[12]. For the most part, the existing terminal facilities, while seemingly structurally sound,[13] will require refurbishment to provide for improved covered waiting areas and a covered walkway to and from the vessel. Importantly, floating pontoons will be installed at each terminal site to provide for rapid and level boarding and alighting.

The proposed vessels are referred to as Kochi Cats. These are catamarans with modern technical specifications including: (i) capacity – 163 passengers, (ii) length, beam and draft are 25.5, 7.6 and 1.42 metres respectively; (iii) clearance – 8 metres;(iv) displacement - 35 tonnes; (v) operating speed – normal at 18 knots, maximum at 25 knots; (vi) hull – aluminium; (vii) deck and upper section – fibreglass. Further specifications are contained in Appendix 2. An image of these vessels is contained in Figure 4.

3.2 Ferry Service Investment Proposals

3.2.1 General

All five of the ferry route investment proposals incorporate terminal upgrades and the provision of Kochi Cats. The upgraded terminals will include, (i) floating pontoons with islands, (ii) covered walkways from the vessels to the waiting areas, (iii) either terminal waiting areas or covered 'at-shore' pontoon waiting areas, (iv) pedestrian ramps, and (v) site landscaping and cosmetic improvements. The terminal facilities will be modern and efficient, yet low cost, and provide completely covered walkways to the vessels. The floating pontoons are the basis for the design of all terminals (Figure 3). They are a simple yet innovative concept as they allow level boarding (irrespective of tide levels) and provide vessel mooring where a ferry can approach the jetty at speed while running parallel to the shore, which greatly reduces 'passenger pick-up' times. In certain cases, the pontoons can be "tacked" onto an existing terminal jettiy without the need for a wholesale remake of the jetty.

Floating Pontoon

Floating Pontoon with Shore-Based Waiting Area

Vessel Mooring Parallel to the Shoreline

Figure 3: Floating Pontoons

It is envisioned that the Kochi Cats will be purpose-built, low wash type catamarans, capable of carrying up to 163 passengers, and achieving travel speeds of up to 25 knots (Figure 4). Due to their speed and carrying capacity, and to the efficiency of the pontoon loading/unloading systems, the Kochi Cats will provide a dramatically improved ferry service in terms of safety, comfort, speed and reliability.

[12] For Fort Kochi and Thevara with two routes, the waiting capacity will be 200 passengers.

[13] Based on visual inspections only; engineering testing has not been carried out in the PFS.

Kochi Cat

Kochi Cat: Front Loading

Kochi Cat Interior

Figure 4: Kochi Cats

Although each of the five ferry routes could be implemented individually, there is considerable value in standardizing the designs of vessels, jetties, pontoons and passenger waiting areas. Such standardization will offer 'interoperability' between services, and provide for effective 'whole of network' branding which can further assist in developing market confidence and increases in demand. Such interoperability also increases service flexibility, to be readily tailored to developing markets without the need for a wholesale restructuring of the sector. It will also encourage inter-service interchanging for travel beyond individual service areas. This represents the foundation of an integrated water transport system for Cochin's backwaters.

3.2.2 Route 1: Vypeen to Fort Kochi

The Vypeen to Fort Kochi route has an existing service which requires the upgrading of both vessel and terminal infrastructure. The existing route and current vessel infrastructure conditions are shown in Figure 5. This route serves the traditional link between the fishing villages on Vypeen Island and the warehousing and trading activities from Fort Kochi to Mattancherry. In addition, when day labour is required at the Port on Wellingdon Island, this also draws from this community. In the future, when the LNG plant on Vypeen and the new container terminal at Vallarpadam become operational, an increase in the flow of passengers between Vypeen and Fort Kochi is anticipated. As official data regarding the market characteristics for this service does not exist, further detailed analysis will be required to ascertain the extent of this demand so that design parameters can be confirmed for the terminal infrastructure and in particular the vessel design.

This service will be operated by one high speed Kochi Cat, providing a 15 minute trip frequency during the service hours of 6.00am and 9.00pm daily. Future capacity on this route will be up to 12,000 passenger trips per day. Both the Fort Kochi and Vypeen passenger terminals will be modernized to include a minimum of 200 square meters (m^3) of floor space and basic tourist facilities and food stalls Floating pontoons will also be incorporated for all day level boarding and alighting. Passengers on this service travelling to Ernakulam or the High Court Terminals will be offered a convenient transfer at the Fort Kochi terminal.

The indicative capital costs of the Route 1 Investment Proposal is US$ 9.1 million.

Figure 5: Route 1 - Vypeen to Fort Kochi

3.2.3 Route 2: Mattancherry, Fort Kochi, Ernakulam and High Court

Four Kochi Cats will operate this service on a 15 minute frequency during the service hours of 6.00am and 9.00pm daily. Route capacity will be 48,000 passenger trips per day. Additional park and pay facilities, in conjunction with the development of the bus terminal for the 1,150 daily bus departures at Fort Kochi, will help build the demand for the ferry service to the Ernakulam or High Court Terminals. Return travel demand will also be enhanced by park and pay facilities at both High Court and Ernakulam Termini. The Mattancherry, Fort Kochi, and High Court passenger facilities will be upgraded to reflect modern design and to incorporate floating pontoons for all day level boarding and alighting. (Figure 6). They will have a floor space of at least 200 m² and include small food stalls and other retail outlets. Floating pontoons will also be installed at the Ernakulam passenger terminal.

The indicative capital costs of the Route 2 Investment Proposal is US$ 16.4million.

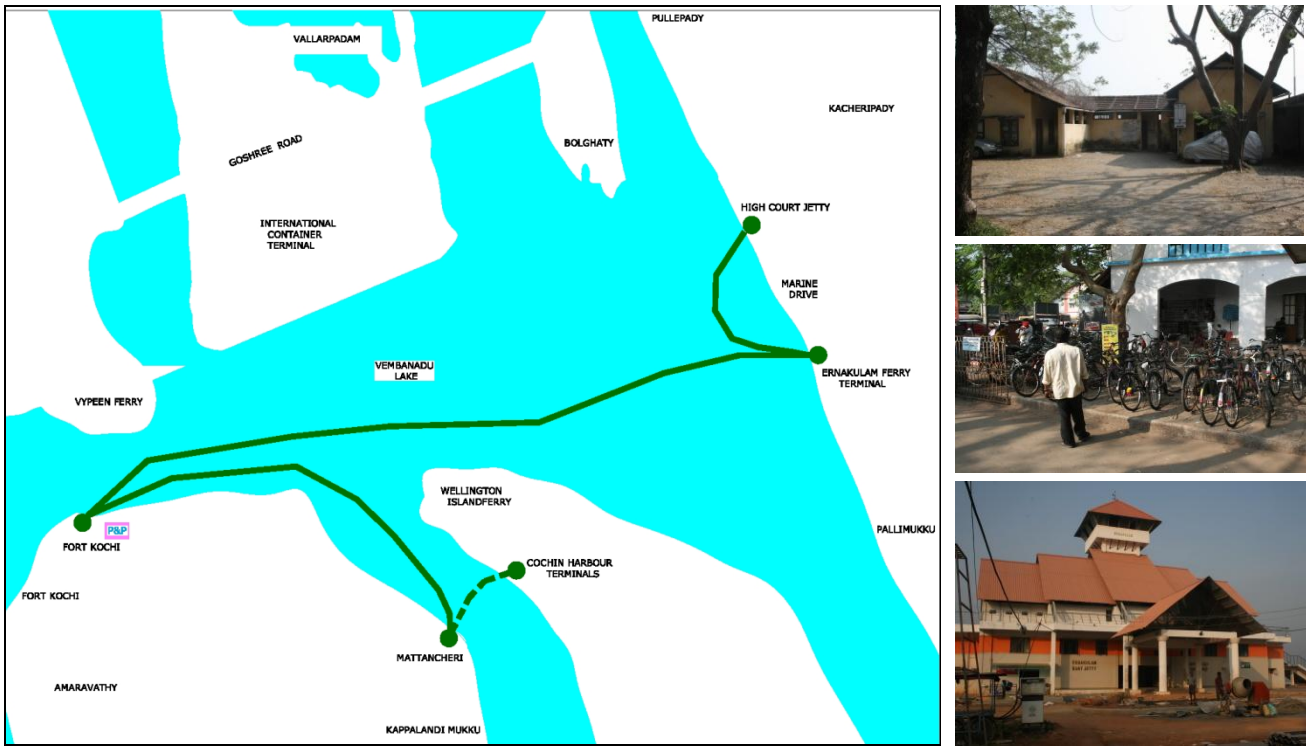


Figure 6: Route 2 - Mattancherry, Fort Kochi, Ernakulam and High Court

3.2.4 Route 3: Edakochi to Thevara

This service will be operated by one Kochi Cat and will offer a 20 minute frequency between the service hours of 6.00am and 9.00pm daily. Route capacity will be 9,000 passengers per day. Both the Edakochi and Thevara terminals will be upgraded to reflect modern design and to incorporate floating pontoons for all day level boarding and alighting. (Figure 7) They will include, (i) passenger waiting and seating space, (ii) seating for at least 25 percent of these passengers, (iii) land accessway to the waiting area, and (iv) timetable information facilities.

The indicative capital cost of the Route 3 Investment Proposal is US$ 4.1 million.

Figure 7: Route 3 - Edakochi to Thevara

3.2.5 Route 4: Panchayat Terminal to High Court and Ernakulam via Sicily Jetty, Hospital Jetty, Ponnarimangalam Jetty and North Jetty.

This service will be operated by two Kochi Cats on a 30 minute frequency. Route capacity will be 12,000 passengers per day. Passengers on this route will be able to link directly with other ferry routes at Ernakulam for travel south to Thevara or west to Kochi, Mattancherry and Vypeen (Figure 8). All five jetties serviced on this route will be upgraded to reflect modern design and to incorporate floating pontoons for all day level boarding and alighting.

The indicative capital cost of the Route 4 Investment Proposal is US$ 8.7 million.

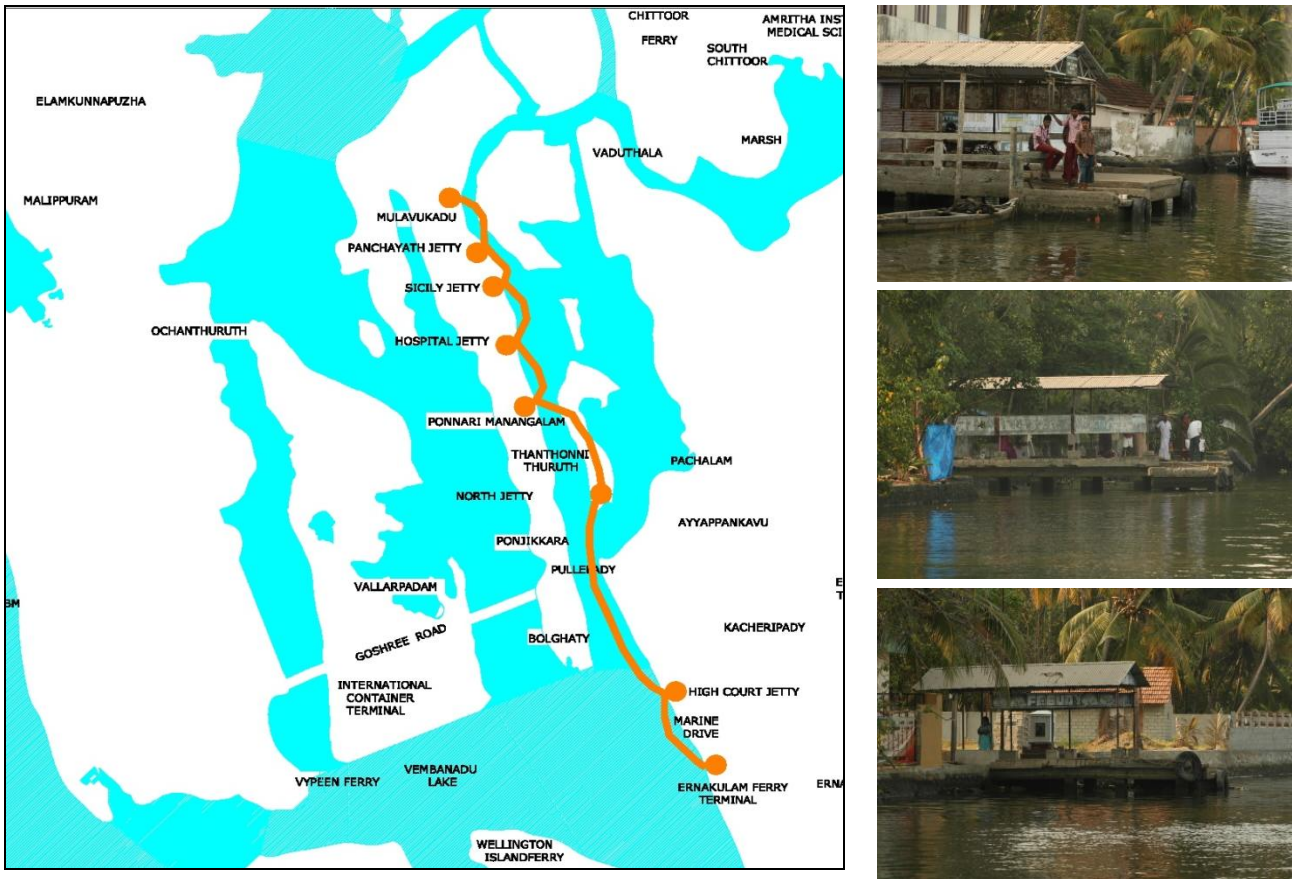


Figure 8: Route 4 - Panchayat Terminal to High Court and Ernakulam

3.2.6 Investment Proposal FS05 Route 5: Kumbalam to Chittoor via Ernakulam, High Court and Vaduthala Terminals.

This limited-stop service (6 stops) will be operated by three Kochi Cat vessels on a 40 minute service frequency between the service hours of 6.00am and 9.00pm. Connections will be made at the Thevara Terminal with Route 3 services. (Figure 9). This will offer a travel time from Kumbalam to Ernakulam of approximately 15-20 minutes. The limited stop service from Chittoor to High Court and Ernakulam will have a travel time of approximately 20-25 minutes. This route will provide for a capacity of 12,000 passengers per day. The Kumbalam, Vaduthala and Chittoor jetties on this route will be upgraded to reflect modern design and to incorporate floating pontoons for all day level boarding and alighting. They will include, (i) passenger waiting and seating space, (ii) seating for at least 25 percent of these passengers, (iii) land accessway to the waiting area, and (iv) timetable information facilities.

The indicative capital cost of the Route 5 Investment Proposal is US$ 11.2 million.

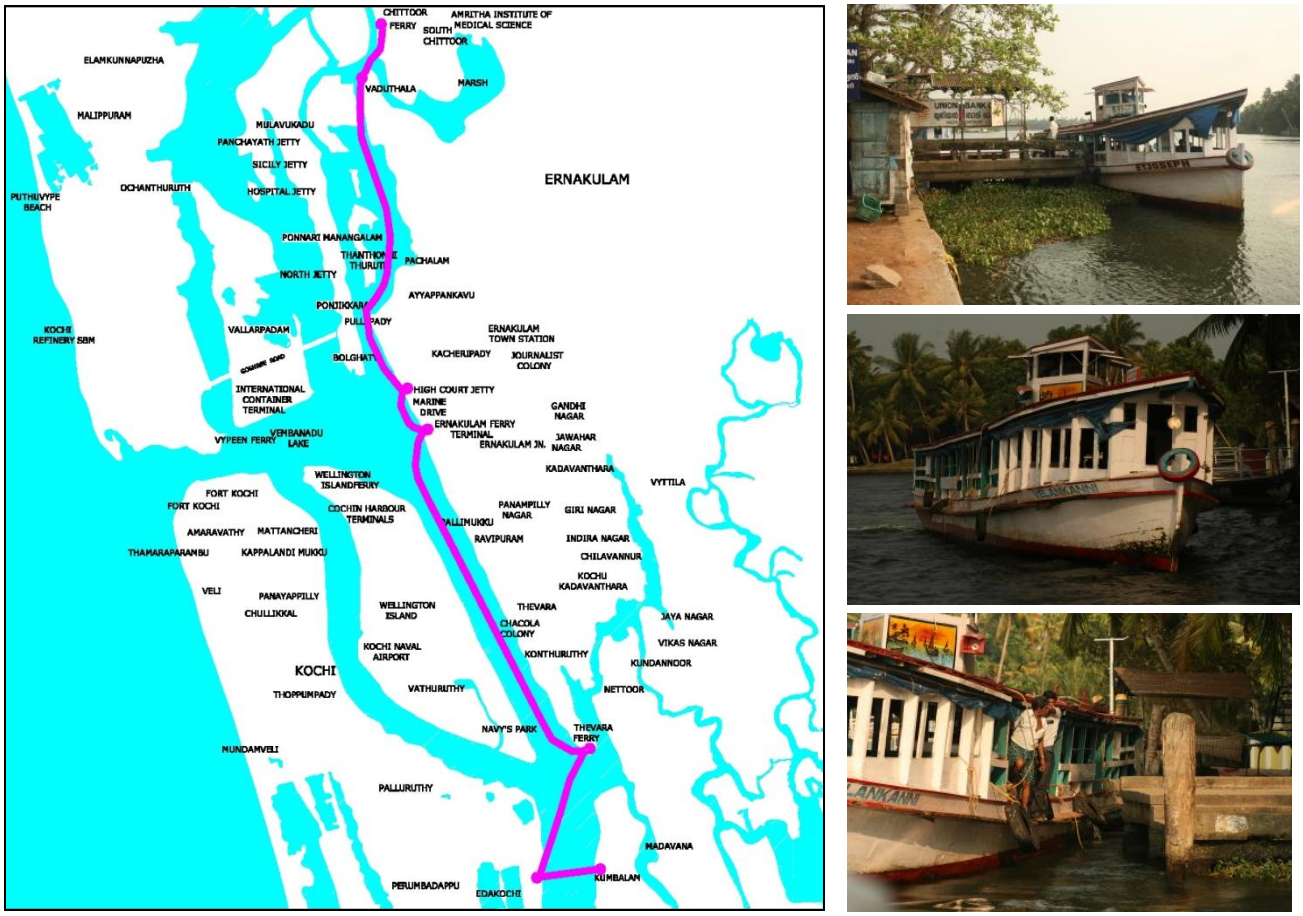


Figure 9: Route 5 - Kumbalam to Chittoor

3.3 Investment Proposal Implementation Schedule

While it is desirable that the benefits from each investment component be captured as quickly as possible, implementation must be prioritized in an orderly manner so that the entire initiative proceeds according to sound scientific principles, within manageable components, and in a sequence that the travelling public can readily understand and associate with. Only then will the true value of the investment be realized.

It is proposed that the development of the ferry investments would commence in early Q4, 2010, and the entire package be completed and operational by early Q3, 2012 (Figure 10). As shown on the figure, the development program will commence with demand and network development tasks, including route network confirmation; engineering, environmental and social surveys; terminal catchment analysis and; development of functional design specifications. By Q1, 2011, this will then lead into the assessment of passenger capacity requirements and demand modelling. At this time, the conceptual design of the infrastructure components will also be undertaken, leading into the detailed design and then into a one-year procurement and construction phase. In conjunction with this, the ferries will be designed and constructed over an 18-month period (Q1, 2011 to Q2, 2012), so that all physical components can be commissioned concurrently in early Q3, 2012 The management and maintenance contracts for the ferry services will be developed and procured during the period Q4, 2011 to Q2, 2012,, so they can also commence simultaneously with physical component commissioning.

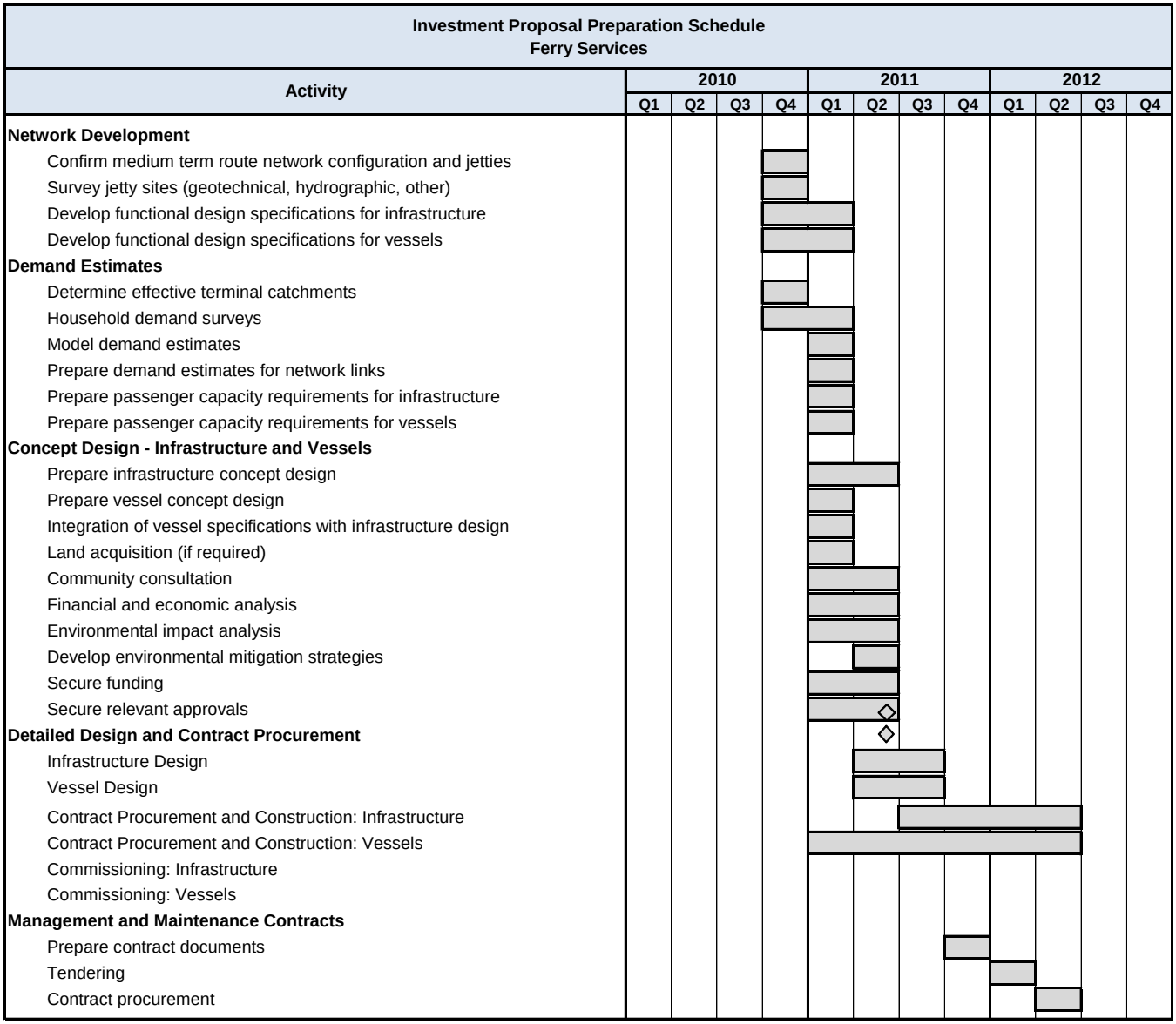


Figure 10: Investment Implementation Sequencing

4.0 Economic and Financial Analysis

4.1 Introduction

Financial and economic analyses are important PFS components to quantitatively and qualitatively assess the financial and economic benefits and impacts of transport infrastructure investments. They allow decision making agencies to identify, quantify, and value the economic and financial benefits and costs over a multiyear timeframe. With this information, agencies are better able to target scarce resources to their best uses in terms of maximizing benefits to the public and to account for the many different phases of the transportation decision-making process. These analyses can inform many different phases of the transportation decision making process, and in particular, provide information and analysis in order to assess the following;

1. Assess the economic and/or financial viability of the project from a societal standpoint (should the project be constructed or not?); what levels of economic and financial return would the project generate?).

2. Identify the tariffs, user charges, taxes and other funding sources needed to recover costs and provide for long term sustainability.

3. Identify possible funding options; the Cochin Corporation, National and State government, international agencies, the private sector and community organizations.

4. Further evaluate the role for the private sector and community in funding and implementation.

5. Assess the affordability of the proposal in terms of ability and willingness to pay.

6. Frame a marketing plan through which the necessary financing may be mobilized.

This work has been performed at the pre-feasibility stage, in which investments have been identified in concept only, and prior to completion of technical designs and detailed feasibility assessment. For this reason, the characteristics of each project, project costs, and the economic and financial analyses and benefits are subject to considerable uncertainty and modification. Nevertheless, a best effort attempt has been made at this stage to identify the costs and benefits of the investment as a guide to moving forward with the investment. Also, the assumptions followed and data used are indicated so as to assist in further stages of analysis.

4.2 Analytical Approach

The economic and financial analysis has been undertaken in accordance with Asian Development Bank (ADB) guidelines, including Guidelines for the Economic Analysis of Projects, Guidelines for the Financial Analysis of Projects and Framework for the Economic and Financial Appraisal of Urban Development Sector Projects as well as the guidelines from Indian Roads Congress (IRC). Both economic and financial analyses involve comparing the situation with and without the project. The net agency costs, net user costs and net project benefits associated with the investment during its analysis period were calculated for each of the proposed sub-investments in order to arrive at their internal rate of return (IRR) and net present value (NPV) both for economic and financial analysis.

The economic analysis included the following assumptions and criteria;

A period of 20 years was used for the economic evaluation as follows:

1. Base Year (2010)
2. Construction period (2011 and 2012)
3. Project opening for passengers (2012)
4. Project operating period (2012-32)
5. End of the analysis period (2032)
6. Consideration of Salvage Value (2032)

All the costs were at 2010 (Base Year) level and the resulting NPV is in $2010. Financial costs were converted into economic cost in accordance with ADB guidelines. (Appendices 4 and 5). Appropriate excel based models were developed to quantify the relevant project benefits life cycle costs, project net benefits and to calculate the economic feasibility criteria (EIRR and ENPV).

Existing traffic was estimated from the current timetable applying an average load per trip based on observed ferry loadings. This was used to determine the proposed timetable for the new ferries. It was assumed that the new ferries will average 100 passengers per trip (ie about 60% of their capacity). The patronage forecasts will need to be reviewed during the detailed feasibility study.

The 'Updated Road User Cost Study, 2001' was used to assess resource cost savings for diverted traffic. The study inputs were updated using unit rates of VOC and travel time for different vehicle categories. Wherever possible, estimation of these input variables was made region-specific using available secondary data.

The investments were evaluated using the economic internal rate of return (EIRR) and economic net present value (ENPV). For the ENPV, the discounted cash flow (DCF) was calculated using an economic opportunity cost of capital (EOCC) of 12%. This is the normal rate applied by ADB where capital is constrained. The EIRR must be compared with the economic opportunity cost of capital, when determining project feasibility.

The financial analysis included the following assumptions and criteria;

The financial analysis was undertaken in accordance with ADB's Framework for the Economic and Financial Appraisal of Urban Development Sector Projects. Financial analysis was conducted to assess the financial viability of the various component of the investment proposal

Financial Internal Rates of Return (FIRR) were calculated and sensitivity analyses were carried out for each component. The FIRR have been independently estimated for each of the investment proposal components at constant financial prices considering the incremental cost and benefit streams over the anticipated useful life of all direct revenue earning investments and tested with the sensitivity analysis under given variables. The proposal will be considered financially viable if the FIRR is more than the weighted average cost of capital (WACC) which in this case is evaluated under four different financing plan scenarios (Figure 11). Details of WACC calculation are given in Appendix 3

.

Weighted Average Cost of Capital (WACC) - Four Scenarios	
Scenario	**WACC**
Corporation accessing funds from ADB 70% & 30% with own equity contribution	3.8%
Corporation accessing funds from ADB 70% & 30% with market loan / borrowing for own equity contribution	5.8%
Corporation accessing funds from JnNURM - GoI - 50% grant , GoK - 30% grant with market loan / borrowing for own equity contribution	4.2%
Corporation accessing funds from JnNURM - GoI - 50% grant , GoK - 30% grant and balance Corporation's own equity	2.9%

Figure 11: Weighted Average Cost of Capital – Four Scenarios

Existing fares/fees for ferry services and parking were taken as the base for analysis purposes. Present ferry charges range from a minimum of Rs. 2.50 per trip to a maximum of Rs. 8.50 per trip and parking fees range from Rs. 5-10 in case of car to Rs. 3 for two wheelers for two hours. The proposed fare levels were assessed to ascertain their affordability to the beneficiaries, in particular the low-income groups and poor households, i.e. those below the poverty line. Financial projections for the Corporation were also performed to determine the financial capability of Corporation to deliver and operate the investment proposal on a sustainable basis.

4.3 Cost Estimates

Figure 12 summarizes the preliminary capital cost estimates for the items proposed under this investment proposal. Additional detailed costs are contained in Appendix 1. Base Costs (current 2010 prices) have been estimated based on the market rates for ferry boats, recently awarded tenders and updates of previous study reports. To this base cost, the estimates for land cost (excluding land owned by Government of Kerala, Cochin Corporation and other government agencies), utility shifting, relief and rehabilitation, environmental mitigation, design and construction supervision, and physical and price contingencies have been added to arrive at the total cost estimates. Figure 12 shows the total cost of proposed items under this investment proposal.

Figure 12: Summary of Capital Cost Estimates

Particulars	Rs. Million	US $ Million
Route 1: Vypeen to Fort Kochi	417.1	9.1
Route 2: Mattancherry, Fort Kochi, Ernakulam and High Court.	757.3	16.4
Route 3: Edakochi to Thevara	190.6	4.1
Route 4: Panchayat Terminal to High Court and Ernakulam	400.3	8.7
Route 5: Kumbalam to Chittoor via Ernakulam, High Court and Vaduthala	514.0	11.2
Total	**2279.3**	**49.5**

Source: Consultant Estimates

Annual operating costs of this investment proposal at constant prices have been broken down into different items of this investment proposal and used for analysis purposes. The total annual operating costs for this investment proposal have been estimated to be Rs. 91 million or US$ 2 million. Details of estimates of annual operating costs are in Appendix 1.

4.4 Economic Analysis

4.4.1 Economic Internal Rate of Return

The economic analysis covers the estimation of the likely traffic, the identification and quantification of the implied project cost and benefits; economic feasibility analysis results; and sensitivity analysis. The investment proposal consists of five ferry routes with 12 modern technology boats (including 1 spare) and the upgrading of ferry terminals and three park and pay stations close to the ferry terminals at Mattancherry, Fort Kochi and Vypeen. These components will directly benefit the existing ferry passengers as well as passengers who transfer to ferry services from buses and private road vehicles. Accordingly, the economic benefits considered include:

1. Value of Travel Time Savings
   for the traffic using existing ferry services
   for the passengers diverted from road to ferry services

2. Value of vehicle operating cost (VOC) savings
   for the passengers diverted from road to ferry services
   for people who are shifting private vehicles to the IWT system by using park and ride facilities

As part of the economic feasibility analysis, the feasibility parameters developed are shown in Figure 13 and the cost-benefit flow pattern in Figure 14. A more detailed economic feasibility analysis is given in Appendix 5.

Figure 13: Economic Cost-Benefit Analysis

Details	**Present Value** (Rs. million) a/
Costs	
Capital costs	1658
O&M costs	311
Total costs	1969
Benefits	
Savings in Travel Time Cost - Ferry Users	1177
Savings in VOC - Ferry Users	2233
User cost Savings to Parking Users	40
Total benefits	3450
Economic Return Measures	
Net present value (Rs. Million)	1481
EIRR (%)	**22**

a/ In 2010 prices. Discounted to 2010 at 12% real discount rate.
Source: Consultant

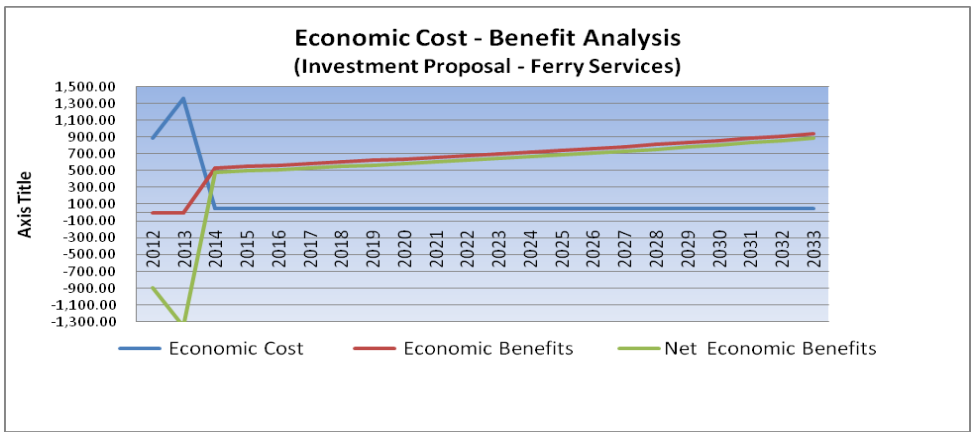


Figure 14: Economic Cost-Benefit Flow

4.4.2 Sensitivity Analysis

Sensitivity analysis was carried out to their economic feasibility results for the following scenarios is presented in Figure 15.

1. Capital cost increase by 20%
2. O&M costs increased by 20%
3. Target beneficiaries reduced by 20%
4. Delay in accrual of benefit by 1 year
5. Combined adverse condition

Figure 15: Results of Sensitivity Analysis

Details	EIRR
Main Evaluation (Base Case) [a/]	22%
Capital Cost Overrun [b/]	19%
Switching Value [c/]	89%
O&M Cost Overrun [d/]	22%
Switching Value[c/]	475%
Decrease in Project Benefits [e/]	18%
Switching Value[c/]	43%
One Year Delay in Implementation	22%
All Four Tests Combined	14%

a/ From Figure 1.

b/ 20% increase in capital cost.

c/ Calculated as the percentage change in a variable required for EIRR to reduce to 12%.

d/ 20% increase in O&M cost.

e/ Decrease in project benefits by 20%.

4.4.3 Conclusions

The evaluation indicates that, at this pre-feasibilty stage, the investment proposal is economically viable, with the calculated EIRR values exceeding the economic opportunity cost of capital. The sensitivity analysis has demonstrated the robustness of this result, with the investment proposal being

economically viable even when the combination of changed assumptions is tested. Furthermore, for the investment proposed, the calculated EIRR value is considered a conservative estimate of economic return, as there are a number of economic benefits that have not been quantified, such as reduced water pollution related, improvements in sanitation and tourism benefits. The analysis is based on initial Consultant estimates of the likely patronage. These should also be reviewed during the detailed feasibility stage, when surveys of existing and potential passengers should be undertaken.

4.5 Financial Analysis

4.5.1 Financial Internal Rate of Return

The analysis was carried out based on existing fares in the range of Rs 6 to 10 depending on the route, existing parking charges of Rs 10 (for cars) and Rs 3 (for two wheelers) and existing commercial space monthly rents (Rs 500 per square meter), which are mostly followed in the project area. An increase of 15% every third year in respect of fees, parking charges and rents is considered for analytical purposes.

The assumptions and approach used in the calculation of the FIRR include: (i) all revenues and costs are stated at constant 2010 prices; (ii) all revenues and costs are calculated on an incremental basis, i.e. difference between "with investment proposal" and "without investment proposal" situations; and (iii) investment proposal capital expenditures are recognized at the time they are incurred during the period of implementation. Sensitivity analyses were also carried out to determine the possible effects of adverse changes on the investment proposals. The key variables considered in the sensitivity analysis were; (i) 10% increase in capital costs; (ii) 10% increase in O&M costs; (iii) 10% decrease in revenues; and (iv) the worst scenario. The results of the FIRR calculation and sensitivity analyses are summarized in Figure 16. More detailed calculations are contained in Appendix 4.

The ferry services investment proposal is found to be financially viable with a combined IRR of 14.0% for the total investment proposal. This FIRR is higher than the WACC. The results of the sensitivity analysis underline the robustness of the project even under unfavourable scenarios of sensitivity.

Figure 16: FIRR (%) - Combined for All Routes Including Parking Facilities

Component	Base Case	Capital Cost Increased by 10%	O&M Costs Increased by 10%	Project Revenue Decreased by 10%	Project Delay by One Year
All Routes	14%	13%	14%	13%	14%
Route 1	14%	13%	14%	12%	14%
Route 2	15%	14%	15%	13%	15%
Route 3	13%	12%	13%	12%	13%
Route 4	12%	11%	12%	11%	12%
Route 5	13%	12%	13%	12%	13%

Source: Consultant Estimates

An analysis was also carried out with a lower fee structure and a higher fee structure. The analysis results for all routes are given in summary form in Figure 17. Figure 18 shows the trend of net cash flows in three different fee structure and cost recovery scenarios.

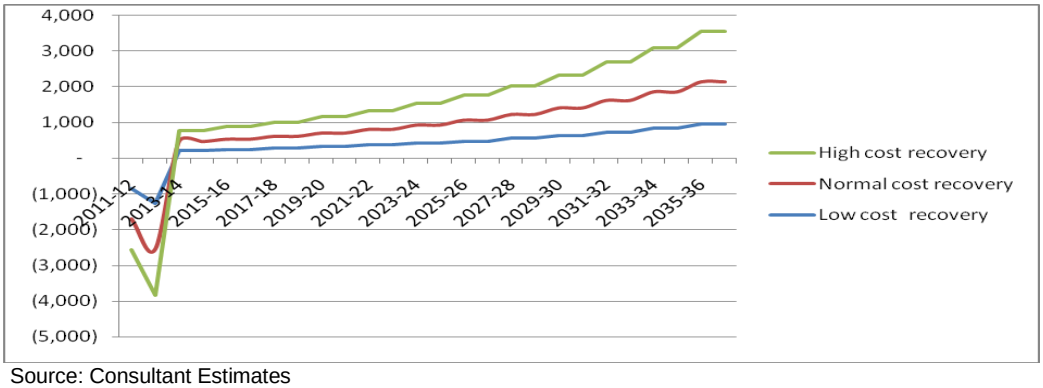
Figure 17: IRR – Low, Moderate and High Cost Recovery

Component	Base Case	Capital Cost Increased by 10%	O&M Costs Increased by 10%	Project Revenue Decreased by 10%	Project Delay by One Year
Lower fee hence low cost recovery	11%	10%	11%	10%	11%
Moderate fee hence moderate cost recovery	14%	13%	14%	13%	14%
Higher fee - High cost recovery	17%	15%	16%	15%	16%

Source: Consultant Estimates

In all the above scenarios, the returns are considered sufficient at this pre-feasibility stage to potentially attract private sector investment if so desired.

Figure 18: Net Cost Recovery Options Trends (Current Prices)



Source: Consultant Estimates

4.5.2 Affordability

Existing fares, fees and charges have been taken as the base for analysis purposes. For ferries, the starting fares have been proposed at Rs. 6 per person per trip with a maximum of Rs, 10 per person per trip. Similarly parking charges have been proposed to start with proposed at Rs 10 per car and Rs. 3 per two-wheeler for 2 hours. Therefore, to start with, the range of fees and charges that commuters using the improved and new ferry services under this investment proposal will not be different from what they are paying now. An increase of 15% every three years in the fares, fees and charges have been assumed for analysis. Initial consultations with individuals and other stakeholders infer that the people of Cochin are willing to pay these increased fares, fees and charges for substantially improved or new facilities and services. This should be further ascertained at the feasibility assessment stage.

4.5.3 Financing Plans and Gap

As discussed in the next section, two financing options are potentially available for this investment proposal. The first is through the JnNURM program, which would include grant funding from both the National Government (50%) and State Government (30%); with the balance (20%) to be provided by the Corporation as its own equity provided from its own resources, from the State Government, or from private modalities. Figure 19 presents the likely apportionment of funds under this arrangement.

Figure 19: Financing Plan 1: JnNURM Funding

Particulars	Total Cost		GoI Grant (50%)		GoK Grant (30%)		Corporation Contribution (20%)	
	(Rs. Million)	(US $. Million)	(Rs. Million)	(US $. Million)	(Rs. Million)	(US $. Million)	(Rs. Million)	(US $. Million)
All Routes	**2279.3**	**49.5**	**1139.6**	**24.8**	**683.8**	**14.9**	**455.9**	**9.9**
Route 1	417.1	9.1	208.6	4.6	125.1	2.7	83.4	1.8
Route 2	757.3	16.5	378.6	8.2	227.2	4.9	151.5	3.3
Route 3	190.6	4.1	95.3	2.1	57.2	1.2	38.1	0.8
Route 4	400.3	8.7	200.2	4.4	120.1	2.6	80.1	1.7
Route 5	514.0	11.2	257.0	5.6	154.2	3.4	102.8	2.2

Source: Consultants Estimates

The second option is to secure international donor funding, such as through the partners of the CDIA. This would include a donor-funded loan or loans, with an equity contribution provided through the Corporation's own resources, the State Government or from private modalities. Figure 20 provides an example of funds apportionment under this option, assuming donor agency funding of 70%, and a Corporation contribution of 30%.

Figure 20: Financing Plan 2: International Donor Agency Funding

Particulars	Total Cost		CDIA or Other Agencies (70%)		Corporation Contribution (30%)	
	(Rs. Million)	(US $. Million)	(Rs. Million)	(US $. Million)	(Rs. Million)	(US $. Million)
All Routes	**2279.3**	**49.5**	**1595.5**	**34.7**	**683.8**	**14.9**
Route 1	417.1	9.1	292.0	6.4	125.1	2.7
Route 2	735.5	16.0	530.1	11.5	227.2	4.9
Route 3	190.6	4.1	133.4	2.9	57.2	1.2
Route 4	400.3	8.7	280.2	6.1	120.1	2.6
Route 5	514.0	11.2	359.8	7.8	154.2	3.4

Source: Consultants Estimates.

The potential also exists to supplement conventional loan funding by parallel grant funding from donor agencies for discrete aspects of the investment proposal. In addition, there are strong opportunities for private sector investment under a range of possible PPP modalities, and these are discussed in the next section.

4.5.4 Impact on the Corporation's Finances

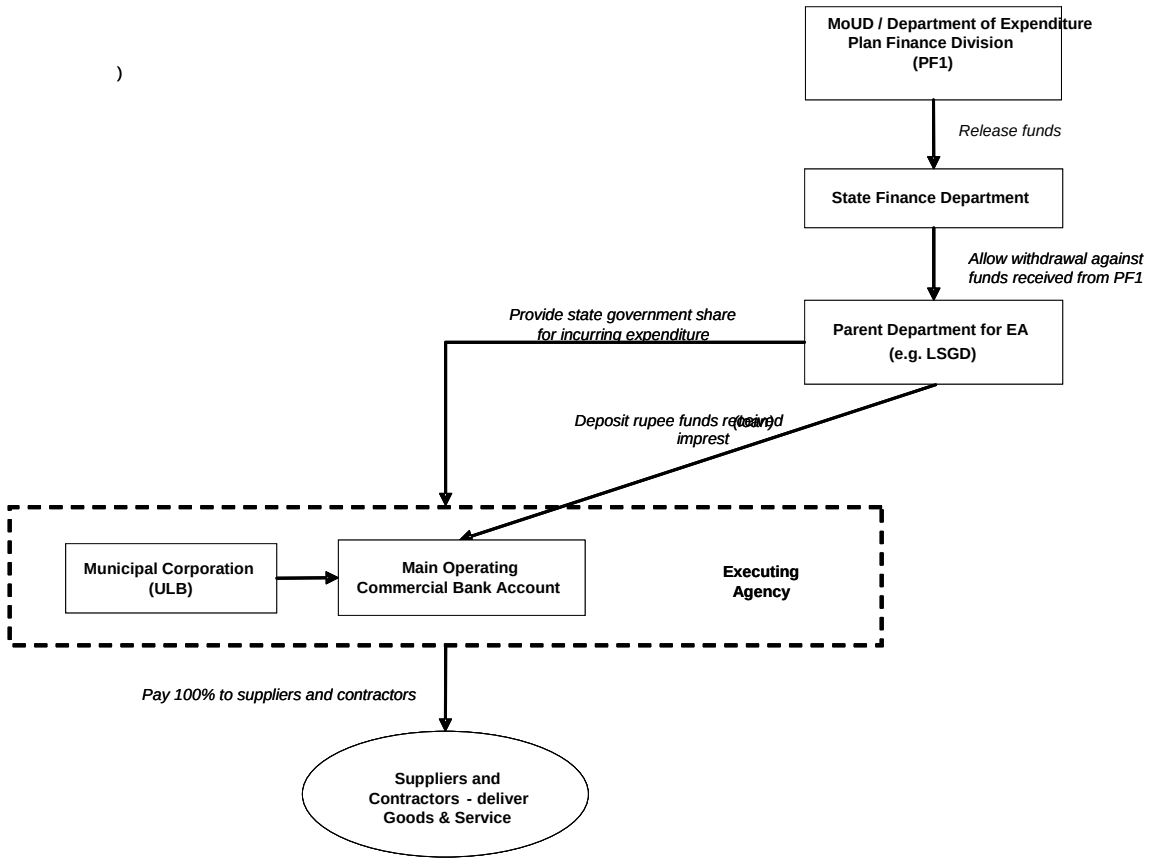
The impact of this investment proposal on the Corporation's budget has been assessed. This indicates that the successful implementation and operation of the investment proposal will not have a negative impact on the Corporation's budget. Additional details are contained in Appendix 2.

4.5.5 Flow of Funds

The flow of funds to the Corporation for the implementation of this investment proposal under both financing plan options outlined above will be similar to the existing arrangements for the implementation of projects under the JnNURM and KSUDP (an ADB assisted project). The flow of funds is presented in the flow charts on Figure 21 and Figure 22.

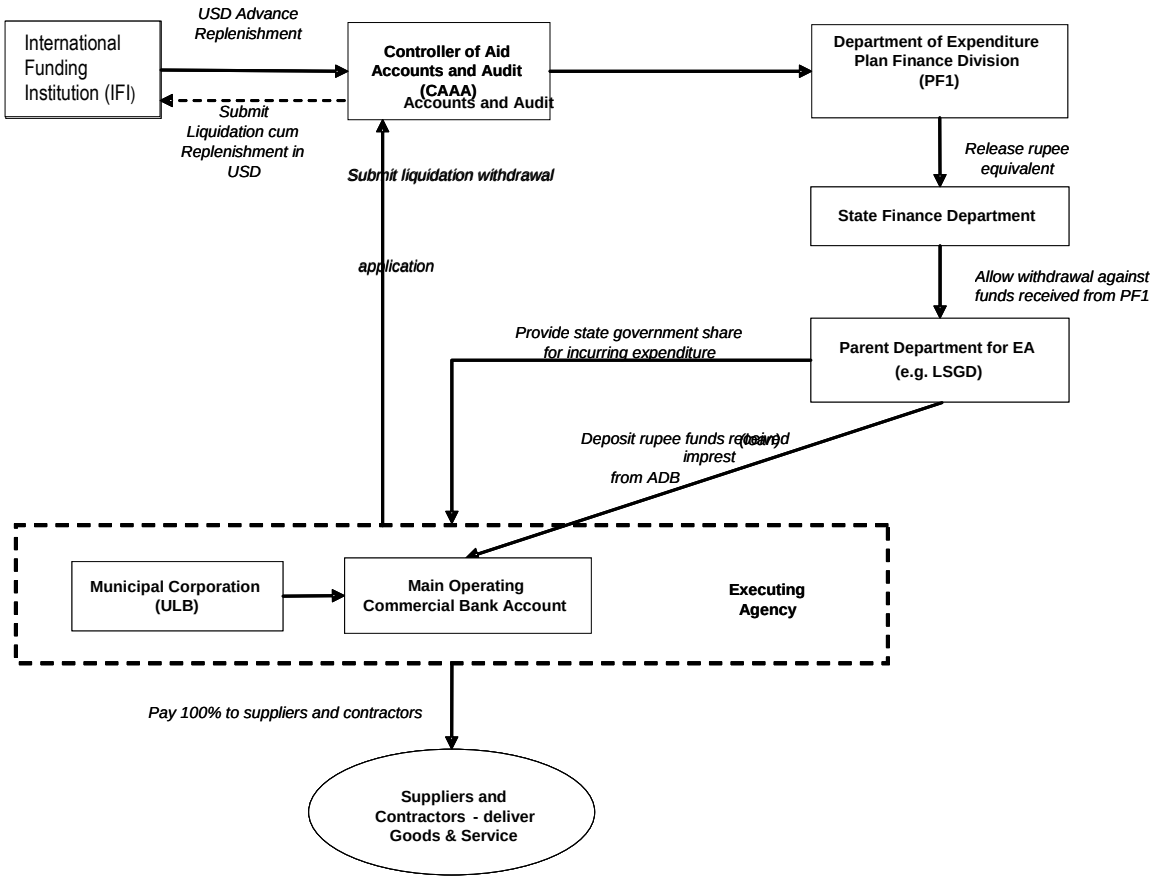
In the case of JnNURM, funds from the Government of India (50% grant) are received in instalments by GoK,. These funds are then transferred to the Corporation through the Local Self Government Department along with its own share of financing (30%). The Corporation arranges its own share of financing (20%) from its internal resources. Details of the use of these funds are reported by the Corporation on regular basis to GoK and GoI.

Figure 21: Financing Plan 1 – JnNURM Funding



The flow of funds in the case of loans from international donor agencies is slightly different. Initially loan funds are received by the Department of Economic Affairs, (GoI). Sometimes the donors make payments directly to the supplier / contractor upon receipt of such requests from the borrower. In these cases the details of direct payments are provided to the borrower. In normal cases, the GoI transfers the loan funds to the GoK at agreed terms and conditions. Thereafter, GoK transfers the funds to the Corporation's project implementation unit through the project management unit under the Local Self Government Department.

Figure 22: Financing Plan 2 – International Donor Agency Funding



4.4.6 Conclusions

The above economic and financial analyses confirm at this pre-feasibility stage that this investment proposal is economically justified and financially viable; and a review of the financial implications has shown that the funding of the investment by the Corporation should not have a negative impact on its finances.

5.0 Financing Options and Public Private Partnerships

As presented previously, the estimated capital cost of the ferry services proposal is US$ 49.5 million, and several public and private sector financing options are potentially available to provide this funding. This section discusses these options, alongside opportunities for overall public-private-partnership (PPP) involvement, culminating in recommendations for the consideration of the Cochin Corporation.

5.1 Public Sector Financing

As indicated in the previous section, two public sector financing options are potentially available for this investment proposal. The first is through the JnNURM program, which would include grant funding from both the National Government (50%) and State Government (30%); with the balance (20%) to be provided by the Corporation as its own equity provided from its own resources, from the State Government, or from private modalities. This option would naturally include applications to the National and State Governments, together with convincing justification of the benefits of the investment package and the high priority nature of it.

The second option is to secure international donor funding, such as through the partners of the CDIA. This would include a donor-funded loan or loans, with an equity contribution provided through the Corporation's own resources, the State Government or from private modalities. Such donor funded loans vary in type, duration, repayment schedule, costs, interest rates and other parameters, and would require a detailed proposal which conforms to the application requirements of a particular funding agency. This PFS already includes valuable preliminary information which can be used as the basis of initial donor funding review, supplemented where necessary by further feasibility assessment leading to funds approval.

The potential also exists to supplement conventional loan funding by parallel grant funding from donor agencies. This may be possible to provide additional funding for discrete aspects of the investment proposal, for example; community awareness activities to promote the ferry services, particularly in lower income areas; financial or other assistance for the small retail businesses locating within and near to the rehabilitated ferry terminals; or possible funding to promote the climate change agenda of the investment, due to its carbon reduction achievements and its built-in climate proofing measures such as the provision of the floating pontoons.

5.2 Public Private Partnerships

Several of Cochin's ferry services are currently operated by the private sector[14]. Although these services face many challenges and only provide a marginal level of service, they do demonstrate that a PPP enabling environment does exist in Cochin, and that the private sector is able to operate in the ferry subsector with some degree of sustainability. In addition, several private sector groups have already expressed interest to run additional ferry routes, further demonstrating the potential for expanded and enhanced PPP involvement in the sector. The planned investment proposal will dramatically transform Cochin's ferry services, and with this comes an opportunity to optimize PPP involvement wherever this is of benefit.

In the national context, the Indian Government fully recognizes the importance of infrastructure improvements and expansion in order to sustain the nation's economic and social development. It also acknowledges that tight fiscal constraints necessitate innovative approaches to infrastructure investment and operations; away from the traditional role of Government as 'infrastructure service provider'. PPP is evolving as a viable option for infrastructure investment and operations, and there is

[14] Route 2 is currently operated by Government, and the other four routes by the private sector.

commitment and willingness at all Government levels to promote and support PPP. The Government indicates that nationally, a cumulative investment of over US$ 300 billion is required in infrastructure to 2012[15], including US$ 48 billion in the roads sector and US$ 12 billion in the ports sector[16]. This underlines the magnitude of infrastructure needs generally, further highlights the need for PPP investment. PPP is recognized by the Cochin Corporation as a viable modality for infrastructure investment and provision, and to date there have already been several modest PPP innovations in Cochin's transport sector[17].

There are already many examples of PPP in the Indian transport sector, utilizing a range of commercial structures and arrangements. These include, (i) build-operate-transfer (BOT) projects, where the private sector builds, finances and operates a facility or service, and later returns the asset back to the Government on contract termination[18], (ii) concessions and services contracts, where the private sector operates Government-owned assets under a performance based contract for a specified duration[19], and (iii) lease contracts, where the Government leases out assets for the private sector to operate for a specified period[20].

In the context of the ferry services proposal, Figure 23 summarizes the alternative PPP structures available. These range from less sophisticated arrangements such as services contracts, management contracts and leasing contracts; to more complex BOT structures; and through to relatively sophisticated divestiture and privatization options, where assets are actually sold and transferred to the private sector.

Figure 23: Project PPP Financing Options

Range of PPP Options					
PPP Form	**Service**	**Management**	**Leasing**	**BOT**	**Divestiture**
Structure Complexity	Low	Low	Moderate	High	High
Rights of Private Partner	Simple services	Supervisory management control with or without O&M	Construct and or O&M and transfer	Design, rehabilitate, construct, O&M and transfer	Fully divested and sale of assets to private partner
Ownership of Assets	With Government or its agencies	With Government and its agencies	Lease rights with private partner for the period	With private partner during the construction and/or O&M period	With private partner for eternity
Duration of Contract	Short term	Short term	Medium-long term	Long term	Perpetuity

15 Department of Economic Affairs, Ministry of Finance, Government of India.

16 There are 387 port projects in India, and practically all berths are now being transitioned to PPP (Ministry of Finance, Government of India).

17 These reportedly include, (i) the international airport, constructed and operated by the private sector, (ii) the Matancherry Bridge developed under a BOT scheme, (ii) various bus and ferry concessions, and (iii) potential private investment in a proposed road overbridge at the Round Junction, Pachalam.

18 An example is the Surat BRT project, which involves the development of an innovative, 60,000 square meter (m^2) landmark commercial building at Kharwarnagar, with a nodal BRT station on the ground floor.

19 An example is the Ahmedabad BRT project, which includes an exclusive, 7-year duration service and license contract to provide buses and drivers to operate the system. The initial contract includes 50 specially designed buses, with penalties for poor performance in terms of availability, punctuality, bus cleanliness and maintenance. The contract also includes automated fare collection, passenger information systems and a central control center.

20 Including buses in Orissa and Pune, and ferries in Assam.

Given the current national and local landscape in Cochin, it is considered extremely unlikely that the Cochin Corporation, or the State or National Government would desire that any of Cochin's transport sector assets and systems be fully divested or 'privatized' at this stage. Indeed, the privatization and divestiture of transport assets is relatively uncommon in the Asian region. Regarding the potential for BOT options however,[21] this is dependent on various factors including, (i) whether the Corporation would prefer to finance the ferry service assets itself, or allow the private sector to finance them and transition the assets back to the Corporation following contract termination[22], and (ii) if the latter, whether the private sector would be able and willing to make the required level of investment.

Regarding the vessels, there could be advantages if the private sector financed these; however this may be unlikely due to the significant level of investment required, the uniqueness of the vessels[23], the relatively untested nature of the upgraded system, and the corresponding ridership and revenue generation risks. The Corporation may also desire to directly finance these assets for reasons of route security in the event of dispute between the Government and the private sector investor.

Although the ferry terminals included in the investment proposal already exist, they will undergo major renovation and upgrading, and in some cases, expansion. Floating pontoons will be added, as will park and ride facilities and small retail outlets for certain terminals. Two financing options are also apparent, (i) that the Corporation funds the terminal rehabilitation works, including the provision of the pontoons, park and pay and other facilities, or (ii) the private sector funds this as part of a wider BOT scheme. Again, there could be advantages to the Corporation if the private sector finances these upgrades, although this may be unlikely due primarily to the required investment level and also risks associated with this pioneering initiative discussed above.

In terms of vessel and terminal operations and maintenance, certainly there are advantages to these physical investments being operated by the private sector under competitively bid, performance based concession contracts, as oppose to Government operations. In this way, the Corporation can continually manage and monitor these operations to a specific set of performance criteria, directly linking contractor payments and penalties to performance. For the ferries, such criteria could include vessel availability, on-time performance, health and safety targets, cleanliness and equipment condition benchmarks; for the ferries the criteria could include building and facility availability, condition and cleanliness; and health and safety benchmarks. The park and pay facilities and small retail outlets at the terminals could be leased directly by the Corporation, or included in the appropriate terminal facility concession contract.

The required private sector capacity to design, construct, operate and maintain the ferry terminals is believed to already exist locally in Cochin; these are relatively basic facilities. The ferries however require specialized construction, and it is most likely that they will need to be sourced internationally. Also, although the ferries will require specialist skills to operate, it is believed that these skills can be localized quickly and easily. From this, it appears therefore that while the local private sector has the capacity to develop and operate the ferry terminals over the long term, the ferries will need to be constructed overseas, and at least initially, an experienced international operator will be required to assist initially in the ferry operations. From that point forward, the ferry system can be exclusively operated by the local private sector.

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21 The term BOT as used here, loosely defines a range of commercial structures which revolve around the concept of 'design-build-finance-operate'. Under these modalities, the private sector would be responsible to complete all design development of the assets and systems, provide capital financing, operate the system for a number of years, and then transfer the assets back to the Government on completion of the contract.

22 Often, a special purpose vehicle (SPV), usually in the form of a joint venture corporation (JVC), will be set up under a BOT, with ownership divided between the Government and the private sector entity, usually with the Government owning a minimum of a 51 percent stake in the entity.

23 The vessels will most likely be constructed overseas due to their unique design.

Options also exist regarding the optimal number of contracts; (i) is it preferable to combine all the ferry and terminal operations into one contract; or have one contract for the ferry services and one for the terminals services, and (ii) is it preferable to have individual contracts for each route, or to combine the routes. Regarding the former, as the ferry operations are markedly different to the terminal operations, it is considered better to separate these two functions into different contracts. Regarding the latter, it appears preferable to bundle all ferry operations into one contract and terminal facilities into another contract, in order to optimize critical mass, and allow synergy across the network. In summary therefore, it is considered preferable to have one ferry services contract covering the entire five-route network, and one terminal services contract also covering the entire route network.

Other PPP options also exist regarding the design, build and operate aspects of the systems. For the ferries, it is probable that there is one contract for their construction[24], which also includes extended warrantee and maintenance servicing and possibly short-term, in-country technical assistance to train a local operator in the ferry operations. Ongoing ferry operations could then be undertaken through a single, nationally bid performance based operation and maintenance contract. Regarding the terminals, there are three possible options, (i) three separate contracts, one for terminal facilities design, one for construction and one for operations, (ii) two contracts, one 'design-build' contract, and one operations contract, and (iii) a single 'design-build-operate' contract. Although each of these options has its own attributes, it may be advantageous to have a single, design-build-operate contract for all of the ferry facilities in the network. In this case, a contractor would be responsible to complete all the facilities designs, permits and approvals; construct the facilities in accordance with the designs; and then operate the facilities for a fixed period, possibly between 3 to 5 years. This option therefore provides the incentives of critical mass (a larger contract with numerous facilities), longer term involvement, and assures the contractor's interest in ensuring that the design and construction provide for successful long term operations.

It will also be necessary to devise an appropriate transition program to assure the smooth transition from the existing ferry services to the new services. As Route 2 is currently operated by Government, the disposal or relocation of the existing ferries and equipment will need to be arranged, as well as the protection and employment relocation of the existing Government employees currently serving on the route. For the other routes, which are operated by the private sector though annual servicing contracts, adequate advanced notice should be provided to them regarding the investment proposals, and that future contract arrangements will change dramatically once the new ferry services are commissioned.

In summary, the preliminary PPP conclusions at this pre-feasibility stage are summarized, which should be further evaluated by the Corporation during the subsequent feasibility assessment phase;

4. Secure investment financing through Government programs or international donor agency support, while considering further the potential for private sector financing through BOT modalities. The latter should include, (a) internal Government review of procedures, requirements and ramifications relating to BOT intervention, and overall interest and capabilities to proceed with BOT, (b) further assessment of private sector capacity and willingness to invest in the proposed investments, and (c) tailoring the development of one or several BOT packages in light of these findings.
5. In the event that the investment proposals are financed through Government or international donor agency financing, then consider carefully the various options available under competitively bid, performance based PPP operations contract modalities. At this stage, it seems most feasible to include the following contract packages, (a) a single, nationally-bid, design-build-operate contract for the ferry terminal infrastructure, possibly with a three to five year duration and which includes the leasing and management of park and pay facilities and retail outlets, (b) a single, internationally bid construction contract for vessel construction,

[24] Most likely a competitively bid international contract.

including extended warrantee and maintenance servicing and operations training assistance, and (c) a single, nationally bid, performance based ferry operations contract to operate and maintain the ferries, possibly of three to five year duration.

6. Develop the necessary skills and capabilities to properly manage the PPP contracts throughout the procurement, design, build and operations stages of the initiative.

6.0 Investment Proposal Benefits

6.1 Introduction

This section analyses the overall attributes and potential deficiencies of the ferry services investment proposal, in order to allow closer issues identification and assessment in key areas. Two strategic planning tools are used for the preliminary assessment; the 'strengths-weaknesses-opportunities-threats' (SWOT) analysis, and the 'political-legal-economic-social-technological' (PLEST) analysis. Following this is a presentation of the proposed beneficiaries of the ferry services investment proposal in terms of the ferry services themselves, the terminals, and the park and ride facilities.

6.2 SWOT Analysis

A SWOT analysis has been used to evaluate the strengths, weaknesses, opportunities and threats of the proposed ferry services investment[25]. The results of the analysis are summarized as follows and on Figure 24.

Strengths	Weaknesses	Opportunities	Threats
Relatively simple, straightforward project	Popular perception that Government is unable to deliver	Demonstrates that the Corporation can deliver infrastructure projects	Change in Government and transport policies and priorities
Meets a priority need of Cochin's island communities	Potential disjoint in intermodal operations through poor licensing practices	Pioneering project with substantial expansion and replication potential in Cochin	'Grandfather rights' issues
Supports Cochins transport sector strategy	Perception that this first phase investment is too large	Innovative PPP project for national replication	Increasingly congested sea lanes
Widespread Government and stakeholder support	Local capacity constraints to manage and operate system	Opens up a range of opportunities for island communities	Climate change
Supports intermodal transport development		Supports the tourism sector	Route cherry picking
Strengthens climate change and climate proofing initiatives			

Figure 24: Results of the SWOT Analysis

Strengths: A key attribute of the investment program is that, unlike many land-based transport systems which require complex land acquisition, rights-of-way, resettlement and other issues, the ferry services proposal is a relatively straightforward initiative. Utilizing the uncongested and under-utilized waterways of Cochin for the ferry services, and the existing Government-owned ferry terminals, it 'steers clear' of many legal, regulatory, social and environmental issues which normally affect other transport projects. This is considered a major strength, especially

[25] This includes the, (i) strengths; project attributes which assist in achieving the intended objective, (ii) weaknesses; attributes which hamper the achievement of the objectives, (iii) opportunities; external conditions which assist to achieve the objectives, and (iv) threats; external conditions which hamper the achievement of the objectives.

as the Corporation wishes to prioritize simpler projects which are straightforward to develop and implement.

Another major strength is that the project responds directly to the crucial need of providing, fast, safe, economical and efficient mobility to Cochin's island communities, many of which are seriously constrained. The investments also fully align with Cochin's strategic direction for the transport sector by prioritizing public transport and reducing the reliance on private vehicle use. The investments also promote intermodal transport development by enhancing connectivity with the bus transport mode; and by reducing carbon emissions and providing climate proofing measures, they support Cochin's climate change agenda. It is also emphasized that one of the most significant strengths of the proposal is its widespread, universal support by Government agencies and the civil society in Cochin, as indicated by their efforts in helping to complete the PFS.

Weaknesses: One primary weakness relates to the general perception that the Corporation has been only marginally successful in developing major projects in Cochin. Reportedly, there is also a widespread perception that the private sector is reluctant to work and partner with the Corporation and other Government agencies. Implementation of this relatively straightforward project should therefore provide a counter to this perception, and strengthen the overall reputation of the Corporation in project delivery and in PPP implementation. Operationally, although the ferry services are specifically designed to interconnect with the bus network and improve modal integration, constraints will still exist such as in the disjoint in ticketing between the various modes. This will need to be addressed fully prior to project implementation.

There could also be a perception that this initial investment package, which includes five routes, is too large and should be reduced to reflect its pilot-type nature. Although the proposed investment of five routes is currently considered optimal, it would be a straightforward process during subsequent feasibility assessment to phase these investments over a longer time period, and reduce the first-phase investment level if this is considered necessary. Also, there may be concerns regarding local capacity constraints to manage and operate the system, especially relating to the high-speed ferries; as reported previously however it is most likely that an experienced international group will initiate the ferry services operations, and providing technical and skills transfer to a local operator

Opportunities: As discussed above, implementation of the investments provides a valuable opportunity for the Corporation to demonstrate its capability to deliver high-priority infrastructure projects on time, and to involve the private sector in a sustainable way. Operationally, not only does the investment provide an opportunity for ferry system expansion within Cochin, it also provides a valuable pilot project which can be replicated regionally and nationally. Locally, it opens up a wide range of opportunities for the island communities it serves, dramatically improving their mobility and access to employment and social services on the mainland. It also opens up further tourism opportunities, by providing improved transport services to Cochin's many tourism destinations within and surrounding its waterways and canals.

Threats: As with other significant, long-term infrastructure investments, a major threat relates to future changes in political and Government structures, which can result in changes in transport policies and priorities, possibly to the detriment of existing services. From discussions in Cochin however, it is likely that the significant vision and support for the investment proposal shown by the existing administration will be continued by the next administration, which takes office in the near future. There are also threats due to climate change, including flooding and damage to infrastructure; and there could be sea lane constraints as the waterways become more congested, Also, there could conceivably be threats relating to the transition of the

existing ferry services to the new services in terms of the existing Government and private sector employees currently employed on the routes. This will also require careful mitigation.

6.3 PLEST Analysis

A PLEST analytical framework has been used as a tool to further evaluate the investment proposal in terms of political, legal, economic, social and technological constraints. This is summarized on Figure 25 and as follows.

Political	Legal	Economic	Social	Technological
Change in government removes support for initiative	Sea lane restrictions	Temporary displacement of businesses during project construction	Resettlement complaints	New system
Poor perceptions of Government's ability to deliver	Resettlement complaints	Livelihood impacts on the existing private sector ferry operators	Livelihood impacts on the existing private sector ferry operators	More complex operation and maintenance requirements
Route 'cherry-picking'				

Figure 25: Results of the PLEST Analysis

Political Issues: As discussed previously, political changes in Government conceivably could trigger a change in transport policy and priorities, which could potentially impact on the proposed investments, either positively or negatively. Currently, the investment proposal has strong political support, and this is destined to continue as, amongst other things, the initiative provides significant benefits to the voting populations being served. Also discussed previously is the perception that Government has only been marginally successful in developing major projects which could potentially weaken overall support for the initiative; successful implementation of it therefore can only improve this situation. There could also conceivably be a situation where there is political interference in the selection and development (cherry-picking) of routes, although this is extremely unlikely as the routes have already been formally selected.

Legal Issues: There is potential that two legal issues might emerge in the future, (a) legal and regulatory restrictions on the sea lanes being utilized, and (b) resettlement complaints due to redevelopment of the terminals. Regarding the sea lanes, although there are major port and shipping investments ongoing in Cochin, it is considered unlikely that in the medium term, these could impact on the ferry operations from a legislative or regulatory prospective. Regarding resettlement issues, the only resettlement proposed at present is temporary resettlement in order to undertake the redevelopment of the ferry terminals, and the relocation of several small retail vendors. These impacts, including any compensation, should be mitigated through standard resettlement protocol and procedures.

Economic Issues: Two economic constraints have been identified. The first relates to the temporary displacement of businesses due to terminal facility construction, in that they may suffer a loss of revenues during facility construction, which would affect them directly and the surrounding economy indirectly. These impacts are however considered to be relatively minor, and must to appropriately mitigated through compensation mechanisms as part of investment proposal implementation.

The second issue relates to potential livelihood impacts on the existing private sector ferry operators and their employees due to the transition to the new system. Under the new system, the existing ferry operations will no longer be required, the termination of which will be designed to coincide with the commissioning of the new ferry systems. The existing private sector operators are contracted annually, and therefore their existing contracts will terminate prior to commissioning of the new ferry operations (Q3, 2012); subsequent contracts can be designed to terminate concurrently with new system commissioning. Nevertheless, follow on feasibility assessment should assess further the circumstances of these private sector operators and their employees to ensure that they do not endure negative impacts due to the planned initiative. This is particularly relevant for the employees of these entities.

Social Issues: Two social issues have been identified, (a) the temporary displacement of businesses and potential temporary and permanent loss of employment due to terminal facility construction, and (b) impacts to employees of the existing ferry services, which will no longer be required once the new system is commissioned. These issues are discussed above.

Technological Issues: The new ferry services investment proposal will include the provision of specially designed, high speed catamarans, which are more sophisticated to operate and maintain than the existing ferries. As this will require higher skill levels to operate and maintain, there is a concern that this skill level is not available locally. As discussed elsewhere however, it is proposed that the vessel construction contract will include in-country O&M training by the specialist contractor to the local operator/s. This should therefore mitigate these impacts.

6.4 Beneficiaries of the Investment Proposal

Figure 26 highlights the beneficiaries of the investment proposal, divided into the beneficiaries of the three primary physical components; ferry services, ferry terminals and park and pay facilities. The poor and socially excluded island residents will benefit significantly from the investment proposal through, (i) better accessibility to the city, their workplace, and other activity centers, (ii) affordable transport alternatives to travel into the city, (iii) better living conditions and reduced pollution, and (iv) potential employment opportunities arising from investment construction and operations. Overall, the proposed initiative contributes substantially to the betterment of an efficient, safe, and environmentally sustainable urban transport system for the entire Cochin area, benefiting Government, commerce and all citizens and visitors to the city.

Figure 26: Beneficiaries of the Ferry Services Investment Proposal

Investment Proposal Component	Beneficiaries	Benefits	
Ferry Services	Existing Ferry Passengers	– Reduced travel time – Higher trip frequency – Improved service reliability – Enhanced comfort and safety	– Convenient modal interchanges – Improved accessibility through route rationalisation
	Passengers Diverting from Road Based Transport	– Reduced travel time – Reduced vehicle operating costs – Higher trip frequency – Improved service reliability	– Enhanced comfort and safety – Convenient modal interchanges – Improved accessibility through route rationalisation
	Ferry Operators and Employees	– Better amenities (toilets, washing facilities, drinking water points, rest areas) – Improved commercial facility provision (food outlets, shops)	– Improved traffic flow within and around terminals
Ferry Terminals	Ferry Service Passengers	– Improved waiting facilities – Provision of amenities (toilets, drinking water points, rest areas) – Provision commercial facilities (food outlets, shops)	– Enhanced passenger comfort – Less congestion – Less noise pollution – Improved streetscapes – Improved passenger safety
	Adjacent Neighborhood	– Expanded parking facilities – Less congestion – Less noise pollution	– Improved streetscapes – Employment opportunities
	Business Community	– Enhanced business and commercial activities – Expanded commercial areas –	– Replacement of dilapidated stores – Improved streetscapes
Park and Ride Facilities	Vehicle Users	– Reduced travel time – Reduced vehicle operating costs – Improved parked vehicle safety	– Improved travel comfort – More safety during ferry travel
	Adjacent Neighborhood	– Less haphazard parking – Expanded parking facilities – Less congestion	– Less noise pollution – Employment opportunities
	Business Community	– Improved business opportunities – Improved parking	– Increased business potential from more convenient parking

7.0 Social Due Diligence

This section outlines the due diligence of the various elements of this investment proposal from stakeholder consultations, household interviews, site inspections, 'riding-ons' and observing passenger responses to the ferry services. It complements the brief analysis of the socioeconomic profile outlined in this section.

7.1 Social Development Perspective

The efficiency, reliability and mobility provided by modern urban transport systems have a direct impact on local communities. This is even more profound for island communities where street systems are narrow and there are limited alternative modes of transport. In many cases, these island communities have been adversely affected over the years as limited and unreliable access to employment, health and social facilities relegates them to the lower end of the socioeconomic table. Improvements in transport and mobility have been proven to help reduce poverty levels in these often isolated communities. Where new residential colonies are being established along the backwaters, modern water transport facilities provide a viable option for travel to the CBD. For these, the journey can be made more pleasant as the incessant honking and stop -start traffic conditions can be avoided.

As part of this study, a household interview survey was undertaken to record residents' perceptions in sample communities and to assist in prioritizing transport investments. For those that were consulted, a number advised that they had not been asked for their opinion before and were therefore most grateful. Others, such as members of the Kerala Chamber of Commerce, Rotary, GIDA and the Thrikkakara Panchayat Residents Association provided specific suggestions and requested for an audience. This was taken as a reflection of the genuine concern for achieving improvements in urban transport and the suggestions were accepted with an open mind. These and other consultations conducted during the study informed the due diligence elements that are reported upon in Figure 27. Further, more comprehensive consultations will be required in subsequent feasibility assessments of the investment proposal.

Figure 27: Social Policy Analysis: Ferry Services Investment Proposal

Social Policy Analysis: Ferry Services Investment Proposal						
Project Number	**Project Name**	**Stakeholder Consultation**	**Poverty Focus and Poverty Targeting**	**Gender Impact**	**Potential Safeguard Issues**	**Other Social Risks/ Vulnerabilities**
FS1- 01	Route 1	Household surveys and stakeholder workshops. Community consultation.	The investment proposal will assist in addressing mobility for those fishing village residents who must commute to Fort Kochi and Wellingdon Island for employment and other purposes on a regular basis. By hubbing with the Ernakulam service at Fort Kochi, this will offer a convenient transfer to services to the mainland at Ernakulam and High Court, This will improve access to medical and commercial facilities. Will provide improved safety and convenience for those reliant on ferry travel.	Improved access to key employment opportunities in traditional market and port areas. No specific gender impact.	Vypeen Terminal upgrade to be contained within existing site.	Nil apparent
FS1 -02	Route 2	Household surveys and stakeholder workshops. Community consultation	The investment proposal will improve access to Wellington Island and to the mainland by providing more regular and upgraded facilities. With services hubbing at Fort Kochi, passengers will have a convenient transfer to Vypeen Island for future employment opportunities at the LNG plant and the port facilities at Vallarpadam.	Improved access to key employment opportunities in traditional market and port areas. No specific gender impact	Mattancherry and Fort Kochi terminal upgrades to be undertaken in consultation with local street venders and shop owners to ensure impacts on businesses are managed.	Nil apparent
FS1-03	Route 3	Household surveys and stakeholder workshops.	The investment proposal will provide a welcome upgrade of services and facilities for faster and more convenient travel to employment, health and social opportunities on the mainland.	Likely to benefit non private vehicle owners significantly. Generally these will be female.	Terminal upgrades to be contained to reduce the need for land acquisition.	Nil apparent
FS1 -04	Route 4	Household surveys and stakeholder workshops Community consultation	The investment proposal will provide a quality link into the city centre at Ernakulam. Improved service levels and passenger facilities will enable residents to better access the CBD employment, health and commercial facilities more readily as there will not be a need to interchange onto a bus for a continuation to the CBD center as is the case at present.	Likely to benefit non private vehicle owners significantly. Generally these will be female. Student travel will	Terminal upgrades to be contained to reduce the need for land acquisition.	Nil apparent

				also be assisted.		
FS1-05	Route 5	Household surveys and stakeholder workshops Community consultation	Limited stop ferry services from Chittoor will provide increased trip duration certainty for day labor commuters. At present service levels are unreliable and time consuming. With this new service additional access to the CBD at Ernakulam will be possible.	Day labor and school student travel.	Terminal upgrades to be contained to reduce the need for land acquisition.	Nil apparent

7.2 Socio Economic Characteristics of Communities Consulted

Urban poverty is typically characterized by a number of contributing factors, including low levels of income, lack of access to health and education facilities, low economic growth opportunities, lack of title to land, and exclusion. Affordable access to services, employment and social networks is critical to poverty reduction. Transport that is affordable, efficient, safe, and regular facilitates such access.

A household (HH) socioeconomic survey was conducted in the Cochin Corporation area and its periphery in order to understand socio-economic and travel profiles. In total, 406 HHs were surveyed to provide representative feedback from different socioeconomic groups in different locations. HH's in residential colonies (334 HHs) [26] as well as slums (72 HHs) [27] were covered. Respondents in the slums were mostly the wives of the head of household (HoH), whereas in residential areas, they were mostly the HoH reflecting a higher proportion of self employed and business people. The surveyed population included 1,611 individuals, with the average family size being four. A total of 7% of the population are senior citizens or disabled, 18% are students and 6% are children below the age of five.

A total of 89% of the surveyed HHs live in permanent houses, with 66% owning the house. Two percent don't have electricity and 5% don't have sanitation facilities. Most houses have household gadgets and some also have private vehicles. Most HHs have more than one mobile connection, followed by TV, refrigerator and motorized two wheelers. Two wheelers are the main type of vehicle; not many use bicycles. Less than 5% of the people surveyed were unemployed. On average, there are two earning members per HH. In Willingdon slums, there are three income earners per HH, probably because most inhabitants are migrant labourers from the neighbouring state of Tamil Nadu. A total of 33% of those employed work in private companies, 25% are wage labourers, 21% are traders, and 6% are transporters who run autorickshaws or trucks.

Slum HHs were specifically covered under this survey to ensure that there is proper representation of HHs from lower income groups (LIG). The income pattern however clearly indicates that location is not an indicator of the economic status of the HH. Average income of HHs in slums is Rs. 7,639 per HH, putting them in the middle income group (MIG).

Expenditure on transportation is third highest expenditure after food and loan repayments. An average of 12% of the HH income is spent on travel. Of this, the most is spent on fuel; indicating usage of personal vehicles, followed by buses. In the residential areas, more than 50% of the travel expense is on fuel. Overall, the slums in mainland Cochin spend 13% of their income on travel. Some of these slums are now in the periphery of Cochin City, thereby requiring them to travel long distances for work. In Fort Kochi.

[26] Residential colonies: have proper access to roads and other civic amenities. Houses are permanent, land tenureship is legal.

[27] Slums: dense agglomerations of houses which may be of a temporary nature, and may or may not have access to civic amenities. Land tenureship may not be legal.

Figure 28: Income Pattern and Economic Category of Surveyed Participants

Income Pattern / Economic Category											
Area				V	LIG	MIG	HIG				
		HH's Surveyed	Average Monthly Income per HH (Rs.)	1 to 2500	2501 to 5000	5001 to 10000	10001 to 25000	25001 to 50000	50001 to 75000	>75000	No Response
Mainland	Slum	39	6,360.72	7	9	12	8				3
	Residential	202	23,553.98	8	25	53	62	30	14	9	1
Fort Kochi	Slum	28	6,058.93	8	8	8	3	1	0	0	
	Residential	107	17,615.89	3	17	38	31	14	2	2	
Willing-don Island	Slum	5	10,500	0	0	3	2	0	0	0	0
	Residential	25	24,372.0	0		2	16	4	2	1	

Legend

V Vulnerable
LIG Low Income Group
MIG Middle Income Group
HIG High Income Group

7.3 Urban Poverty in Cochin

Generally, slums are defined as centres of inhabitation of the urban poor. However the slums in Cochin do not exhibit many of the extremes of slums found elsewhere, such as dilapidated and non-permanent housing structures, poor ventilation, acute overcrowding, and lack of drinking water. Neither are the slums home to people from the lower income groups. The main distinguishing characteristics of the Cochin slum areas are;

1. Lower educational achievement (6% with tertiary education compared with 31% elsewhere).
2. Higher proportion of wage labor (27% versus 6% elsewhere).
3. Only slightly lower ownership of televisions (76% versus 100%), but much lower ownership of telephones (10% versus 65%), and computers (7% versus 43%).

7.4 Travel Profile of Surveyed Population

Survey data indicates that people staying in slums don't travel as much as those living in the residential areas. Slum dwellers travel longer distances for work; but trips to markets, banks and social networking is generally local. Unlike slum dwellers, people from residential areas travel longer distances for education. In residential areas, it is seen that even for trips of less than a km, people use two-wheelers; while cars and two wheelers are used for distances greater than a km. Employed people living in the slum areas of Fort Kochi and Willingdon Island spend an average of Rs.16 per trip to work. On the mainland, people from the slums spend from less than Rs. 5 to Rs.20 per trip to work, with an average of Rs. 10. People from the residential areas spend more money on travel, probably because they travel longer distances to work and also use personal vehicles.

7.5 Stakeholder Assessment

Stakeholders in the transport sector include commuters, operators, infrastructure providers, policy makers and regulators. Interaction with various stakeholder groups has provided an insight into local needs, constraints and opinions regarding the transport situation and sector in Cochin. During the course of the PFS, discussions were held with various stakeholders such as bus and auto-rickshaw operators, the traffic police and other Government agencies. As described earlier, a household survey

of 406 households was also undertaken, and two stakeholder workshops have been conducted during the PFS to provide additional public perception insights into the transport sector. In excess of 80 leaders from the Government and private sector attended these workshops. A summary of opinions collected from key industry groups is contained below.

Commuters: This group had views on the quality of roads, congestion, transport options available and also the role of the Government in delivering quality services. While everyone stated that road widths need to be increased and pedestrian facilities needed to be improved, some also stated that this could only be achieved while protecting the interests of buildings alongside roads. Everyone was unanimous of the need for pedestrian facilities being available on the roads. A number of respondents also raised the following issues;

1. Commuters from Fort Kochi are concerned about the quality of the roads, lack of maintenance and poor connectivity with the mainland.

2. Stricter adherence to the provisions of the Motor Vehicles Act (MVA) is needed.

3. Delay in delivering projects that are under construction is a continuing concern.

4. There is a partial willingness to pay for higher fares if the facilities are improved, while others consider that fares are already high enough and that the Government is already receiving enough funding for transport projects from the national and state governments.

5. Some believe that the authorities need to become more transparent and accountable to the public.

6. Most felt that roadside parking is a major reason for congestion, while others felt that congestion can be mitigated by the widening of roads and provision of more flyovers, bridges and bypasses.

Operators: This group believes that the MVA is a 'pro-government' agency and does not act in the best interests of the private operators. Auto-rickshaw drivers expressed that, at times of conflict, the police habitually side with the passengers.

Traffic Police: The Police felt that the Rs.100 fine for illegal parking is not a suitable deterrent.

Governmental Agencies:[28] The Mayor expressed that water transport needs to be promoted and people should be made aware that water transport is not a slow commuting option but a fast speed one. New corridors need to be developed. Social networks and residents welfare associations should also participate transport sector development and it is important that people are aware of safety measures. The Mayor believes that new policies are need to reduce congestion. PPP is considered to be a very viable option. The Collector emphasized that roads have become unsafe for pedestrians due to the excessive number of vehicles. Due to this people don't even walk distances that they normally could. Other opinions are that Cochin's transport system has become stagnant; there is a need to clear encroachments, develop an outer ring road, and clean up and use the waterways for ferry transport.

Civil Society: Key points raised included, (i) road maintenance and upgrading has not kept up with vehicle growth, (ii) transport planning does not exist, and there is no spatial mapping, (iii) a congestion tax during peak hours may help to reduce private vehicle usage, (iv) streets need to be pedestrianized, and (v) parking at bus stops and junctions should be prevented.

[28] Including the Cochin Corpoation and the Collectorate.

Overall, the comments and the survey confirm a general community call for improvements to the current public transport system and services and additional restrictions on the use of private transport modes through selected parking controls. Respondents also indicate a willingness to walk further distances on the assumption that better pedestrian facilities are provided. Also highlighted is a need for greater coordination between agencies. Stakeholder comments have been summarized and condensed into those items most relevant to the water transport sector. They are included in Figure 29 and highlight the level of public disquiet over the current state of the sector. Significantly, there is a willingness to pay for improved services, a feature of the extent to which this level of disquiet has generated.

Figure 29: Stakeholder Comments on Ferry Services and the General Transport Sector

Commuters	Operators	Regulation and Compliance	Infrastructure Support and Maintenance
Transport and Congestion • Ferry operations need to be taken over by the Government. Ferries are not safe and not maintained. Women are scared to use the ferries • Increase the boat service • The transport system in Cochin is now stagnant **Present Status of Roads** • No proper maintenance of roads, improper utilisation of funds • Not sufficient roads. Projects being implemented take a long time to finish. • Roads are so bad that its difficult to travel during the monsoons • Street lights do not work properly • Roads are too narrow, and not enough roads connect to the islands • Roads are poorly planned, very dusty and high congested (traffic jams) • No pedestrian facilities, house & shops closer to road • People dig the roads for other works but then it is not tarred again. • Vehicles are parked on the footpaths.	**Bus (Private)** • Revenue generated from advertisements is heavily taxed by the CC • All government projects on transportation do not benefit the operators • Operators are not happy with the present fare structure. They are not happy about providing concessions to students, police personnel, handicapped people and so on • Government is providing licenses to too many operators. Licensing take time and charges are very high • Not willing to pay extra for priority measures since the existing road tax is very high at INR 30,000/ quarter which is not justified. • Police should take care of their complaints • No complaint book is kept in the buses. Passengers complain about fare hikes, speeds, and accidents. Operators find it difficult to handle as there is so much that is going wrong • No records are maintained of ticket sales and concessions given • Routes are developed by operators hence computerized tendering may not be possible	• The Motor Vehicles Act (MVA) licenses the routes. In addition it gives a lot of power to the officers – it is a very inflexible act. It needs revamping. • Removal of encroachment is the Revenue Dept. and Corporation function. Police help is sought occasionally. • Police have capability to solve parking problems by applying MC Act 122 but there is interference at different levels (political intervention). • Police are informed about works in roadways. • Police are empowered to check pollution. • A major task is to coordinate and manage private bus operations **Options for PPP** • Outsourcing for removing illegally parked vehicles • Traffic Wardens can be sponsored by private firms and trained by the Police **Desired Inputs/Projects** • Imposition of congestion tax during peak hours • Timeliness and efficiency of public transport • Integration and linkages to interior destinations is required. • Allocate 30% of roads to pedestrians • Cost of using two wheeler almost same as using public transport, so public transport should be made economically viable	• There is close interaction between RBDCL, PWD, Water Authority and Electricity Board during road development stages. • There is no Dedicated Road Fund at the city level. But a Kerala State Road Fund exists. The RBDCL gets an amount of this fund for construction • R & R activities are taken care by the District Administration • Projects are often delayed by decisions being turned over regularly. There are too many referees engaged to settle disputes. • Delay in land acquisition is tied to under valuation of land by the people transacting to save taxes. Lack of a master plan that is public results in public anguish when the government takes over land. • Delivery of integrated transport and land use is being severely compromised due to regular turnover of staff at the CC • Cochin Corporation does not have the resources to develop basic maps for route and road planning purposes. **Desired Inputs/Projects** • Need for a regulatory body for transportation • Need to improve the image of water transportation and improve the services • Integrated transport hubs • Provide multilevel parking

Commuters	Operators	Regulation and Compliance	Infrastructure Support and Maintenance
			Desired Inputs/Projects (Continued) • Need to plan projects on different term basis, and need for out of box solutions • Removal of encroachments • Need for a spatial map for Cochin • Need to improve community awareness on transport issues • Need for long term planning such as 10-20 years
Road Improvements • Tar the roads, to ensure proper maintenance of existing roads, increase the width with consideration of the houses on either side • Increase the width road and number of overbridges • Corporation has to be more responsible, to utilize funds properly and carry out repairs of small potholes before they become worse • Plant trees on both sides of road and provide friendly and safe pedestrian facilities. • Street light facilities should be improved • Widening, proper tarring, traffic police and lights are required • Need quality work and covering of drainage with slabs. • The PWD works should become transparent. People should be informed about the money spent on each work.	**Ferries** • The state water transport department (SWTD) operates some of its own ferries and some are operated by private operators • There were more private operators previously but could not continue due to losses • The state government sets the fares • Passenger patronage is fine during the peak hours but there has been a dwindling trend due to competition by the road transport • Routes are decide by the state government • Operators themselves build and maintain the boats/crafts • Trainings offered on need basis • UMTA cannot work since a multiplicity of organizations is involved.	**Fares** • There is need to increase fares. Government isn't providing enough facilities for the rates and tax we pay • We are ready for an increase by Rs 1 for bus and 10% for auto rickshaws, if projects are guaranteed. • We are willing to pay more for better ferry services • We are willing to pay up to Rs. 3 for boat services and up to Rs. 5 for bus services • We are paying tax and central government is allocating funds which remain unutilized. Then why should we pay for the road. • We are ready to accept increased fares, but the government has to make sure that the facilities provided are useful for common people.	**Auto** • Environmental concerns were taken care of when autorickshaw engines were converted from petrol/diesel to LNG • The MV Act does not cater to the operators but to the government • MV act should be more specific about the amount of luggage a passenger can carry in an auto and the rates for it • Passengers tend to negotiate fares even if the meter is used. If passengers complain to the police then the autorickshaw drivers are forced to work on a compromise. • Fares are the only source of income for auto drivers

7.6 Social Impacts of Route Rehabilitation

The following summarizes the social assessment findings for each ferry route of the investment proposal.

Route 1: The redevelopment of the Vypeen terminal is not expected to have any adverse social impact as the land adjacent to the jetty is free of any local traders. On the Fort Kochi side, and depending on the season, there can be up to five street stall sellers that may be directly affected by the redevelopment of this terminal. The Fort Kochi development has the opportunity to incorporate a limited number of stall sellers in the new entry area planned for the terminal, subject to agreement.

Route 2: Redevelopment of the Mattancherry terminal will directly affect up to six street stall sellers. At this location, the impacts will be more significant. The precinct surrounding the current ferry terminal contains a large number of street stall sellers and there is little room for possible relocations adjacent to the site. Therefore any reduction of stalls will have a lasting financial impact on those affected.

The proposed relocation of services from Customs Jetty to Fort Kochi will have positive and negative social impacts. On the positive side, passenger travelling on the Vypeen to Fort Kochi route will now have a convenient changeover at Fort Kochi for onward travel to Willingdon Island. This is in contrast to the present situation where a lengthy walk is incurred between transfers. As service times are not coordinated, the overall trip length can be extended by up to one hour. This has implications for day labor employment. On the negative side, the street stall holders and shops adjacent to the Customs Jetty will suffer from the loss of passing trade. Although there may be an opportunity to relocate the street sellers, for the fixed shops the impact may be significant.

Elsewhere, stalls and retailing establishments on the road between the current Customs Jetty and the new Fort Kochi terminal will also lose the passing trade from tourists walking from the Customs Jetty to the Chinese Nets market area. These are well established retailing establishments however, and are less dependent on passing trade than the street stall hawkers. On the broader Fort Kochi community context, the redevelopment of the Fort Kochi ferry terminal and the accompanying park and pay facility will provide a faster, more reliable service to Ernakulam and High Court from the feeder two and four wheeler market.

Route 3: This service is likely to have minimal adverse social impact as the current informal business activity at these sites is minimal. Furthermore, the terminal improvements proposed can be accommodated on land currently available at the site. Positive social benefits include improved trip times compared with current bus services for trips to destinations within walking distance of the terminal sites.

Route 4: As is the case with Route 3, only minimal adverse social impacts are anticipated as local commercial activity in close proximity to the terminal facilities is minimal. A social impact may be felt in cases of a loss of sales revenue by island community shopkeepers if residents change shopping preferences as a result of improved mobility.

Route 5: This route is not expected to have any measurable adverse social impact on communities served. As may be the case with Route 4, minor adverse social impacts may occur

8.0 Investment Proposal Institutional Arrangements

This section addresses the institutional arrangements required to implement operate and maintain the various elements of the investment proposal. These arrangements are inevitably linked to the institutional arrangements for the sector as a whole and as such, require a whole of Government strategy.

The aspects explored here are broad concepts only and will require refinement by the relevant agencies to arrive at a consensus on the way forward. It is only through this approach that Agencies will be able to accept the new arrangements and work co-operatively for the benefit of the residents of Cochin.

8.1 Implementation Requirements

The investment proposal requires an integrated proposal of measures covering demand forecasting, vessel standards, infrastructure design, community engagement, legal and capacity building expertise. This is irrespective of the institutional model finally agreed upon. Figure 33 outlines the relevance of these skills and capabilities for this investment proposal. As can be seen, the skill and capability requirements are relevant to many other areas of the urban transport sector.

8.2 Institutional Landscape

The institutional landscape for the transport sector may be summarised as follows:

1. There are a number of Government Agencies involved in the regulatory functions of the sector. Each has a clear appreciation of their specific area of jurisdiction.

2. Each Government Agency has responsibility for specific aspects of the transport sector. It may be regulatory, it may be operational or it may be compliance related. However, there is no Agency which has a multiplicity of roles and responsibilities.

3. There is little evidence of co-ordination or cooperation between Agencies when projects or program implementation issues are considered. This “silo” approach has created a situation where projects and programs are being constantly delayed or compromised in aspects of design, delivery or ongoing maintenance.

4. The influence of the private sector is strong. Decisions of Government are being “influenced” according to sectional interests rather than by sound scientific reasoning. Such is the process of democracy in Kerala.

5. This influence is manifested through the Government sector as Government staff appointments and transfers are made in Thiruvananthapuram. This has the effect of unsettling the workings of local institutions as frequent transfers of senior staff [29]result in a lack of progress on issues of significance. Often, project delivery schedules are interrupted by this process. As a result, there is often little incentive for staff officers to extend themselves beyond the specific file issue at the time.

6. A lack of trust between the public and Government is evident and this also adds to the poor level of programme delivery when issues such as land acquisition arise. The apparent “ease” with which the public can issue a Public Interest Litigation (PIL) petition to the High Court in order to have a halt to the project granted, is a feature of the “politics” of delivering urban transport infrastructure in Cochin.

[29] For example, the Corporation has had five Secretaries in Four years.

7. There is an overriding lack of adequate technical skills and supporting technology with which to undertake a diagnostic analysis of the transport sector. Feedback from informed sources suggests there is no overall GIS based base plan for the City as a whole. This is a reflection of the overall inadequate resource capability of the Corporation and indeed a number of Agencies involved in the transport sector. The current "influence" of selected members of the industry on Government decision making suggests that such skills are not a sought after commodity in the current setting.

8. At the broader level, there is no integrated or coordinated master planning effort which will assist Cochin manage the urban development and urban transport sectors in a sustainable way. Moreover, while there is recognition of this shortcoming, there is little incentive or motivation to address the matter. Despite earlier planning studies highlighting these inadequacies, there is often a measure of symbolism attached to these statements as nothing of substance has been achieved on these issues in recent years.

9. As a consequence, of the 15 objectives of the National Urban Transport Policy, the introduction of the low floor Volvo buses as part of the JnNURM program is the only objective being complied with to any measureable degree.

Thus while the legislation exists, the current institutions are inadequately skilled and resourced to undertake the necessary analytical analysis to achieve and deliver a sustainable transport sector. Given the institutional culture in Kerala, this does not seem to be a concern of those involved.

As a consequence, the way forward is not a clear one.

8.3 Institutional Options

There are a number of options available for adoption. They may be summarised as follows:

- Responsibility and accountability is invested in a single Agency which is empowered and resourced to undertake the implementation and ongoing operations and maintenance elements of the investment
- Establish a co-ordination agency which draws upon the skills and resources of complementary Agencies to enact implementation.
- Establish a Special Purpose Vehicle (SPV) with specific responsibilities to implement, own, operate and maintain the investment proposal.

Within the above options, there is a need to establish a high powered committee with specific skills and day to day accountabilities to deliver (under the direction of the host organization/structure), the investment proposal. For the purposes of this investment proposal document, this committee is referred to as the CAFÉ Implementation Committee (CIC).

What ever option is eventually settled upon, it is imperative that there be a project champion with the appropriate empowerment and influence to drive the implementation process forward. Furthermore, it is imperative that there be a staged approach so that adequate processes and safeguards can be put in place in a timely manner. This will ensure the long term sustainability of the process and the structure.
There is currently debate on the advantages of a unified Authority with all the legislative and empowerment authority to plan and manage urban transport. While this model has merit, it requires the co-operation and support of a number of Agencies in the sector to enable it to function. Based on the current institutional landscape, neither the capacity nor opportunity exists at the present time. Therefore, such an Authority is unlikely to be achieved in the short to medium term. In the future, and

when adequate skills and capabilities have been developed in Cochin, the issue of an UMPTA can be considered as a realistic model.

8.4 Institutional Recommendations

For the immediate future, there is a recognised value in co-ordination committees in the development and implementation of sector improvements. This is a model which is in place in Cochin and irrespective of the effectiveness of this model, is considered a basis for the immediate future on the basis of it being a familiar model to start with. In addition, such a familiar model gives everyone a sense that their role in the sector is not being diminished.

However at the broader level, this model in itself is expected to have limited effect in delivering the CAFE transport master plan. A CAFE Implementation Committee (CIC) with the correct level of empowerment is considered be the most practical option for the immediate future. Such a committee would in turn oversee an Agency charged with the delivery of the policies developed and projects sanctioned by the CIC

The CAFE Implementation Committee (CIC) will have as its mandate:

To be accountable to the Government of Kerala for the timely preparation of sector policy, supporting plans and procedures to deliver the project proposals of the CAFE Master Plan in accordance with the objectives of the National Urban Transport Policy.

To achieve this objective, the CIC could conform to the following arrangements:

i. A Committee Chairman (full time) who has the appropriate level of political support and empowerment and who is sufficiently informed on the technical aspects of sustainable transport outcomes. The Chairman will be supported full time by other senior IAS committee members for a fixed term (minimum 5 years) and will have specific accountabilities to deliver. The CIC (through the Chairman) will report directly to a Committee of Ministers comprising at least the Ministers representing the Transport, Local Self Government, Industry and Commerce, and the Finance portfolios.

ii. The CIC will also include key senior officers from relevant Agencies on a needs basis for the purpose of assisting to navigate Departmental procedures to achieve timely outcomes. Compliance with this requirement should be strictly enforced by Ministerial decree so that the effectiveness of the CIC is not compromised.

iii. Adequate financial and technical resourcing should be provided to the CIC to enable it to function as intended. In particular financial and technical resources should provide for a marketing capability with the objective of improved community engagement and dispute resolution practices.

iv. Other accountabilities and resources as are required from time to time.

The CIC will be directly accountable for the achievement of the nominated KRA targets as listed in Figure 30 and as amended from time to time. Accordingly, the CIC will be responsible for policy determinations and the final outcomes of the CAFE Transport Master Plan.

Figure 30: Target Strategies, Key Result Areas and Measurement Criteria		
Target Strategies	**KRAs**	**Measurement Criteria**
1. Develop an integrated, safe and cost effective transport plan for pedestrians, public transport, and private vehicles. (CAFE transport).	Community development (pro-poor and social equity) Mode share Road accidents Formal passenger feedback	Community feedback (%) Maintenance of mode share (%) Reduction in accidents (%) Satisfaction levels (%)
2. Formally acknowledge the existing shortcomings of existing governance and commit to rectifying this situation as a first priority	Legislation amendments Government administrative practices Financial management and reporting	Enacted legislation (number) Review and restructure (date) Accountability measure (rating) Project returns per Rs Lahk
3. Develop a staged implementation strategy for works on doable improvements to the pedestrian, bus, ferry and rail systems, while providing for progression to a system to match long term needs of the city	Government reform Pro-poor and social equity Mode share Formal community feedback	Program (independent review) Community feedback (%) Maintenance of mode share (%) Satisfaction levels (%)
4. Establish a system to monitor and evaluate the effectiveness of the staged implementation program.	Government reform All KRAs	Enacted legislation (number) Rating (independent review)
5. Support the orderly growth of the city eastward and the Ernakulam economy through the timely delivery of key road linkages and road network improvements in accordance with the roadmap.	Pro-poor and social equity Economic development	Community feedback (%) Business levels (number)
6. Deliver a transport system which makes a measurable contribution to climate change through improvements in air quality and noise reduction	Air quality Noise quality	Monitoring (levels) Monitoring (levels)
7. Identify public and private sector finance mechanisms in order to develop projects in the roadmap with programs for sustainable operations and maintenance	Government and industry reform PPP	Community (feedback) Value of investment (Rs Lahks)

There are two options available for the CIC model.

The first is to inaugurate the CIC as the nodal agency with full accountabilities and with appropriate skills and resources. In this respect, a CAFE implementation cell with a range of capabilities would be required. Such a model is shown in Figure 31. In this model, membership of the CIC can be drawn from existing departments, providing there are adequate proven skills and capabilities to cover the requirements of the skill base required.

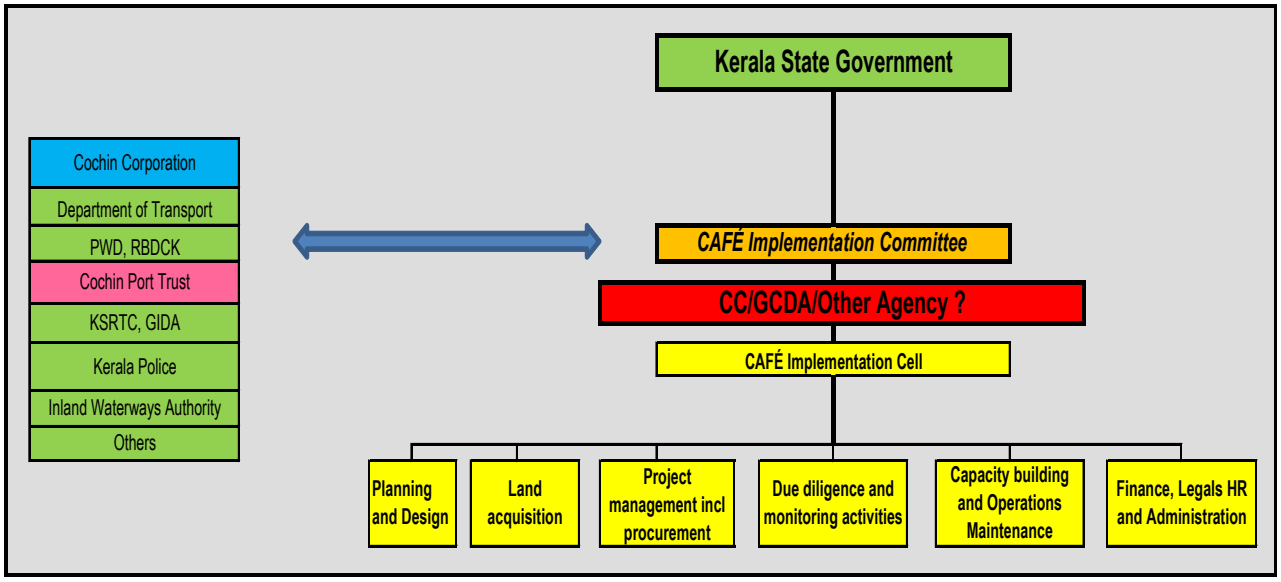


Figure 31: CAFE Implementation Cell Model

The second option is to establish an SPV with autonomous powers but owned by the Cochin Corporation, GCDA, PWD or other Agency. In this model, the need for a CAFE implementation cell will be eliminated as per the model in Figure 32. The SPV would report through the CIC.

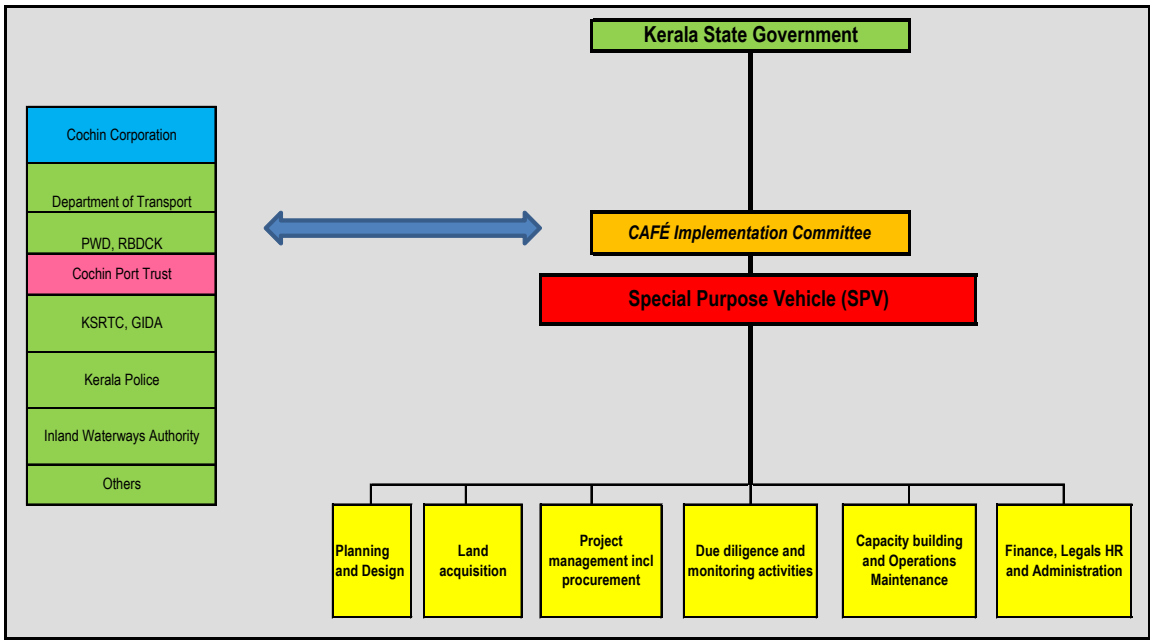


Figure 32: CAFE Implementation SPV Model

<u>As noted above, it will be the responsibility of the Corporation to make the decision on the appropriate model for Cochin.</u>

Whatever decision is made, the body will need to be the Nodal Agency for all matters relating to the master planning of urban development and the provision of sustainable urban transport outcomes which conform with and support the National Urban Transport Policy.

Once the decision has been taken, the task of developing an appropriate skills base within the model will need to commence in earnest. Figure 33 lists the skills matrix required for this new nodal agency.

Type of Training	CAFE Implementation Cell					
	Planning and Design	Land Acquisition	Project Management & Procurement	Due Dilligence and Monitoring Activities	Capacity Building, Ops. & Maint.	Finance, Legals HR and Administration
Network Planning and Design						
Modern policy principles and practices	X					
Modern travel demand surveys and analysis techniques	X			X		
GIS and demand modelling	X				X	
Network and service planning techniques	X	X		X	X	X
Infrastructure Planning and Design						
Design of modern terminals and passenger waiting facilities	X	X	X	X	X	X
Design of ITS and passenger support systems	X		X	X	X	
Vessel design specifications	X		X	X	X	
Design of modern refuelling and vessel storage terminal	X		X		X	
Contract procurement and management			X		X	X
Infrastructure Operations and Maintenance						
Service operations management	X		X	X	X	X
Infrastructure maintenance (terminals, pontoons & systems)			X	X	X	X
Modern Vessel Survey and Maintenance			X		X	X
Modern Financial Management						
Project feasibility assessment techniques	X		X	X		X
Contract management and dispute resolution techniques			X			X
Public Private Partnsrship Development Techniques					X	X
Modern financial management practices				X	X	X
Financial forecasting	X			X	X	X
Financial reporting	X			X	X	X
Environmental and Social Assessment and Mitigation						
Environmantal assessment	X			X		X
Climate change mitigation	X			X		X
Social assessment and mitigation	X			X		X
Effective community consultation practices	X	X	X	X	X	X

Figure 33: Skills Development Matrix, Requirement

8.5 Timing

The suggested timing for the implementation of this recommendation is as follows:

1. Establish the Committee of Ministers – September 2010
2. Establish the CAFE Implementation Committee – October 2010
3. Appoint Chairman and CIC members – November 2010
4. Decide on the preferred model for the immediate future – November 2010
5. Commence recruitment of technical skills – December 2010
6. Prepare program of CAFE Transport delivery and program marketing strategy – January 2011
7. Project preparation and commencement of implementation - March 2011
8. Continuation of policy development, master planning and project delivery – Onwards

This model is a simple approach based on the Coordination Committee philosophy that is familiar in Cochin. The difference with the CIC is that it will have the backing of the State Government across a number of Ministries. It will represent a “whole of Government” approach to the issue and will provide a “training ground environment” for a future Unified Mass Transport Authority for Cochin to be established when circumstances become more favourable to such an initiative.

9.0 Climate Change Analysis

9.1 Background

This proposal proposes investment in five different ferry routes and an upgrade of the ferry terminals to encourage use of waterways as a clean and affordable mode of transportation for Cochin and neighbouring islands. The investment proposal provides for an increase in daily ridership to 100,000 passenger trips from the existing 18,000 through twelve modern and fast passenger catamarans (including one spare vessel) and improved terminal infrastructure. One of the proposed routes in the investment proposal is new, while the other four are either an upgrade, a restructure or an extension of the current route.

The existing market share for ferry services is 0.27% of the total passenger trips in Cochin. As noted earlier, this is partly a reflection of the current state of the run-down ferry services where most of the ferries are perceived to be unsafe and the existing routes are not well linked to the bus routes. Inadequate terminals add further to the unpopularity of the ferries among the passengers. This investment proposal proposes to introduce modern new generation and highly fuel efficient catamarans, improve the jetty terminals, extend the existing ferry routes and add some a new route to meet the unmet market demand.

This investment proposal is aimed at achieving a modal shift from road transport to water transport. The routes will not only assist in connecting the underserved islands with the city center, but also provide commuters and tourists better travel options in terms of access and time. Two routes, Vypen to Kochi and Mattancherry to High Court via Fort Kochi and Ernakulam will have parking facilities that will enhance the travel experience and encourage private vehicle travelers to park and ride rather than drive to the mainland. This will result in a secondary beneficial impact. The shift from passengers using road transport to waterways will reduce traffic congestion on roads. Figure 34 below highlights the proposed proposal of ferry routes and associated parking infrastructure.

Figure 34: Summary of Investment Proposal

Route	Investment Proposal	Proposed Passenger Trips/Day
Route 1: Vypeen to Fort Kochi	Parking facility at Vypeen (100 car spaces) Introduction of one Kochi catamaran	12,000
Route 2: Mattancherry, Fort Kochi, Ernakulam and High Court	Parking facility at Fort Kochi and Mattancherry (100 car spaces each) Introduction of four Kochi catamarans	48,000
Route 3: Edakochi to Thevara	Introduction of one Kochi catamaran	9,000
Route 4: Panchayat Terminal to High Court and Ernakulam via Sicily Fetty, Hospital Jetty, Ponnarimangalam Jetty and North Jetty	Introduction of two Kochi catamarans	12,000
Route 5: Kumbalam to Chittoor via Ernakulam, High Court and Vaduthala terminals.	Introduction of three Kochi catamarans	12,000.

The subsequent section discusses the greenhouse gas (GHG) emissions impacts resulting from implementation of the ferry investment proposal and presents the methodology and results.

9.2 Emissions Savings Methodology

The investment proposes improvements to the ferry services through the introduction of fuel efficient ferries and associated infrastructure. The emissions impact focuses only on GHG emissions, and the project boundary for the analysis is the project activity. The analysis presents the emissions growth from implementation of the improved ferry services as, (i) emissions from ferry operations, and (ii) emissions from construction activity associated with the parking facilities.

Construction activity is defined to include the transport of construction materials and the energy used in raising the structures. The embedded emissions of the construction materials (i.e., the emissions contained within construction material like cement or brick) are not included. The emissions savings from the introduction of improved ferry services come from, (i) the modal shift from road transport to ferries, and (ii) improved fuel efficiency from reduced traffic congestion as a result of reduction in traffic volumes. The net savings in GHG emissions from improved ferry services are, therefore, defined as the emissions savings minus the emissions growth, as illustrated in the text box below:

> Net Emissions savings = Total emissions saving due to modal shift + emissions from improved fuel efficiency due to traffic decongestion – emissions due to ferry operation - emissions from the construction of car parking facilities at ferry terminals

The emissions from the construction of car parking are a one-time occurrence, whereas all other components reoccur annually. The net emissions savings were translated into a 5 year horizon, using the following approach:

> Net emissions over five years = (Emissions savings due to modal shift + emissions from improved fuel efficiency – emissions due to ferry operations)*5 - emissions from the construction of car parking facilities

In developing the five year outlook, it is assumed that the ferry operations will remain as it is currently proposed. Anticipated growth in the ferry operations or increases in ferry ridership (over and above that indicated above) is not included in the five year savings estimate. Each route proposed in the investment proposal has been analyzed separately to determine the GHG emissions savings and is presented below.

9.3 Greenhouse Gas Emission Reduction

Emissions reductions from this investment proposal arise predominately from change in the transport mode from road to waterway. As illustrated in Figure 35, the biggest shift occurs from passengers who would have used the bus service (in the absence of these ferry improvements). On average, across the five routes, the shift from bus passengers to ferry is anticipated to account for 50-60% of the total shift. The second largest category of the shift will be from two wheelers, which account for 20-30% of the total and the remaining shift consists of car passengers. The total vehicle km displaced is based on the expected occupancy of the ferry, which in most routes is assumed to be 50%.

Figure 35: Expected Share of Modal Shift to Ferry Service

Package	Share of displaced passenger by transport mode (%)			Total vehicle km displaced from road (Km)
	2 wheelers	Cars	Buses	
Route 1: Vypeen - Fort Kochi	25	19	56	29,000
Route 2 Mattacncherry, Fort Kochi, Ernakulam and High Court	22	18	60	81,130
Route 3 Edakochi to Thevera	21	16	63	11,179
Route 4 Panchayat Terminal to High Court	27	18	55	10,966
Route 5 Kumbulam to Chittoor via Ernakulam, High Court and Vaduthala	27	18	55	12,081

Figure 36 describes the emissions impacts of implementing the ferry service. As illustrated in the Figure 36, total emissions savings over a 5 year period is expected to be 38,000 tonnes of CO2. On an annual basis, the net emissions savings will be approximately 7,500 tonnes.

Figure 36: GHG Emissions Savings

Package	Passenger trips	Emissions savings (TCO2)		Project Emissions (TCO2)		Net Annual Emissions savings (TCO2)	5 year Net Emissions savings (TCO2)
		Annual emissions savings from modal shift	Annual Emission Savings due to decongestion	Annual Ferry Emissions	Emissions due to construction		
Route 1: Vyppen to Fort Kochi	12,000	1,842	159	59	19	1,923	9,691
Route 2: Mattacncherry, Fort Kochi, Ernakulam and	48,000	5,424	138	825	39	4,697	23,641
Route 3: Edakochi to Thevera	9,000	760	111	83		788	3,941
Route 4: Panchayat Terminal to High Court	12,000	666	78	734		10	49
Route 5: Kumbulam to Chittoor via Ernakulam, High Court and Vaduthala	12,000	733		587		146	732
Total	**93,000**	**9,424**	**486**	**2,287**	**58**	**7,564**	**38,053**

The majority of the emissions savings occur from modal shift from road to waterway. These savings, which will recur annually, will be approximately 9,400 tonnes of CO2, and consist of road vehicle fuel

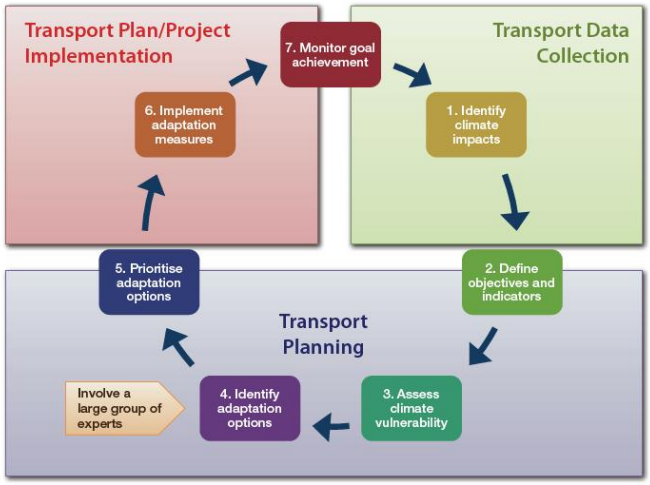
that is avoided as a result of using the ferries. Additional savings in emissions are expected from the reductions in road vehicle fuel use as a result of improved vehicle fuel efficiency from decongestion. Increased ferry use will likely result in lower traffic density, which in turn improves the fuel efficiency of the remaining vehicles on the road. This is likely to result in savings of approximate 480 tonnes of CO2 annually. In total however, the modal shift rather than the efficiency gains from improved traffic flows are the principal determinants of emissions savings.

The emissions savings will be offset by emissions growth from increased ferry use. Increased ferry use is expected to add approximately 2,200 tonnes of CO2 annually. This is a conservative estimate as it does not exclude the emissions from existing ferry use that would be replaced from the enhanced ferry service. Another component of the emissions growth results from the construction of parking facilities at three ferry terminals. This is a one-time emissions growth that occurs from the construction activity of the facility and is expected to be approximately 60 tonnes.

9.4 Climate Proofing Methodology

Despite enormous progress in climate predictions, a degree of uncertainty remains in impacts and vulnerability assessment, especially at the local level. Still, adaptation needs to be a part of the planning approach to reduce vulnerability and ensure that large public investments in long-lasting transport infrastructure are not rendered unusable due to changed climatic conditions. Climate proofing aims to reduce perceived climate change risks while developing packages. UK Climate Impacts Programme (UKCIP) has designed a framework (Figure 37) for developing adaptation strategy for urban transport development.

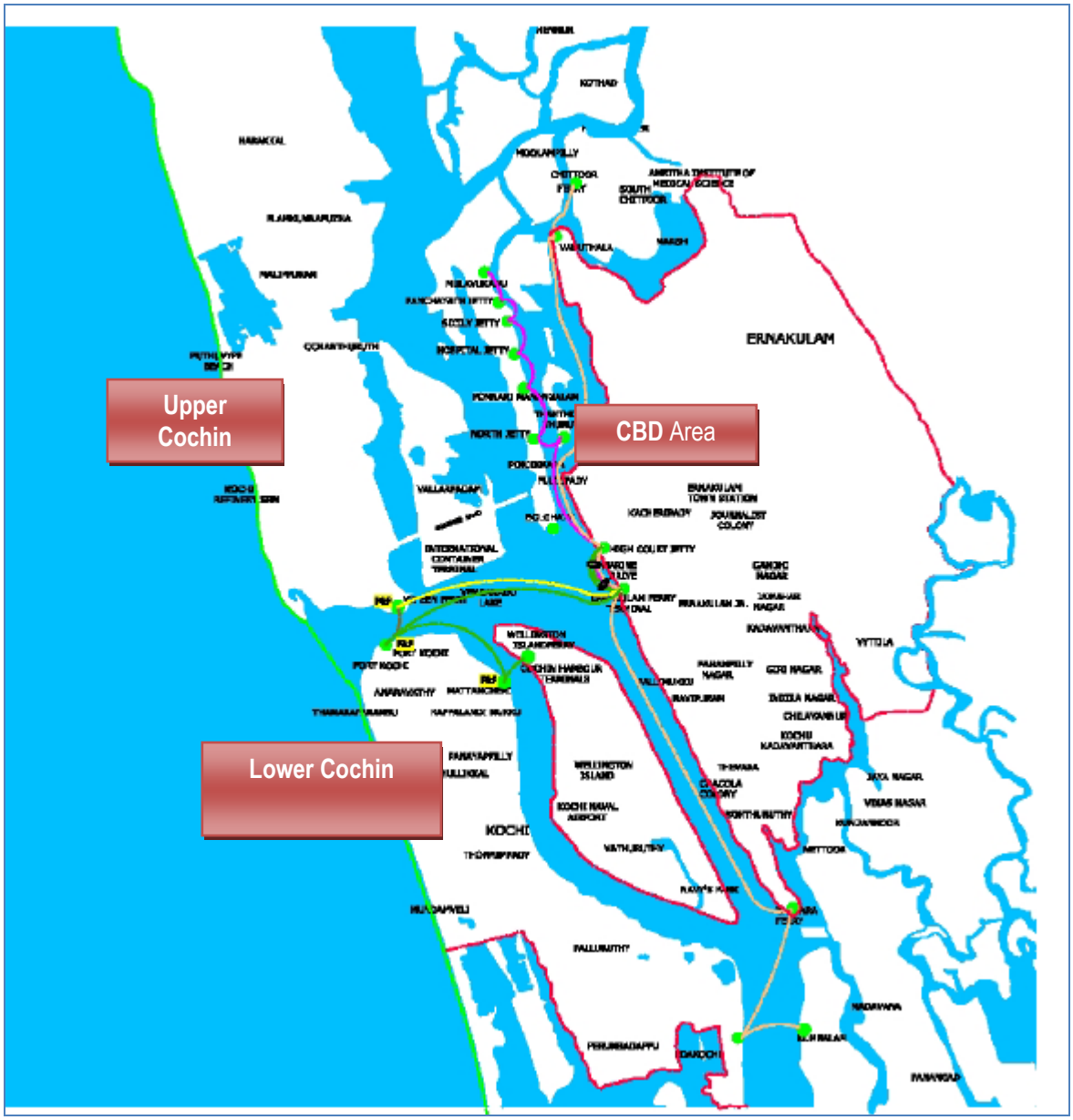
Figure 37: Framework for Developing Adaptation Strategy for Urban Transport Development



This analysis of climate proofing, has involved only Steps 1 – 4 because the projects are still at the pre-feasibility stages and will go through stakeholder discussions and prioritization as it evolves through feasibility and to implementation. The remaining steps 5 - 7 are better suited for when the projects reach the feasibility phases.

To assist with this analysis, Cochin has been divided into three areas for the analysis. For ease of locating development projects under each investment package, these three areas are nominally referred to as: Upper Cochin, Lower Cochin and City CBD
below shows location of these areas.

Figure 38: Cochin Map Showing Different Analysis Areas



Step 1: Identify Climate Impacts: Transportation investments are usually planned for more than 50 years. Given this long planning horizon, climate change assessment has gradually become an important part of pre-feasibility studies undertaken prior to investing on urban transportation infrastructure. Assessment of potential climate change impact on the infrastructure investment planned for a city helps to gauze through the existing and expected climate change threats, the extent of vulnerability, the areas which would be impacted the most, and the most vulnerable areas and groups of people. Identification of potential climate risks holds more importance for low lying coastal cities such as Cochin. The Climate Check tool recommends identifying the potential climate impacts in the city/region where the investment is planned as the first step in the climate change assessment. Section 9.5.1 discusses historical, existing and the potential climate impacts for Cochin. The discussion is based principally on scientific and academic literature.

Step 2: Define Objectives and Indicators: In order to have a climate proof system, objectives for system design must be clearly defined so that adaptation strategies can be appropriately designed and against which varying transport development and adaptation options can be assessed. By accommodating an adaptation perspective in the transport system design this will help in formulating benchmark criteria for necessary measures which can be incorporated in the planning and designing of infrastructure to help reduce risks posed by climatic hazard. Section 9.5.2 discusses some of the possible objectives and indicators along with the rationale for choosing those indicators.

Step 3: Assess Climate Vulnerability: The purpose of this assessment is to identify risks that may be inflicted by climate change, and to estimate their extent of effects on infrastructure set up and disruption in transport services. Figure 39 lists the perceived impacts on various infrastructure types and commuting behaviour:

Figure 39: Climate Change Impact on Various Transport Infrastructure Type

Climate Impacts	More Vulnerable Areas	Transportation Mode Impacted	Extent of Impact (Low/Moderate/Severe)
Heat Waves	City Business District (CBD)	Road, Pedestrian	Moderate
Water shortage	CBD, Lower Cochin, Upper Cochin	Road, Pedestrian	Low
Coastal Floods (Sea level rise)	Lower Cochin, Upper Cochin	Road, Pedestrian	Severe
		Water	Moderate
Floods (Extreme Rain)	CBD, Lower Cochin, Upper Cochin	Road, Pedestrian	Severe
		Waterways	Moderate
Cyclone	CBD, Lower Cochin, Upper Cochin	Road, Waterways, Pedestrian	Severe[1]

Note[1]: Although the impact of cyclones on infrastructure will be high, the impact on various packages due to cyclone has not been evaluated due to low probability of occurrence of cyclones in this region.

The vulnerability of each investment package is assessed against the risks of the expected climate impacts as illustrated in Figure 40. The checklist provided in the manual was followed to prepare a risk matrix which is shown in detail in Section 9.5.3.

Figure 40: Level of Impact on Various Packages Due To Climate Change

Heat Waves	Water Shortage	Coastal Flood	Flood (Extreme Rain)
Low	Low	Moderate	Moderate

Step 4: Identify Adaptation Options: Building a climate resilient infrastructure is imperative to safeguard infrastructure and its embedded value, ensure reliable mobility, ensure economic development and guarantee the health and safety of citizens. Based on the potential risks posed due to climate change, each proposed route has been analysed separately to assess the level of impacts due to climate hazards. Figure 41 summarizes the interventions needed from different perspectives (planning, design or O&M) to increase the adaptive capacity of each route. Appropriate measures needed to address the risks have been discussed in detail in Section 9.5.4.

Figure 41: Proposed Stage of Intervention to Meet Adaptation Measure

Relevant Climate Impacts	Risk level on infrastructure	Proposed adaptation mechanism (Planning/Design/Operation)
Heat Waves	Low	No measure suggested
Water Shortage	Low	No measure suggested
Coastal Flood	Moderate	Planning, Design, Operation
Flood (Extreme rain)	Moderate	Planning, Design, Operation

No adaptation mechanism is suggested for the low level of climate risks

9.5 Climate Proofing

This section discusses the various climate change impacts in Cochin. This includes the adaptation objectives and the monitoring metric for these objectives, climate change risks and extent of vulnerability of the proposed investment packages, and the potential adaption measures to make these investments climate proof.

9.5.1 Identification of Climate Impacts

The widespread and profound impacts of global climate change are well recognized and accepted in international scientific communities. Coastal areas are more vulnerable owing to the additional perils of sea level rise and extreme weather events such as cyclones and hurricanes that can be ascribed to climate shifts. Therefore, a holistic assessment of the effects of future climatic scenarios on Cochin is a prerequisite for planning any future infrastructure project, especially with regard to its capability to endure probable extreme weather and to support disaster management in case of extreme events. This study is based on review of existing literature and climate research on Cochin and other coastal areas which are predicted to have similar climatic impacts as Cochin.

At an average elevation of 1.5 meters above sea level, Cochin City is nestled on the western coast of southern peninsular India. One of the most important ports on the western coast of India, this city in Kerala, is situated on the sea mouth of six rivers. These rivers and their estuaries discharge their waters in the navigable backwaters of Cochin. The city comprises several islands including the Wellingdon, Ramanthuruthu and Cheranelloor islands that are currently connected by ferry routes. Farther inland, the land gradient rises in the Western Ghats mountain range that has sheltered the city from much of the cyclonic activities originating over the Bay of Bengal, on India's eastern coast[30].

9.5.2 Perceived Climate Threats in Cochin

The effects of global environmental change will be manifested most directly through four mechanisms: (a) global mean surface and sea temperature, (b) precipitation changes, (c) storms and associated phenomenon, and (d) sea level rise. Most scientists now agree that given current trends, global mean surface and sea temperatures will rise sharply over the next century. Though the scale of the change is debatable, it is believed that any change will adversely affect the natural ecosystem. Temperature increase is also believed to effect precipitation patterns worldwide. Storms and other associated phenomenon are likely to increase both in intensity and in frequency. Fourth, sea

[30] Possible Vulnerabilities of Kochi, India, to Climate Change Impacts and Response Strategies to Increase Resilience – ORNL & CUST, June, 2003.

level is expected to rise due to a combination of thermal expansion and the melting of mountain glaciers and the polar ice caps.

Temperature Rise

Studies substantively indicate marked global mean temperature rise over the past 100 years. Cochin is not insulated from such changes and has itself witnessed an increase in mean annual temperature rise of approximately 1°C. Moreover, the proximity of the city to the sea causes the city's climate to be affected by the sea surface temperature (SST) as well. Studies of long-term time series (1856–2000) of SST anomalies off the Cochin coast have shown an increase in temperature over the decades except for negative anomaly periods in the 1950–59 and 1970–79 decades. In the case of SST, if the present rate of increase continues, the sea-surface off the Cochin coast will be warmer by another 0.5°C by the end of 2050. As per current studies, local climate is believed to be more sensitive to SST changes than land surface temperature.

Meanwhile, forecasts of global climate change show expectations of an increase in global average surface temperatures of 1.1 to 6.4°C by 2100, with median projections in the range of an increase in the range of 3°C. According to these forecasts, Cochin, due to its proximity to the equator and to the sea, is expected to have temperature increases less than the global average. If, however, an increase of 1 to 2°C as a result of climate change is added to rising temperature trends detected otherwise, Cochin could be warmer in 2050 than at present by several degrees Centigrade. Further, rapid urbanization in Cochin will entail the urban heat island effect due to which the temperature difference between a typical city and adjoining rural areas could be as high as 3°C during day and 12°C at night time[31].

Temperature rise will directly impact demand for potable water and electricity for cooling and refrigeration purposes. With economic development and lifestyle advancements, electricity demand will increase at faster rates in the coming decades. Acute changes in temperature and precipitation patterns have the potential to change local human and natural ecologies. Human health as an example can be affected by swelling populations of pests and pathogens in these conditions. Implications on sanitation and personal hygiene levels must also be considered. Further, local flora and fauna could be affected adversely. Sea water temperature and composition could have a pronounced effect on sea currents and thereby on local fish populations and people who rely on fish agriculture.

Precipitation Changes

Annual precipitation levels in Cochin have shown great variability over the years (Figure 42). While the normal number of rainy days annually in Cochin is 160 days; over the past 50 years there has been a considerable decrease in the number of rainy days as a part of the annual rainfall pattern. It can be inferred that Cochin is receiving more short spells of intense rainfall during the southwest monsoon season and throughout the year than in the past

Figure 43 presents the average monthly rainfall during the months of June and July, which alone have received an average of 40% of total rainfall in a calendar year. These are also the months that mark the onset of the southwest monsoon in southern India. Flooding events such as those in 1991 and 2007 have been marked with extremely high precipitation in the months of June and July, respectively. As seen in the graphs, monthly rainfall data is also indicative of short bursts of intense rainfall in years in which flooding has occurred.

Predicting changes in rainfall and its variability in the future as a result of global climate change is quite complex in the absence of regional models or modeling capabilities for developing specific scenarios for Kerala or Cochin. Atmospheric general circulation models (GCMs) have been used to construct scenarios for Asia and for South Asia and a regional climate model (RCM) has predicted a first set of

[31] US EPA - http://www.epa.gov/hiri/

estimates of regional climate change within India. Different models give somewhat different results regarding patterns of total annual rainfall increase or decrease. For example, some GCMs show a decrease in annual rainfall in the Kerala region, but predictions of rainfall changes from the RCM model show a significant increase in total annual rainfall by 2050 (Figure 44). Most models agree, however, that both annual and seasonal rainfall will become more variable and that, in most years, a larger percentage of the rainfall will fall in a smaller number of more intense events.

Figure 42: Annual Rainfall in Cochin

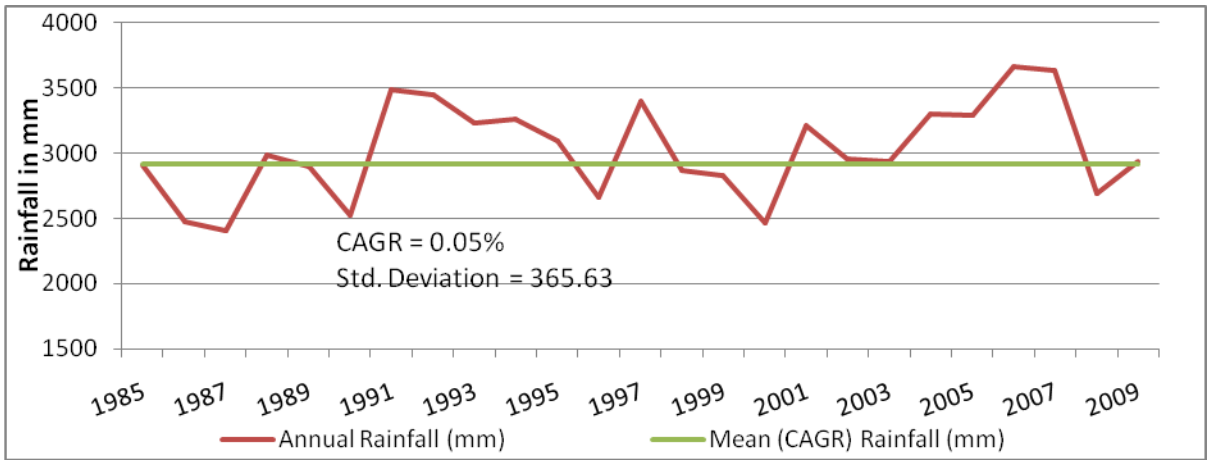


Figure 43: Rainfall in Cochin in June and July

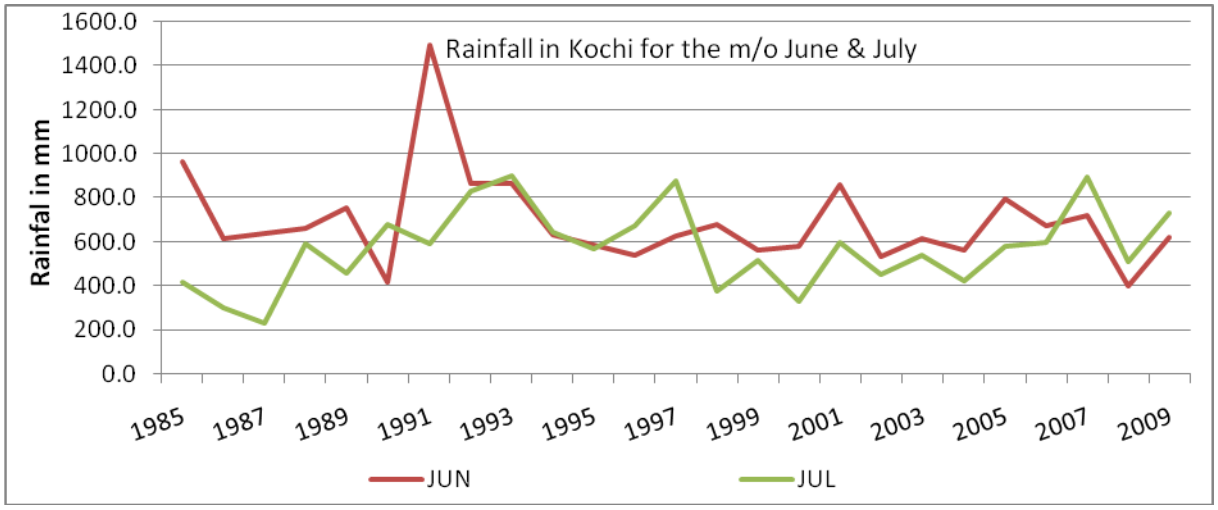
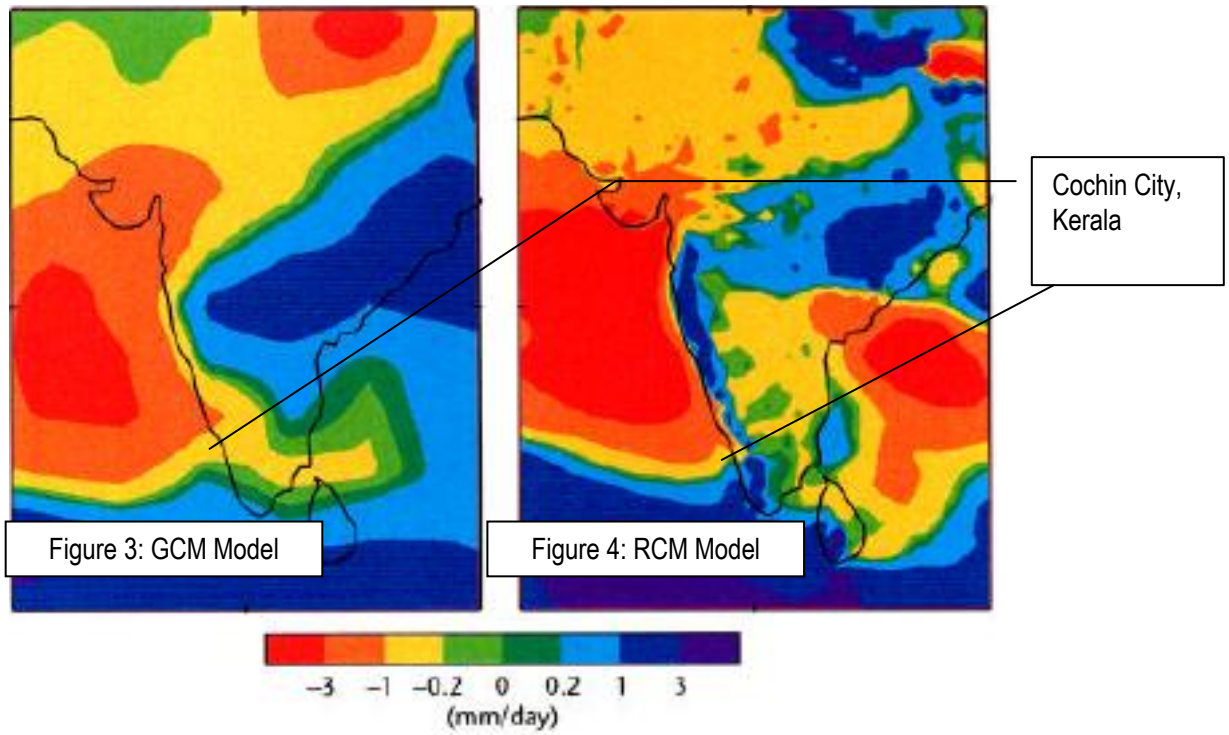


Figure 44: GCM and RCM Maps for Annual Rainfall Prediction



Predicted changes in monsoon rainfall (mm/day) over India, between the present day and the middle of the 21st century from the GCM (left) and from the RCM (right). (Hadley Centre, 2000)

Although these studies differ on the total amount of rainfall that Cochin is expected to receive, they reinforce trends that indicate greater variability and intensity of precipitation. Based on these studies, it can be concluded that Cochin's rainfall is likely to occur in a smaller number of more intense storm events.

Sea Level Rise

Studies of tide gauge data worldwide have indicated a gradual increase in the mean sea level. Estimates of mean sea level rise made from past tide gauge data at Cochin have indicated a rise of approximately 1.75 mm/year after applying Glacial Iso-static Corrections[32][33].

[32] Sea Level Changes Along The Indian Coast: Observations And Projections, Unnikrishnan 'et al, February 2006

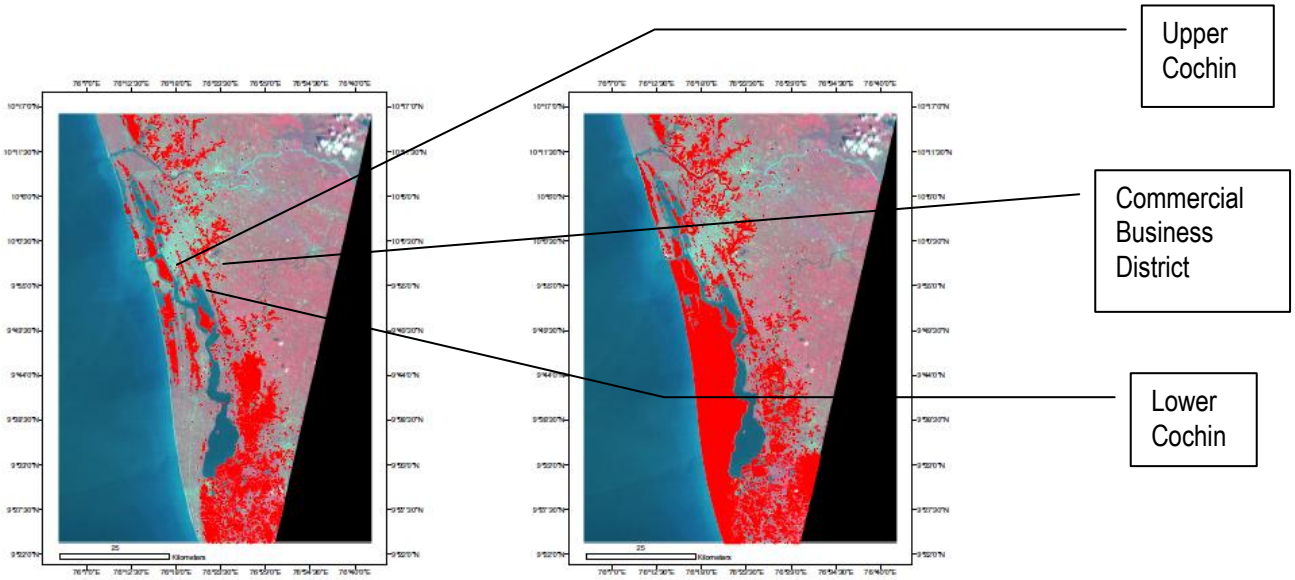
[33] Glacial-isostatic adjustment describes the phenomenon of how the earth readjusts to a stable shape after its loading by ice sheets. These glacial loads are quite substantial. For example, during the last glaciation which lasted roughly from 100,000 yr to 8,000 yr BP (before present).

Net Sea Level Rise Trends (Unnikrishnan & Shankar, 2007) In: (*Global & Planetary Change*) from past tide-gauge records in Cochin			
No. of Years of Data	**Trends (mm/yr)**	**GIA (Glacial Isostatic Corrections)**	**Net Sea Level rise (mm/yr)**
54	1.31	-0.44	1.75

Some studies[34] of the pattern of sea level over the period 1949 to 1998, however, do not show a significant rise. Conversely, global projections of climate change indicate that the globally averaged sea level will rise significantly by 2100, perhaps as much as 0.9 meters. Apparent sea-level rise can also be affected by coastal land subsidence or uplifting. Considering results of global and regional analyses, the likelihood of sea-level rise in the Cochin area in coming decades is quite high. Though rates of change and eventual equilibrium levels are highly debatable, sea level rise of up to one-third of a meter by 2050 appear quite likely[35]. These estimates are conservative when more recent studies such as the one conducted by Unnikrishnan & Shankar in 2007 are considered.

Based on these studies, shown below are the inundation maps of the larger Cochin area based on two scenarios for sea level rise (Figure 45). The first on the left considers sea level rise of around 1 m by 2100 and the second forecasts a 2m sea level rise by 2100. The first scenario is much likely and could cause some damage to the lower and upper parts of Kochi, while the CBD area is moderately affected.

Figure 45: Inundation Map of Cochin for Projected Sea Level Rise of 1m and 2m[36]



34 Monthly Mean Sea Level Variations at Cochin, Southwest Coast of India, Dinesh Kumar, 2001.

35 Possible Vulnerabilities of Cochin, India, to Climate Change Impacts and Response Strategies to Increase Resilience – ORNL & CUST, June, 2003.

36 Sea-level changes along the Indian coast – Impacts & Vulnerability, Unnikrishnan et al.

Cochin's Wastewater Evacuation System

Cochin's canals range from wide waterways that once carried water transport and trade, to relatively small drainage channels. Currently however, the canals are silted, polluted by solid wastes, seasonally clogged by water foliage, and in some cases narrowed by encroachments to increase space for buildings and roadways. Cochin's canals now also receive much of the city's liquid wastes, further compounding health related problems.

Water flows through the city from two principal sources, (i) the tides that regularly force seawater into the canals and backwaters, and (ii) monsoon rainfall on the city and eastward in the Western Ghats brings fresh water runoff through the numerous rivers and streams toward the coast. The existing drainage infrastructure could come under even more pressure if future precipitation events were to become more intense. This problem could be aggravated by any sea level rise owing to climate change. Water clogging and flooding as a consequence, could cause structural problems for existing infrastructure and could also pose serious health concerns in affected areas thereby making them virtually uninhabitable.

Storm Behaviour

Studies suggest that apart from precipitation amounts and intensities, monsoonal storm behaviour (e.g., severe weather events) is quite unlikely to significantly affect Cochin's climate.[37]

Impact on Coastal Areas

Most of the developed coastal area in Cochin is at about 1m above sea level, which makes it vulnerable even to a modest sea level rise in the range of 0.3 to 0.5m during high tide or monsoonal storms. Cochin's surrounding islands at 1.2 to 2.1 m above sea level are not safe either. High tide storm surges that are usually above 1.2m above nominal sea level could affect large areas within the islands.[38] The corresponding effects could be two fold. First, salt water intrusion into ground and surface water resources could affect already limited potable water supplies. Secondly, increasing sea levels and intense monsoonal storm surges could further accelerate beach erosion. As witnessed in recent times, the equilibrium process comprising balanced erosion and accretion has been altered to cause rapid depletion of coastal shorelines.

As a consequence, large portions of coastal regions could become inhabitable thus forcing an influx of landless poor into central Cochin corporation area. This could increase the pressure on existing infrastructure and concomitantly result in other problems related to over-crowding in the city.

9.5.3 Setting Adaptation Objectives and Indicators

Climate change can cause floods, cyclones, drought and tidal surges in coastal regions thereby affecting Cochin and neighbouring islands. Against this backdrop, people living in the coastal areas for their livelihood sustenance are vulnerable to climate impacts. Risks of climate impact make transport infrastructure susceptible to damages; endangering reliable mobility, economic development and health and safety of citizens. Hence, safeguarding transport infrastructure from climate impacts is of utmost importance and failing to do so could lead to consequences far more severe than infrastructure damages.

The future livelihood of denizens of Cochin and surrounding areas depends on viable adaptation measures to cope with the future extent and consequences of global warming. One way is to have a climate proof system by making urban infrastructure more adaptive and resilient to climatic change

[37] Possible Vulnerabilities of Cochin, India, to Climate Change Impacts and Response Strategies to Increase Resilience – ORNL & CUST, June, 2003.

induced extreme weather events. In order to have climate proof infrastructure investments, objectives for system design must be clearly defined so that adaptation coping strategies can be accordingly designed and against which different transport development and adaptation options can be assessed.

Having an adaptation perspective in the transport system design will help in formulating benchmark criteria for necessary measures that can be incorporated in planning and designing of infrastructure to facilitate reduction of risks posed by climatic hazard. Some of the relevant criteria or indicators for setting objective of system design in context to different transport development packages for Cochin are illustrated in Figure 46.

Figure 46: Indicators for Setting Adaptation Objectives

Adaptation Criterion	Rationale	Monitoring Metric
Ability of roads, waterways and other associated infrastructure to withstand without major structural damages floods of intensity greater than the most severe flood incident observed in Cochin and adjoining areas, in the last 50 years.	Improving system ability to help in disaster response Incur minimum damage to infrastructure Help in speedy restoration post disaster	Number and extent of damage on the associated infrastructure resulting from extreme events as recorded by relevant authorities
Availability of transport fleet and infrastructure (buses, ferries, roads, waterways etc.) during normal conditions and affected conditions should be very high and as per the international standards. (It is understood that availability levels are different for normal and affected conditions)	Ensuring high level of reliability in operation Improving system ability to help in disaster response and demonstrating high level of resiliency in being able to return to service quickly after the extreme weather even	Recording down time of transport fleet and infrastructure during extreme events and during regular operations
Limiting traffic and public transport disruption in major roads caused due to floods to less than 4 hours post event occurrence. Roads and waterways should be brought to a pliable condition within this timeframe	Improving system ability to help in disaster response Help in speedy restoration post disaster Minimizing economic losses due to non availability of transport	Recording down time of major roads and waterways caused due to flood by the relevant authorities
Access to high priority establishments such as hospitals, fire stations, emergency services, administrative buildings etc. located in city should be restored within 4 hours post disaster occurrence	Help in speedy restoration post disaster Minimizing economic losses due to non availability of transport	Time required to reach high priority establishments post disaster.

The objectives can be achieved by integration of climate change risks and adaptation into development policy, planning, operations, and the building capacity of people to become better prepared and equipped for adapting to climate change impacts. Suggested measures are:

1. Resilient design standards and materials for infrastructure construction.
2. Regular maintenance of infrastructure facilities.
3. Retreat/Protect planning to avoid high risk prone areas.
4. Sufficient contingency for disaster response.

9.5.4 Climate Risk and Vulnerability

A sound risk assessment procedure is essential to ensure that climate change aspects are integrated within the development planning and decision-making processes. The purpose of this assessment is to identify risks that may be inflicted by climate change, and to estimate their effects on infrastructure set up. Answers to the following key question have been worked out based on research and analysis.

1. What are the most likely climatic impacts – Identify climate vulnerability
2. How the climate impacts have changed over time – Understanding trends
3. Which areas of Cochin are likely to have an impact – Highlighting specific hotspots
4. Whether infrastructure of these areas will be impacted – Impact assessment
5. Do expected risks affect existing or planned transport system – Priority zones
6. What modal shift will occur due to impact on transport – Behavioural change
7. How are the impacts dependent on level of climate change – Scenario analysis

Figure 47 shows the perceived impacts on various infrastructure types and commuting behaviour following various climate change impacts. As illustrated in the figure, heat waves mainly impact road infrastructure and vehicle operation thereby affecting mobility behaviour but the impact on water transport infrastructure is low. The effects of water shortage on road infrastructure can occur in the form of road degradation, landslides and soil subsidence. The only way water shortage can affect water transport is through disruption of ferry movement due to low water level. However, water transport is going to be severely impacted in the event of coastal flood or floods due to extreme rains as the facilities such as jetties/ferries may get damaged. There could be reduced clearance under waterway bridges and silt deposits and obstruction due to trees and other materials may hinder mobility.

Figure 47: Climate Risk and Vulnerability on Infrastructure Type

Climate impacts	Water Infrastructure	Mobility Behaviour
Heat Waves	Increased vegetation growth leading to clogging	Shift from public to private transport
		Slowing of traffic flow
		Less use of over-bridge / precincts
Water Shortage	Low water level can disrupt ferry movement	Less use of over-bridge / precincts
	Reduced clearance under waterway bridges	
	Increase in slit deposits	
	Reduced navigability of rivers and channels	

Note: Impacts of cyclones has not been considered due to very low probability of their occurrence

Once the potential risks to various transport infrastructure types and change in mobility behaviour are established, the vulnerability of each package is assessed against the risks of the expected climate impacts. Figure 48 highlights the vulnerability of each package against climate change triggered impacts and has been prepared based on the checklist provided in the manual. The definition of various climate change impacts such as heat waves, water shortages, coastal floods, floods (extreme rain) is consistent as per the standards.

Figure 48: Climate Risk and Vulnerability Matrix on Various Investment Packages

Climate Change Impact	Level of Certainty Regarding Occurrence of Climate Change Impact	More Vulnerable Areas	Extent of Impact on Transport (Low/Moderate/Severe)
Coastal Floods (Sea Level Rise)	High probability	Lower Cochin, Upper Cochin	Moderate
Floods (Extreme Rain)	High probability	CBD, Lower Cochin, Upper Cochin	Moderate

Note: Impact of cyclone has not been considered due to very low probability of its occurrence

9.5 5 Adaptation Options

It is increasingly acknowledged that climate change adaptation will form a necessary component of development strategies. Building a climate resilient infrastructure is imperative to safeguard infrastructure and its embedded value, ensure reliable mobility, ensure economic development and guarantee health and safety of citizens. Based on the potential risks posed due to climate change, each proposed investment package has been analysed separately to assess impacts due to climate hazards and adaptation measures needed to reduce associated risks. The analysis was carried out as per the climate proofing checklist. After considering local perspective and potential future climate impacts, several measures are identified to increase adaptive capacity of each package. Findings of the analysis and suggested measures for each package are shown as follows (Figures 49 and 50).

Figure 49: Adaptation Measure for Ferries/Waterways

Relevant Climate Impacts	Adaptation Measures	Stage of Intervention
Coastal Flood	Enhance flood defenses such as sea walls, protection of coastal wetlands (as buffers)	Planning
	Use of more durable materials in ferries, jetties	Design
	Incorporate higher levels of flooding into future bridge design, pontoons design	Planning, Design
	Build more redundancy into the system – Spare ferries	Planning
Flood (Extreme Rain)	Use of more durable materials in ferries, jetties	Design
	Incorporate higher levels of flooding into future bridge design, pontoons design	Planning, Design
	Build more redundancy into the system – Spare ferries	Planning

Figure 50: Adaptation Measures for Parking Terminals

Relevant Climate Impacts	Adaptation measures	Stage of Intervention
Coastal Flood, Flood (Extreme Rain)	Improve drainage infrastructure to be able to deal with more intense rainfall	Planning
	Audit drains regularly	Operation
	Enhanced pumping to discharge water	Operation
	Provision of storm water utility system as per standards	Planning
	Make flood risk assessments a requirement for all new development	Planning
	Enhance foundations	Design
	Use of more durable materials, such as more corrosion resistant material	Design
	Enhance condition monitoring of sub grade material especially after rains, flooding	Operation

9.6 Recommendations

The findings of pre-feasibility provide a broader assessment of possibility of occurrence of climate change impacts, and indicators for designing resilient infrastructure, likelihood of infrastructure damage and illustrative adaptation measures for each investment. However, a detailed analysis is needed to understand specific localized vulnerability of each investment package against the climate change impacts. The following recommendations should be addressed through a further feasibility study:

Step 1: Specific recommendations to predict climate impacts at the local level with more certainty: The preliminary study identifies the climate risks that Cochin might face based on broad climate research findings and historical events. It is imperative to study these impacts on a more local level with regards to locations of proposed and existing infrastructure capabilities. Studies to forecast local climate conditions vis-à-vis their socioeconomic impacts need to be conducted with help from local agencies, universities and researchers. The pre-feasibility study identifies flooding due to sea level rise and monsoonal storms as one of the most imminent climate change impacts. Further studies relating to the city's topographic information, flood models and drainage facilities must be carried out. A further analysis of local human geographic conditions is needed to examine current living conditions and incumbent ingenious adaptation measures in addition to climate vulnerability and migration patterns in case of climate extremities

Step 2: Specific recommendations to quantify indicators of resilient transport system design: Quantitatively assess local infrastructural loss during previous extreme weather occurrences with an objective to define metrics against which future designs can be evaluated and standardized. Identify ideal restoration targets post event occurrence based on the appropriate metrics recognized above. Benchmark operating standards for Cochin's infrastructure against international norms with an aim to maximize availability during normal weather conditions.

Step 3: Specific recommendations to gauge accurately the risk exposure to investments: Greater precision in the extent of impact on each investment packages by making impact assessment analysis specific to the exact location of packages within Cochin city. Assessing the nature of damage caused so that relevant adaptation measures can be identified.

Step 4: Specific recommendations for identification of relevant adaptation measures: Identifying the maximum available adaptation measures (best international practices) that are efficient and cost effective and assessing applicability of these measures to the local conditions. Associated benefits from implementing each adaptation measure must be presented which will be helpful in prioritizing adoption decision of these measures.

10.0 Risks

10.1 Introduction

A number of potential risks have been identified during the PFS, which relate directly to the development and implementation of this investment proposal. These risks are summarized as follows, and require further analysis during future feasibility assessment for the investment.

10.2 Assumptions

While there is widespread support for the overall ferry investment proposal, individual components may be subject to risks during their development and implementation. In this respect, this report has made the following key assumptions;

1. All Political and union organizations are committed to support the proposal.
2. There is sufficient institutional capability within either Government or the private sector to implement this proposal.
3. Additional technical assistance will be provided where required for specific technical/design issues.
4. An effective working relationship will be established and maintained between Government and private sector interests so that the proposal can move rapidly through the feasibility stage and into implementation.
5. There is a willingness on behalf of the key agencies (Corporation, Port Trust, Kerala Inland Waterways Authority and others) and their staff to participate proactively in the proposal.
6. A detailed feasibility study will be undertaken prior to implementation, and that the proposal will be implemented as per its specifications. That is, there will not be a systematic 'cherry picking' of individual components in response to this investment opportunity.
7. One of the institutional models described in Section 8 (or a close variation), complete with the recommended CAFE Implementation Committee as a key component will be adopted and implemented.
8. Adequate funding will be provided from Government, international donor agency and private sector sources.

10.3 General Risks

Five fundamental areas of risk have been identified in relation to the investment proposal. These are summarized as follows;

Institutional and Political: As has been highlighted earlier, the political landscape has numerous weaknesses in relation to the ability to implement projects in a timely and consultative manner. These shortcomings are a reflection of the broad political background in Kerala and have been moulded by a combination of union influence and a general lack of analytical capability to address matters on a proactive and scientific basis. For successful implementation of this initiative, it is essential that this aspect be corrected and remains in a corrected state. In particular, the practice of decisions being challenged and placed before the High Court needs to be mitigated for all but critically important issues. In addition, where external union influence, which has the effect of hindering the implementation of the proposal on unsustainable grounds is likely, measures should be put in place to manage this process in a more proactive manner.

Public Compliance and Enforcement: There is a history of non compliance with established regulation. This is as much an issue of poor design and maintenance processes as an inability

to adequately enforce regulations. For the ferry sector, this has led to the perception of unsafe vessels and the public perception of inadequate governance generally. From the enforcement perspective, this inadequacy results from a combination of capacity of the Agency (technically), and the ability of an offender to "settle" the issue to avoid further legal actions. As a result, there is a general acknowledgement within both the private and public sector that public compliance and enforcement is a fluid situation and is available to substantial variations in "interpretation". It will be therefore be important for this issue to be addressed and corrected so that the public trust in the ferry sector can be reinstated and the market for travel be re-established and maintained.

Regarding service performance, the compliance of maintenance of both vessel and terminal infrastructure will be an essential component of increasing public confidence in the sector and that of Government in being able to deliver services in the public interest. A failure to correct the problem of enforcement and compliance with adequate regulations may have a serious effect on the success of the ferry initiative. It will be important for the relevant agencies to develop operation and maintenance manuals for the ongoing compliance and enforcement regimes. This will assist in bringing much needed transparency to the process.

Public Confidence and Support: Many of the elements which have sapped public confidence and support are related to the political process and the practice of "settling" disagreements and non compliance issues without the need for litigation. This will need to be addressed and has been commented upon above. In addition to this aspect, much of the cause of the erosion of public confidence is as a result of the practice of agencies failing to engage the community in a proactive manner and encouraging widespread involvement in project planning, design and delivery.

This aspect can be addressed relatively easily through a simple realignment of staff attitudes and practices so that as a first priority, the affected community is consulted early rather than later in the process. In addition, where issues potentially affect the project, genuine and proactive procedures need to be developed as a basis for project delivery. With the community being included as part of the solution, rather than (as is often the current view) being part of the problem, project risks will lessen, both in number and in intensity. Without this support, there could be a risk to the proposal.

Agency Capability: There is a direct relationship between the technical capability of an agency and the ability of that agency to articulate in a clear and logical manner, the benefits of projects and programs. In the context of this proposal, the ability of the Corporation to market it to both investment partners and the public, will be intimately associated with the technical ability of the agency and the staff involved. Unless the Corporation improves its current level of technical capability to plan, design, procure and manage procurement contracts, there may be a significant risk to the project. This risk may manifest itself in funding shortfalls and reduced revenue streams through reduced public support.

Contingent Liability Risk: There is strong potential for this proposal, or at least some routes, being implemented under a PPP model. While the Corporation is familiar with this delivery model, there remains a reluctance to engage the private sector in such public projects. With the limitations outlined above, there are financial risks in developing and implementing PPP based infrastructure projects. The financial commitment required of the Corporation for this proposal has a fiscal cost. Even if there are no immediate expenditures, the prospect of providing an operating subsidy creates a drain on the annual budget. The guarantees if required from the Corporation also create obligations to make payments (even if in extraordinary circumstances). As the ultimate underwriter of a PPP, the Corporation may be faced with assuming the full financial responsibility for the project in the event that the private sector partner withdraws for financial reasons.

If the Corporation seeks to limit its financial exposure to the project by passing too many risk elements to the private sector partner, the project may become viewed as not value-for-money. In this case it may become un-bankable. Therefore the key challenge is for the Corporation to achieve the right balance between risk and reward. This will then result in a project which is both bankable and represents optimal value-for-money for both the public and private sector partners. It is considered that the identified risks regarding the PPP during implementation of the components will remain an issue unless the Corporation takes steps to accommodate the contingent liability risks for all parties to minimise the financial risk.

Overall, the investment proposal risk is rated at this pre-feasibility stage as being low. The proposal does not have any widespread political or institutional opposition, and there is widespread public support for the improvements proposed. In addition, a substantial effort has been directed at assessing the financial capacity of the Corporation to participate financially in the project. None of these have raised any significant concerns from a risk perspective. The key risk is more related to the processes and practices of the Corporation in relation to project preparation and delivery. It is this aspect that will require a focus of attention so that there is ongoing support of the public for the proposal. Risk mitigation will be the key in successful proposal delivery. Whatever mitigation measure is determined, it must be framed to include the principles of openness and transparency, trust, legal soundness, and being good for business. A compromise on any one of these principles could have serious consequences for the delivery of the proposal and its relevant components.

10.4 Private Sector Risks

The following are risks which are particularly relevant to any PPP model contemplated. A brief assessment of strategies to address the issues is presented for consideration. It is emphasized that further detailed consideration and ongoing dialogue with the relevant agencies will be required to address these matters fully.

Business Structure Risk: For this risk, the issue is what options are available for the private sector group if a partner (including a Government partner) fails to honor its commitments during the concession period. To address this risk, there needs to be a basis for Government as the party with the ultimate responsibility for the project to assume this role. In this case, a State based SPV with sufficient financial (Ministry of Finance) and operational capability can be a party to the original agreement in addition to any Government party at the Municipality level.

Payment Risk: From assessments, it is clear that contract payments can be a long and arduous process in Cochin. For the private sector to be willing to invest there must be a process where payments are agreed on a predetermined basis and according to a fixed schedule. There are at least two options available. The first is the establishment of a project pool budget where adequate funds are placed from the outset and are used exclusively for the project. Funds are released by an independent third party on the basis of an agreed schedule of deliverables. Provisions for liquidated damages may be included to compensate either party for delays to any component of the project caused by non compliance, delays in approvals etc. Alternatively, a third party guarantee (from a Union government program, or an international agency such as CDIA) could be secured to provide a sufficient guarantee in the event of local defaults.

Legal Issues: The adequacy of the Indian legal system to provide for the Cochin Corporation (or any other Government instrument) to enter into an arrangement with the private sector for the purpose of design-build-operate (DBO) schemes or other commercial arrangements over a lengthy concession period will be an issue for the relevant legal experts to address. Given the complexity of the issues and the range of regulatory participants involved, it will be infinitely more complicated than the Corporation's simple PPP model used for the upgrading of bus

shelters. This must be addressed by suitably qualified personnel to ensure all legal responsibilities and risks are mitigated.

Financing: The issue here is the ability of the private sector to leverage private sector finance for investments which are in partnership with the Corporation. Considering the Corporation's past performance in the financing and delivery of projects (particularly where land acquisition is involved), will there be sufficient interest from the private sector? This will need to be tested in the market once detailed feasibility evaluation has been undertaken for the investment.

Procurement: What is the ability of the Corporation to properly and fairly proceed through procurement processes to arrive at a partnership arrangement with the private sector? Given the apparent sensitivity of the private sector to procurement delays, what is the appropriate role Government can play and what is the appropriate role the private sector can play? These are some of the key questions in Cochin regarding procurement.

Overall Political and Legal Risks: Given elections are for five year terms, the issue of political risk always arises for major infrastructure investments and long term concessions, which span one or several election cycles. Will there be adequate protection of each party's interests (both financial and non financial) to provide the confidence to enter into the arrangements initially? For this, it may require a Union Government guarantee. This matter requires more detailed consideration and will be dependent on the investment and the identity of the parties.

Appendix 1
Cost Estimates

Appendix 1
Cost Estimates

Investment Proposal - Ferry Services - Summary Cost Estimates										Rs. Million	U.S.$ Million
Code	Package Name	Details (ie what)	Base Cost	Land Cost	Utility Shifting	Relief & Rehab	Environment	D&C Contingency	Physical Contingency	Price Contingency	Total Cost	Total Cost
	Ferry Services	Ferry Services + Ferry Terminals at Ernakulam ,Fort Kochi and Mattancherry, + Park and Pay at Fort Kochi & Mattancherry Jetties (Route 2)	653.6	49.4	0.4	1.1	0.4	2.2	7.4	42.8	757.3	16.5
		Ferry Services + Ferry Terminal & Park & Pay at Vypeen and Ferry Terminal (Route 1)	357.0	24.7	0.3	1.0	0.3	2.0	6.7	25.0	417.1	9.1
		Ferry Services + Ferry Terminals at Edakochi and Thevara Jetties (Route 3)	175.1	0.0	0.2	0.5	0.2	0.9	3.0	10.8	190.6	4.1
		Ferry Services + Ferry Terminals at North Jetty, Ponnarimangalam Jetty, Hospital Jetty, Sicily Jetty & Panchayat Jetty (Mulavukadu Island) (Route 4)	365.2	0.0	0.4	1.1	0.4	2.3	7.6	23.4	400.3	8.7
		Ferry Services + Ferry Terminals at Kumbalam, Vaduthala and Chittoor Jetties (Route 5)	479.8	0.0	0.2	0.7	0.2	1.4	4.5	27.1	514.0	11.2
		Total	**2030.7**	**74.1**	**1.5**	**4.4**	**1.5**	**8.8**	**29.3**	**129.1**	**2279.3**	**49.5**
		Grand Total (in Millon US $ @ Rs. 46	**44.1**	**1.6**	**0.0**	**0.1**	**0.0**	**0.2**	**0.6**	**2.8**	**49.5**	

Notes:

1 Utility Shifting cost considered @ 0.5% of base cost
2 R & R cost considered @ 1.5% of base cost
3 Environment cost considered @ 0.5% of base cost
4 Design and Construction Supervision (D&C) taken as 3% of base cost
5 Provision for engineering design and contract management
6 Physical Contingency considered @ 10% of Base Cost
7 Price Contingency considered @ 5 % per annum
8 Land Cost considered @ Rs. 1.0 Million per Cent. 40.48 sq.m = 1 Cent and 100 Cents = 1 Acre. Land owned by Government agencies and CC - no cost considered.

Code	Name	Details (ie what)	Quantity	Unit	Unit Cost	Base (Engineering) Cost	Land (area in m^2)	Rate (in Rs. / m^2)	Land Cost	Utility Shifting	Relief & Rehab	Environment	D&C Contingency	Physical Contingency	Price Contingency	Total Cost (Rs. Million)	Total Cost (US $ Million)
	Cost Estimates - Route No.1																
	Vypen to Fort Kochi to Ernakulam and High Court	2 Kochi Kats - Ferries including one spare	2	number	144.8	289.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.5	304.2	6.6
	Ernakulam Jetty	Refurbishment of current facilities, Floating pontoon and improved integration with bus/autorickshaw, park and ride	1	number	15.1	17.1	0.0	0.0	0.0	0.1	0.3	0.1	0.5	1.7	2.0	21.8	0.5
	High Court Jetty	Floating pontoon and refurbishment of current facilities	1	number	15.1	15.1	0.0	0.0	0.0	0.1	0.2	0.1	0.5	1.5	1.8	19.2	0.4
	Vipen Jetty - Kochi	Floating pontoon and redevelopment of current site.	1	number	15.1	15.1	0.0	0.0	0.0	0.1	0.2	0.1	0.5	1.5	1.8	19.2	0.4
	Park and Pay at Vypeen Jetty	100 car space - Ground + 3 floors	1	100	0.2	20.0	1000.0	24703.6	24.7	0.1	0.3	0.1	0.6	2.0	4.9	52.7	1.1
	Total for Route No. 1					**357.0**			**24.7**	**0.3**	**1.0**	**0.3**	**2.0**	**6.7**	**25.0**	**417.1**	**9.1**
		Grand Total (in Millon US $ @ Rs. 46				**7.8**			**0.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.5**	**9.1**	

Code	Name	Details (ie what)	Quantity	Unit	Unit Cost	Base (Engineering) Cost	Land (area in m^2)	Rate (in Rs. / m^2)	Land Cost	Utility Shifting	Relief & Rehab	Environment	D&C Contingency	Physical Contingency	Price Contingency	Total Cost (Rs. Million)	Total Cost (US $ Million)
	Cost Estimates - Route No. 2																
	Mattencherry to Ernakulam and High Court	4 Kochi Cats	4	number	144.84	579.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.0	608.3	13.2
	Mattancherry Boat Jetty	Floating pontoon and refurbishment of current facilities	1	number	15.108	17.1	0	0	0	0.1	0.3	0.1	0.5	1.7	2.0	21.8	0.5
	Fort Kochi Boat Jetty	Floating pontoon and refurbishment of current facilities	1	number	15.108	17.1	0.0	0.0	0.0	0.1	0.3	0.1	0.5	1.7	2.0	21.8	0.5
	Park and Pay at Fort Kochi Jetty	100 car space - Ground + 3 floors	1	100	0.2	20.0	1000.0	24703.6	24.7	0.1	0.3	0.1	0.6	2.0	4.9	52.7	1.1
	Park and Pay at Matancherry Jetty	100 car space - Ground + 3 floors	1	100	0.2	20.0	1000.0	24703.6	24.7	0.1	0.3	0.1	0.6	2.0	4.9	52.7	1.1
	Total for Route No. 2					**653.6**			**49.4**	**0.4**	**1.1**	**0.4**	**2.2**	**7.4**	**42.8**	**757.3**	**16.5**
		Grand Total (in Millon US $ @ Rs. 46				**14.2**			**1.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.2**	**0.9**	**16.5**	

Code	Name	Details (ie what)	Quantity	Unit	Unit Cost	Base (Engineering) Cost	Land (area in m^2)	Rate (in Rs. / m^2)	Land Cost	Utility Shifting	Relief & Rehab	Environment	D&C Contingency	Physical Contingency	Price Contingency	Total Cost (Rs. Million)	Total Cost (US $ Million)
	Cost Estimates - Route No. 3																
	Vypen to Fort Kochi	1 Kochi Cats	1	number	144.84	144.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.2	152.1	3.3
	Edakochi Jetty	Floating pontoon and refurbishment of current f	1	number	15.108	15.1	0.0	0.0	0.0	0.1	0.2	0.1	0.5	1.5	1.8	19.2	0.4
	Thevara Jetty	Floating pontoon and refurbishment of current f	1	number	15.108	15.1	0.0	0.0	0.0	0.1	0.2	0.1	0.5	1.5	1.8	19.2	0.4
	Total for Route No. 3					**175.1**			**0.0**	**0.2**	**0.5**	**0.2**	**0.9**	**3.0**	**10.8**	**190.6**	**4.1**
		Grand Total (in Millon US $ @ Rs. 46				**3.8**			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.2**	**4.1**	

Code	Name	Details (ie what)	Quantity	Unit	Unit Cost	Base (Engineering) Cost	Land (area in m^2)	Rate (in Rs. / m^2)	Land Cost	Utility Shifting	Relief & Rehab	Environment	D&C Contingency	Physical Contingency	Price Contingency	Total Cost (Rs. Million)	Total Cost (US $ Million)
	Cost Estimates - Route No. 4																
	Panchayat Terminal to High Court	1 Kochi Cats	2	number	144.84	289.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.5	304.2	6.6
	Panchayathu Jetty	Floating pontoon and refurbishment of current f	1	number	15.108	15.1	0.0	0.0	0.0	0.1	0.2	0.1	0.5	1.5	1.8	19.2	0.4
	Sicily Jetty	Floating pontoon and refurbishment of current f	1	number	15.1	15.1	0.0	0.0	0.0	0.1	0.2	0.1	0.5	1.5	1.8	19.2	0.4
	North Jetty	Floating pontoon and refurbishment of current f	1	number	15.108	15.1	0.0	0.0	0.0	0.1	0.2	0.1	0.5	1.5	1.8	19.2	0.4
	Ponnarimangalam Jetty	Floating pontoon and refurbishment of current f	1	number	15.108	15.1	0.0	0.0	0.0	0.1	0.2	0.1	0.5	1.5	1.8	19.2	0.4
	Hospital Jetty	Floating pontoon and refurbishment of current f	1	number	15.108	15.1	0.0	0.0	0.0	0.1	0.2	0.1	0.5	1.5	1.8	19.2	0.4
	Total for Route No. 4					**365.2**	**0.0**	**0.0**	**0.0**	**0.4**	**1.1**	**0.4**	**2.3**	**7.6**	**23.4**	**400.3**	**8.7**
		Grand Total (in Millon US $ @ Rs. 46				**7.9**			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.2**	**0.5**	**8.7**	

Code	Name	Details (ie what)	Quantity	Unit	Unit Cost	Base (Engineering) Cost	Land (area in m^2)	Rate (in Rs. / m^2)	Land Cost	Utility Shifting	Relief & Rehab	Environment	D&C Contingency	Physical Contingency	Price Contingency	Total Cost (Rs. Million)	Total Cost (US $ Million)
	Cost Estimates Route No. 5																
	Kumbulam to Chittor via Ernakulam	Kochi Cats	3	number	144.84	434.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.7	456.2	9.9
	Kumbalam Jetty	Floating pontoon and refurbishment of current f	1	number	15.108	15.1	0.0	0.0	0.0	0.1	0.2	0.1	0.5	1.5	1.8	19.2	0.4
	Vaduthala Jetty	Floating pontoon and refurbishment of current f	1	number	15.108	15.1	0.0	0.0	0.0	0.1	0.2	0.1	0.5	1.5	1.8	19.2	0.4
	Chittoor Jetty	Floating pontoon and refurbishment of current f	1	number	15.108	15.1	0.0	0.0	0.0	0.1	0.2	0.1	0.5	1.5	1.8	19.2	0.4
	Total for Route No. 5					**479.8**	**0.0**	**0.0**	**0.0**	**0.2**	**0.7**	**0.2**	**1.4**	**4.5**	**27.1**	**514.0**	**11.2**
		Grand Total (in Millon US $ @ Rs. 46				**10.4**			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.6**	**11.2**	

Annual Operating Cost Estimates

Rs. Million

Component / Proposal	Annual Operating Cost (2010 prices)	
Route No. 1 – Ferry Services	15.48	Including Rs. 0.48 million for Vypeen Park and Pay
Route No. 2 – Ferry Services	30.96	Including Rs. 0.96 million for Fort Kochi and Matanchery Park and Pay
Route No. 3 – Ferry Services	7.50	
Route No. 4 – Ferry Services	15.00	
Route No. 5 – Ferry Services	22.50	
Total for all routes	91.44	

O&M cost per boat	Qty	Rate	Rs. Millon per year
Manpower (2 shifts)	4	20000	1.0
Office and ticketing etc. (Rs. Per Month)		100000	1.2
Fuel			
Running time per day (hours)	15		
Speed (Average per hour)	15		
Number of kilometers in a day	225		
Number of km per litre of diesel	1		
Number of litres of fuel per day	225		
Cost of diesel per litre	40.5		
Fuel cost per day	9121.5		2.9
Repair and Maintenance (Rs./Month)		200000	2.4
Total			7.5

Note: The operating costs, have been calculated for the year following completion of each component, include operations and maintenance, but exclude costs of depreciation and interest.

Additional Notes on Investment Proposal Component Assumptions

Below are additional notes on assumptions made in relation to cost items in this investment proposal. This provides additional background to the notes provided above and in Appendix 3.

Item	Assumption
Ferry Vessels	
Capital Cost	• Existing (2010) market price in Brisbane as supplied by Brisbane City Council
Operating Cost	• This has been estimated and given in a table in Appendix 2 for running ferry operations
Fleet numbers	• Based on applying new Kochi Cat speeds to existing route travel times.
Vessel Speed	• As per specifications of the Brisbane City Cat
Vessel Capacity	• The Brisbane City Cat is capacity is 163. For the purposes of this proposal, the assumed comfortable load for a Kochi Cat is 100.
Ferry Terminal	
Land area req'd.	• No additional land requirement estimated as only the existing terminals are to be upgraded.
Land cost	• Not Applicable
Engineering Costs	• Rates sourced from the City Mobility Plan (CMP) and adjusted for inflation and for recent tender rates in India for floating pontoons.
Utility relocation	• Considered @0.5% of base cost
Relief and Rehabilitation	• Considered @1.5% of base cost
Environment	• Considered @0.5% of base cost
D&C Contingencies	• Considered @3.0% of base cost – this rate is normally considered in similar projects
Physical contingencies	• Considered @10% of base cost as per the usual practice for international funding agencies infrastructure projects in India for Pre Feasiblity assessments such as this.
Price Contingencies	• Considered @5% p.a. in accordance with the World Bank and Asian Development Bank inflation rate forecast for India.
Park and Pay	
Land area	• Allocated 1000 sq metres for each of the three park and pay at Vypeen, Mattencherry and Fort Kochi to provide for at least 200 vehicle spaces.
Land cost	• Based on GoK records for lcurrent and rates in Kochi. Current rates are Rs. 1 million per cent or Rs. 24,704 per sq m
Construction cost	• Based on comparable rates in India and confirmed by comparison with the rates considered for the City Mobility Plan (CMP). The current rate is Rs. 0.2 million or US$4,300 per car space

Brisbane CityCat Details

The following specifications have been provided by Brisbane City Council and are included below to provide additional background on the development of specifications for the Kochi Cat vessel proposed for this proposal.

No	Item	Rate	Large size	Mid	Notes
1	Passenegr capacity	No	163	100	1
2	Length	Metres	25.5	25	
3	Beam	Metres	7.6	7.1	
4	Draft	Metres	1.42	1.42	
5	Clearance – loaded	Metres	8	8	
6	Displacement – light	Tonnes	22	21 approx	
7	Displacement – loaded	Tonnes	35	32 approx	
8	Max operating Speed (fully loaded)	Knots	25	25	
9	Normal operating speed	Knots	18	18	2
10	Fuel capacity	Litres	1,200	as per spec	
11	Fresh water capacity	Litres	500	as per spec	
12	Power supply		dual cummings	as per spec	
13	Power rating		305kw at 2100rpm		
14	Fuel consumption (max speed)	litres/hour	0.25litres/kwh		
15	Manouverability (reverse)	Knots	yes	yes	
16	Manuoverability (turning circle)	metre radius	0-75metres	0-75 metres	3
17	Max wave height operating conditions	Metres	0.5	0.5	
18	Max wind speed against pontoon (berthing)	Knots	N/A	N/A	6
19	Crew	Number	4	4	7
20	Master	Number	1	1	
21	Deck staff	Number	2	2	
22	Ticketing	Number	1	1	
23	Deck height above water (for pontoon height)	Metres	1	1	8
24	Bow wave height at cruising speed	Metres	0.22	0.22	
25	Vessel hull		aluminium		
26	Vessel deck and upper section		fibreglass		
27	Seating – internal		94		3

Notes:

1. The fuel consumption listed is the maximum under fully loaded conditions.
2. For normal operations, assume 50% - 60% of this rate.
3. Cats can turn on the spot as each hull has its own propeller. Turning circle diameter at speed can be up to 3 boat lengths
4. Preferred crew number for safe operations
5. Provides for level boarding and alighting.

Appendix 2
Cochin Corporation: Financial Management Assessment Report

Appendix 2
Financial Management Assessment Report

A financial management assessment (FMA) is an analysis to evaluate the capacity of the executing or implementing agency to effectively manage its financial resources. Such capacity is critical for the success of the project. FMA involves a review of the accounting system, reporting, auditing, internal controls, cash disbursement and cash flow disbursement arrangements.

The main instrument used to facilitate the financial management assessment was the questionnaire furnished by the ADB, which was discussed with the Municipal Finance Officer of the Corporation in February 2010. Interviews, including follow-up interviews, were conducted in February and March 2010 to better appreciate some of the responses and to supplement the original data provided in the questionnaire. Based on the FMA questionnaire responses, documents and follow up interviews, the following observations have been made:

Implementing Agency: The Corporation is an Urban Local Body (ULB). It is implementing the Kerala Sustainable Urban Development Project (KSUDP), a financial assistance ADB project. There is a PIU in the Corporation which is responsible for the implementation of the identified sub-projects under KSUDP. The PIU is headed by a Project Manager and is assisted by a Municipal Finance Officer (MFO) and a Manager (Accounts).

Funds Flow Arrangements: Funds received from either ADB or any other donor agency are deposited into a Reserve Bank of India – Government of India (GoI) account. From GoI, funds are transferred to GoK's Finance Department (FD). GoK(FD) transfers the funds to the Local Self Government Department (LSGD) which in turn transfer the funds to the Project Bank Account with the PIU via the PMU of KSUDP. Past corporation financial statements show that the Corporation's capacity to repay Loans has been satisfactory.

Staffing and Organization: Under the existing structure, the Corporation's financial functions are under the responsibility of the Secretary of the Corporation. Under the Secretary is the finance and accounting section headed by the Accounts Officer, supported by three superintendents (one each for establishment, PF/pension and expenditure). There are 38 junior staff under the finance and accounting section. Most of the staff have considerable experience from the accounts department. It is noted that there is not one chartered accountant in the organization. In the KSUDP cell there is a Municipal Finance Officer who is assisted by and Accounts Manager.

The staff is considered adequate for the present level of operations. Capacities would however have to be developed, including the recruitment of persons with qualifications and experience in the areas of (i) PPP contract management operations, and (ii) resource mobilization, including the management of financial resources, through loans and market borrowings.

Accounting Policies and Procedures: The Corporation prepares accounts as per the Kerala State Municipal Accounts Manual. Separate accounts for projects will have to be maintained. All project accounts will be incorporated in the final accounts of the Corporation. Bank reconciliation is done regularly and is current. Important papers and records are kept on a permanent basis, and other documents are kept for several years as per government rules.

Segregation of Duties: Functional responsibilities appear to be segregated. Separate responsibilities for budget, payment, recording, reporting and audit are assigned to separate groups of officers and staff.

Budgeting System: The Corporation prepares the budget once in a year according to the financial year (April-March) as per prescribed procedures for budget preparation. The actual expenditure is compared with the budget once in a year, in February. The Corporation also publishes monthly financial reports comparing actual against budget figures, and monthly progress reports on project execution which provide information about the stages of project execution. The monthly Management Information System (MIS) Report also includes a comparison of actual financial performance against the budget. The budget variances are reportedly discussed in monthly meetings with the Secretary / Chairman of Finance Standing Committee. A revised budget is prepared whenever necessary.

Payments; Invoice-processing and payroll preparation procedures seem to be in order based on the sample invoices. Invoices are usually stamped "PAID".

Policy Procedures: The basis of accounting is accrual. Financial statements, comprising of Balance Sheet, Income and Expenditure, Receipt and Payments are prepared in accordance with the Kerala Municipal Accounts Manual (KMAM), on a regular basis and published in the official website of the Corporation. Kerala Municipal Accounting (KMA) software has been fully implemented by the Corporation. A KSUDP cell has implemented the 'Tally' accounting software. However consolidated financial statements of the Corporation are prepared under the KMA software.

Cash at Bank: The authorized signatory (of cheque payments) in the case of the Corporation is the 'Secretary' of the Corporation and in case of KSUDP, the Project Manager (PIU) jointly with Secretary of the Corporation for all payments.

Safeguard Over Assets: No inventory is taken of the Corporation's fixed assets and store materials. There is no policy of insurance of assets. Insurance coverage is taken only for vehicles.

Other Office and Implementing Entities: The Corporation has zonal revenue offices, responsible for the billing and collection of property tax. All collections are deposited into the designated bank and the pay-in-slips are sent to the main office of the Corporation where necessary reconciliation and accounting is done. Property tax billing system is computerized.

Internal Audit: There is an internal audit only in the case of the KSUDP. This is outsourced to a professional firm of chartered accountants and they submit their report to the Project Director.

External Audit: The Corproation's operation is subjected to following audits every year: (i) a performance audit – by CAG's office, (i) a local fund audit – from the State Finance department, and (iii) the Auditor General's office. In addition, the KSUDP is subjected to audit by an independent firm of chartered accountants. There is no delay in audit which has been completed up to 31st March 2009.

Reporting and Monitoring: Financial Statements are prepared in accordance with Government accounting standards and Indian accounting standards (IAS). Financial statements are prepared in line with the KMAM.

Information System: All financial information reports are generated from the automated accounting system. According to the requirements, reports in different formats are prepared on a needs basis using MS-office Excel.

Frequent transfer of the staff including members of the core accounting team has resulted in increased requirements of training of new accounts staff in the use of KMA accounting software, accounting principles and concepts. This issue needs to be addressed and to the extent possible, the continuity of

accounting staff including that of core team members should be provided and ensured for. Capacity building for PPP contract management operations and financial management, especially in resource mobilization, will be required.

Analysis shows that the Corporation has the capacity to borrow further loans in view of a low debt: equity ratio. The Corporation has large debts outstanding realization of which will mitigate the financial crunch situation. Improved collection efficiency and full implementation of financial reforms will reduce the Corporation's dependence on the GoK for development grants. This can be achieved and managed with efficient municipal service delivery, awareness campaigns, capacity building and improving the confidence of private investors in the Corporation..

Appendix 3
Weighted Average Cost of Capital

Appendix 3
Weighted Average Cost of Capital

Financial Analysis

The calculation of Weighted Average Cost of Capital (WACC) has been undertaken for four scenarios.

Scenario 1

Under this scenario, the WACC calculation is based on a Loan from International Funding Institutions (IFI) and the balance from the Corporation's own equity. The cost for the Corporation under this scenario is estimated as follows:

	ADB Loan		
	Financing Component		
In Million US Dollars	IFI Loan to CC	GoK/CC Equity	Total
Amount			
Weighting	70.00%	30.00%	
Nominal Cost	5.00%	8.00%	
Tax Rate	0.00%	0.00%	
Tax-Adjusted Nominal Cost	5.00%	8.00%	
Inflation Rate	0.80%	5.00%	
Real Cost	4.17%	2.86%	
Weighted Component of WACC	2.92%	0.86%	**3.77%**

Scenario 2

Under this scenario, the WACC calculation is based on a Loan from International Funding Institutions (IFI) and a Market Loan is used to borrow for the Corporations own equity contribution. The cost for the Corporation under this scenario is estimated as follows:

	ADB Loan		
	Financing Component		
In Million US Dollars	IFI Loan to CC	Loan for CC Equity Cont	Total
Amount			
Weighting	70.00%	30.00%	
Nominal Cost	5.00%	15.00%	
Tax Rate	0.00%	0.00%	
Tax-Adjusted Nominal Cost	5.00%	15.00%	
Inflation Rate	0.80%	5.00%	
Real Cost	4.17%	9.52%	
Weighted Component of WACC	2.92%	2.86%	**5.77%**

Scenario 3

Under this scenario, the WACC calculation is based on funds being sourced under the JnNURM Scheme with the Corporation borrowing from the market for its equity contribution. The cost to the Corporation for borrowing from the market for its' equity contribution is estimated as follows:

	Financing Component		
In Million US Dollars	GoI and GoK Grant	Loan for CC Equity Cont	Total
Amount			
Weighting	80.00%	20.00%	
Nominal Cost	8.00%	15.00%	
Tax Rate	0.00%	0.00%	
Tax-Adjusted Nominal Cost	8.00%	15.00%	
Inflation Rate	5.00%	5.00%	
Real Cost	2.86%	9.52%	
Weighted Component of WACC	2.29%	1.90%	**4.19%**

Scenario 4

Under this scenario, the WACC calculation is based on funds being sourced under the JnNURM Scheme. The cost to the Corporation under this scenario is estimated as follows:

	Financing Component		
In Million US Dollars	GoI and GoK Grant	CC Equity Cont	Total
Amount			
Weighting	80.00%	20.00%	
Nominal Cost	8.00%	8.00%	
Tax Rate	0.00%	0.00%	
Tax-Adjusted Nominal Cost	8.00%	8.00%	
Inflation Rate	5.00%	5.00%	
Real Cost	2.86%	2.86%	
Weighted Component of WACC	2.29%	0.57%	**2.86%**

Methodology and Inflation Factors

Financial Analysis

A financial analysis has been undertaken of each component and of the investment proposal as a whole with the aim of the following:

1. Identifying detailed options for funding and cost recovery of each component and the proposal.
2. Establishing the viability of each component and the investment proposal as whole over a 20 year period after implementation.
3. Conducting financial cost benefit analysis in base year costs as measured in FIRR and NPV, with the latter calculated being based upon a long term, worldwide discount rate of 12%.
4. Determining the sensitivity of each component and the investment proposal as a whole to cost increases, benefit and revenue decreases and schedule slippages.
5. Exploring alternative methods of funding and recovering the costs of each component of the proposal, including through enhanced resource generation, private sector funding and private sector implementation.
6. Assisting with the identification of financial institutions who may be interested in providing funding for the investment proposal. and
7. Contributing to the development of a marketing strategy for the proposal.

In preparing the various models, every effort has been made to present the information in the format required by potential investors and financiers, including international funding agencies.

The following methodology has been employed:

1. Review and refinement of investment proposal cost estimates.
2. Projection of inflation rates for capital expenditures and operating costs.
3. Estimation of funding contributions from international funding agencies.
4. Estimation of debt servicing requirements based upon funding proposed.
5. For the revenue generating components, an estimation of the operating costs has been based on simple operating cost models. For non revenue generating components, the estimation of operating costs has been based upon broad costs from previous project experiences.
6. For the revenue generating components the estimation of revenues has been based upon limited market surveys and simple revenue models.
7. For revenue earning components, the estimation of FIRR and NPV was made by using projected year by year costs and revenues. and
8. For the local government agencies projection of financial resources, the estimate has been based upon projected revenues and expenditures

Appendix 4
Financial Analysis

Appendix 4
Financial Analysis

The Financial Analysis has been based on the following investment parameters:

Revenue Assumptions - Route No. 1		
Number of Boats	2	
Number of trips per day	60	Round Trips
Number of single trips per day	240	
Number of passengers/day	24000	taking 100 as capacity
Ferry Fare	6	per person
Number days / year	320	
Fare increase proposed	15%	every 3 year

Revenue Assumptions - Route No. 2		
Number of Boats	4	
Number of trips per day	60	Round Trips
Number of single trips per day	480	
Number of passengers/day	48000	taking 100 as capacity
Ferry Fare	6	per person
Number days / year	320	
Fare increase proposed	15%	every 3 year

Revenue Assumptions - Route No. 3		
Number of Boats	1	
Number of trips per day	45	Round Trips
Number of single trips per day	90	
Number of passengers/day	9000	taking 100 as capacity
Ferry Fare	7	per person
Number days / year	320	
Fare increase proposed	15%	every 3 year

Revenue Assumptions - Route No. 4		
Number of Boats	2	
Number of trips per day	30	Round Trips
Number of single trips per day	120	
Number of passengers/day	12000	taking 100 as capacity
Ferry Fare	10	per person
Number days / year	320	
Fare increase proposed	15%	every 3 year

Revenue Assumptions - Route No. 5		
Number of Boats	3	
Number of trips per day	20	Round Trips
Number of single trips per day	120	
Number of passengers/day	12000	taking 100 as capacity
Ferry Fare	15	per person
Number days / year	320	
Fare increase proposed	15%	every 3 year

Note:
Parking Facilities at Vypeen, Fort Kochi and Mattanchery

Car Space – 100 cars – Cars 75% and Two Wheelers 25% (3 two wheelers= 1 car space)
Car Space turnover in a day – Cars – 2 and Two Wheelers – 3
Commercial Space area – 360 square meter
Parking Fee – Rs. 10 per car and Rs. 3 per Two-wheeler
Commercial Rent per month – Rs. 500 per sq meter

Appendix : FINANCIAL ANALYSIS FOR - FERRY SERVICES PROPOSAL - CONSOLIDATED *all values in Rs. Million*

Year	Capital Cost	O & M Cost	Revenues	Total Revenue	Net Revenue	Capital Cost increased by 10%	O & M Cost increased by 10%	Incremental Revenue Decreased by 10%	One Year Delay
2011-12	860	-	-	-	(860)	(946)	(860)	(860)	
2012-13	1,290	-	-	-	(1,290)	(1,419)	(1,290)	(1,290)	(860)
2013-14		91	262	262	170	170	161	144	(1,290)
2014-15		91	262	262	170	170	161	144	170
2015-16	-	91	301	301	210	210	200	179	170
2016-17	-	91	301	301	210	210	201	180	210
2017-18	-	91	345	345	254	254	245	219	210
2018-19	-	91	347	347	255	255	246	221	254
2019-20	-	91	397	397	306	306	297	266	255
2020-21	-	91	397	397	306	306	297	266	306
2021-22	-	91	457	457	366	366	356	320	306
2022-23	-	91	458	458	366	366	357	320	366
2023-24	-	91	525	525	433	433	424	381	366
2024-25	-	91	527	527	435	435	426	383	433
2025-26	-	91	603	603	512	512	503	452	435
2026-27	-	91	603	603	512	512	503	452	512
2027-28	-	91	694	694	602	602	593	533	512
2028-29	-	91	694	694	602	602	593	533	602
2029-30	-	91	795	795	704	704	695	624	602
2030-31	-	91	798	798	706	706	697	627	704
2031-32	-	91	915	915	823	823	814	732	706
2032-33	-	91	915	915	823	823	814	732	823
2033-34	-	91	1,052	1,052	960	960	951	855	823
2034-35	-	91	1,052	1,052	960	960	951	855	960
2035-36	-	91	1,206	1,206	1,115	1,115	1,106	994	960
2036-37	-	91	1,523	1,523	1,432	1,432	1,422	1,279	1,115
Total	**2,150**	**2,194**	**15,428**	**15,428**	**11,083**	**10,868**	**10,864**	**9,540**	**9,652**
NPV @ 12%	**1,796**	**567**	**2,753**	**2,753**	**389**	**210**	**333**	**114**	**314**
FIRR (%)					**14%**	**13%**	**14%**	**13%**	**14%**

Appendix : FINANCIAL ANALYSIS FOR Ferry Route No.1 - Vypeen to Fort Kochi

all values in Rs. Million

Year	Capital Cost	O & M Cost	Ferry Fees	Total Revenue	Net Revenue	Capital Cost increased by 10%	O & M Cost increased by 10%	Incremental Revenue Decreased by 10%	One Year Delay
2011-12	157	-	-	-	(157)	(173)	(157)	(157)	
2012-13	235	-	-	-	(235)	(259)	(235)	(235)	(157)
2013-14	-	15	46	46	31	31	30	26	(235)
2014-15	-	15	46	46	31	31	30	26	31
2015-16	-	15	53	53	38	38	36	33	31
2016-17	-	15	53	53	38	38	36	33	38
2017-18	-	15	61	61	46	46	44	40	38
2018-19	-	15	61	61	46	46	44	40	46
2019-20	-	15	70	70	55	55	54	48	46
2020-21	-	15	70	70	55	55	54	48	55
2021-22	-	15	81	81	66	66	64	58	55
2022-23	-	15	81	81	66	66	64	58	66
2023-24	-	15	93	93	78	78	76	68	66
2024-25	-	15	93	93	78	78	76	68	78
2025-26	-	15	107	107	92	92	90	81	78
2026-27	-	15	107	107	92	92	90	81	92
2027-28	-	15	123	123	108	108	106	95	92
2028-29	-	15	123	123	108	108	106	95	108
2029-30	-	15	141	141	126	126	124	112	108
2030-31	-	15	141	141	126	126	124	112	126
2031-32	-	15	162	162	147	147	146	131	126
2032-33	-	15	162	162	147	147	146	131	147
Total	**392**	**360**	**2,673**	**2,673**	**1,921**	**1,881**	**1,885**	**1,653**	**1,721**
NPV @ 12%	**328**	**93**	**483**	**483**	**62**	**30**	**53**	**14**	**52**
FIRR (%)					**14%**	**13%**	**13%**	**12%**	**14%**

Appendix : FINANCIAL ANALYSIS FOR Ferry Route No.2 - Mattancherry, Fort Kochi, Ernakulam and High Court

all values in Rs. Million

Year	Capital Cost	O & M Cost	Ferry Fees	Total Revenue	Net Revenue	Capital Cost increased by 10%	O & M Cost increased by 10%	Incremental Revenue Decreased by 10%	One Year Delay
2011-12	286	-	-	-	(286)	(314)	(286)	(286)	
2012-13	429	-	-	-	(429)	(472)	(429)	(429)	(286)
2013-14		30	92	92	62	62	59	53	(429)
2014-15		30	92	92	62	62	59	53	62
2015-16	-	30	106	106	76	76	73	65	62
2016-17	-	30	106	106	76	76	73	65	76
2017-18	-	30	122	122	92	92	89	80	76
2018-19	-	30	122	122	92	92	89	80	92
2019-20	-	30	140	140	110	110	107	96	92
2020-21	-	30	140	140	110	110	107	96	110
2021-22	-	30	161	161	131	131	128	115	110
2022-23	-	30	161	161	131	131	128	115	131
2023-24	-	30	185	185	155	155	152	137	131
2024-25	-	30	185	185	155	155	152	137	155
2025-26	-	30	213	213	183	183	180	162	155
2026-27	-	30	213	213	183	183	180	162	183
2027-28	-	30	245	245	215	215	212	191	183
2028-29	-	30	245	245	215	215	212	191	215
2029-30	-	30	282	282	252	252	249	224	215
2030-31	-	30	282	282	252	252	249	224	252
2031-32	-	30	324	324	294	294	291	262	252
2032-33	-	30	324	324	294	294	291	262	294
Total	**714**	**720**	**5,346**	**5,346**	**3,911**	**3,840**	**3,839**	**3,377**	**3,512**
NPV @ 12%	**597**	**186**	**966**	**966**	**183**	**123**	**164**	**86**	**162**
FIRR (%)					**15%**	**14%**	**14%**	**13%**	**15%**

Appendix : FINANCIAL ANALYSIS FOR Ferry Route No.3 - Edakochi to Thevara

all values in Rs. Million

Year	Capital Cost	O & M Cost	Ferry Fees	Total Revenue	Net Revenue	Capital Cost increased by 10%	O & M Cost increased by 10%	Incremental Revenue Decreased by 10%	One Year Delay
2011-12	72	-	-	-	(72)	(79)	(72)	(72)	
2012-13	108	-	-	-	(108)	(119)	(108)	(108)	(72)
2013-14		8	20	20	13	13	12	11	(108)
2014-15		8	20	20	13	13	12	11	13
2015-16	-	8	23	23	16	16	15	13	13
2016-17	-	8	23	23	16	16	15	13	16
2017-18	-	8	27	27	19	19	18	16	16
2018-19	-	8	27	27	19	19	18	16	19
2019-20	-	8	31	31	23	23	22	20	19
2020-21	-	8	31	31	23	23	22	20	23
2021-22	-	8	35	35	28	28	27	24	23
2022-23	-	8	35	35	28	28	27	24	28
2023-24	-	8	41	41	33	33	32	29	28
2024-25	-	8	41	41	33	33	32	29	33
2025-26	-	8	47	47	39	39	38	34	33
2026-27	-	8	47	47	39	39	38	34	39
2027-28	-	8	54	54	46	46	45	41	39
2028-29	-	8	54	54	46	46	45	41	46
2029-30	-	8	62	62	54	54	53	48	46
2030-31	-	8	62	62	54	54	53	48	54
2031-32	-	8	71	71	63	63	63	56	54
2032-33	-	8	71	71	63	63	63	56	63
Total	**180**	**180**	**1,169**	**1,169**	**810**	**792**	**792**	**693**	**723**
NPV @ 12%	**150**	**47**	**211**	**211**	**15**	**(0)**	**10**	**(7)**	**10**
FIRR (%)					**13%**	**12%**	**13%**	**12%**	**13%**

Appendix : FINANCIAL ANALYSIS FOR Ferry Route No.4 - Panchayat Terminal to High Court and Ernakulam via Sicily Fetty, Hospital Jetty, Ponnarimangalam Jetty and North Jetty

all values in Rs. Million

Year	Capital Cost	O & M Cost	Ferry Fees	Total Revenue	Net Revenue	Capital Cost increased by 10%	O & M Cost increased by 10%	Incremental Revenue Decreased by 10%	One Year Delay
2011-12	151	-	-	-	(151)	(166)	(151)	(151)	
2012-13	226	-	-	-	(226)	(249)	(226)	(226)	(151)
2013-14		15	38	38	23	23	22	20	(226)
2014-15		15	38	38	23	23	22	20	23
2015-16	-	15	44	44	29	29	28	25	23
2016-17	-	15	44	44	29	29	28	25	29
2017-18	-	15	51	51	36	36	34	31	29
2018-19	-	15	51	51	36	36	34	31	36
2019-20	-	15	58	58	43	43	42	38	36
2020-21	-	15	58	58	43	43	42	38	43
2021-22	-	15	67	67	52	52	51	45	43
2022-23	-	15	67	67	52	52	51	45	52
2023-24	-	15	77	77	62	62	61	55	52
2024-25	-	15	77	77	62	62	61	55	62
2025-26	-	15	89	89	74	74	72	65	62
2026-27	-	15	89	89	74	74	72	65	74
2027-28	-	15	102	102	87	87	86	77	74
2028-29	-	15	102	102	87	87	86	77	87
2029-30	-	15	117	117	102	102	101	91	87
2030-31	-	15	117	117	102	102	101	91	102
2031-32	-	15	135	135	120	120	119	107	102
2032-33	-	15	135	135	120	120	119	107	120
Total	**377**	**360**	**2,227**	**2,227**	**1,490**	**1,453**	**1,454**	**1,268**	**1,327**
NPV @ 12%	**315**	**93**	**403**	**403**	**(5)**	**(37)**	**(15)**	**(46)**	**(14)**
FIRR (%)					**12%**	**11%**	**12%**	**11%**	**12%**

Appendix : FINANCIAL ANALYSIS FOR Ferry Route No.5 - Kumbalam to Chittoor via Ernakulam, High Court and Vaduthala terminals

all values in Rs. Million

Year	Capital Cost	O & M Cost	Ferry Fees	Total Revenue	Net Revenue	Capital Cost increased by 10%	O & M Cost increased by 10%	Incremental Revenue Decreased by 10%	One Year Delay
2011-12	195	-	-	-	(195)	(214)	(195)	(195)	
2012-13	292	-	-	-	(292)	(321)	(292)	(292)	(195)
2013-14	-	23	58	58	35	35	33	29	(292)
2014-15	-	23	58	58	35	35	33	29	35
2015-16	-	23	66	66	44	44	41	37	35
2016-17	-	23	66	66	44	44	41	37	44
2017-18	-	23	76	76	54	54	51	46	44
2018-19	-	23	76	76	54	54	51	46	54
2019-20	-	23	88	88	65	65	63	56	54
2020-21	-	23	88	88	65	65	63	56	65
2021-22	-	23	101	101	78	78	76	68	65
2022-23	-	23	101	101	78	78	76	68	78
2023-24	-	23	116	116	93	93	91	82	78
2024-25	-	23	116	116	93	93	91	82	93
2025-26	-	23	133	133	111	111	108	97	93
2026-27	-	23	133	133	111	111	108	97	111
2027-28	-	23	153	153	131	131	128	115	111
2028-29	-	23	153	153	131	131	128	115	131
2029-30	-	23	176	176	154	154	151	136	131
2030-31	-	23	176	176	154	154	151	136	154
2031-32	-	23	203	203	180	180	178	160	154
2032-33	-	23	203	203	180	180	178	160	180
Total	**487**	**540**	**3,341**	**3,341**	**2,314**	**2,265**	**2,260**	**1,980**	**2,069**
NPV @ 12%	**407**	**140**	**604**	**604**	**57**	**17**	**43**	**(3)**	**44**
FIRR (%)					**13%**	**12%**	**13%**	**12%**	**13%**

Financial Performance of Cochin Corporation

Municipal Revenues

The following points are to be noted:

1. All income received by the municipal corporation constitute a fund called the Municipal Fund (Fund) under the Kerala Municipality Act 1994 (KM Act 1994). The items of income credited to the Fund consist of the following:
2. Own source revenue which includes taxes, duties, cess and surcharge, fees from licences and permissions, income from municipal properties, and income from other miscellaneous items;
3. Share of the taxes levied by the Government and transferred to the municipal corporation;
4. Grants released to the municipal corporation by the Government for the implementation of schemes, projects and plans formulated by the municipal corporation;
5. Grants released to the municipal corporation by the Government for implementation of schemes, projects and plans assigned or entrusted to the municipal corporation under the Kerala Municipal Act;
6. Money raised through donations and contributions from the public and non-governmental agencies.

The municipal corporation maintains its books of accounts under the accrual method of accounting in accordance with the requirements of the Kerala Municipal Accounting Manual (KMAM).

Rs. Million

Figure 1: Cochin Corporation - Income Details

Particulars	**2009-10 10 mths**	**2009-10 projected**	**2008-09 Actual**	**2007-08 Actual**
Income:	**Actual**			
Tax revenue	685.6	822.7	465.0	445.3
Rental income from Municipal Properties	46.1	55.3	18.3	41.1
Fees & user charges	92.9	111.5	56.7	110.8
Sale & hire charges	0.8	1.0	0.5	0.1
Revenue grants, contributions & subsidies	68.1	81.7	97.4	394.2
Income from investments - genral fund	0.1	0.1	0.0	1.6
Interest earned	0.2	0.2	0.7	0.0
Other income	16.2	19.4	13.9	15.9
Total Income	**909.9**	**1091.8**	**652.4**	**1008.9**

Source: Cochin Corporation Accounts
Note: Above figures are exclusive of KSUDP account

It can be seen from above figure that tax revenue, comprising of property tax, professional tax, advertisement tax, entertainment tax etc., is the major source of income for the corporation and has risen from 44% of total income in 2007-08 to 75% of total in the financial year 2009-10. Of the tax revenues, property tax contributed the maximum share at 69% followed by professional tax (24%), entertainment tax (5%), advertisement tax (1%) and other taxes (1%). Fees and user charges levied by the Corporation contributed about 10% of total income on an average. Revenue grants, contributions and subsidies share of total revenues has decreased over the years from a high of 39% in 2007-08 to about 7% in the 2009-10.

Analysis also shows that tax revenues have grown at a compounded rate (CAGR) of 36% from 2007-08 to 2009-10. Overall income of the Corporation has grown at a CAGR of 4% during this period.

Municipal Expenditures

The municipal revenues for the Corporation for the past two years are listed in Figure 2.

Figure 2: Cochin Corporation – Expenditure Details Rs. Million

Particulars	2009-10 10 mths Actual	2009-10 projected	2008-09 Actual	2007-08 Actual
Expenditure				
Establishment expenditure	288.0	345.6	306.7	270.2
Administrative expenditure	49.9	59.9	46.2	39.1
Operation and maintenance expenses	158.4	190.1	124.3	223.9
Interest and finance charges	24.9	29.8	29.7	7.5
Program expenditure	81.8	98.1	76.5	125.4
Revenue grants, contributions & subsidies	0.0	0.0	20.8	28.2
Miscellaneous expenditure	0.1	0.1	0.5	0.4
Depreciation	4.3	5.1	1.3	16.4
Total Expenditure	**607.3**	**728.8**	**605.9**	**711.1**
Revenue surplus / (deficit)	**302.5**	**363.0**	**46.5**	**297.9**

Source: Cochin Corporation Accounts
Note: Above figures are exclusive of KSUDP account

Establishment expenditure constitutes the major revenue expenditure for the Corporation and the share of this to total expenditure is about 47% in the year 2009-10 followed by the operation and maintenance expenditure (26%), program expenditure (13%), administrative expenditure (8%), interest and finance charges (4%) and other expenditure (2%). Analysis also shows that establishment expenditure has grown at a compounded rate (CAGR) of 13% from 2007-08 to 2009-10, administrative expenditure has increased at a CAGR of 24% and interest and finance charges at a CAGR of 99%.

Current Processes for Financing Projects

Current Processes

Corporation projects are financed from its own revenues depending on the availability of surplus funds. The Corporation also receives funds from the Government of Kerala (GoK). These funds fall under under three main headings:

- Development Funds
- Maintenance Funds and
- General Funds

The allocation of funds under above headings for the period 2007-08 to 2010-11 is given in Figure 3 below:

Figure 3: Allocation of Funds to the Corporation

Rs. Million

Corporation	Year	Development Fund	Maintenance Funds		General Funds
			Non-road Assets	Road Assets	
Kochi		212.18	35.05	47.70	88.02
	2007-08	233.39	38.55	52.47	96.82
	2008-09	256.74	42.41	57.71	106.50
	2009-10	282.41	46.65	63.48	117.15
	2010-11	310.65	51.31	69.83	128.86

Development Funds are for the new or ongoing development projects. In addition to these general headings, funds may be received for specific / earmarked schemes from Government of India and from GoK. Development project proposals are developed and after due approval of the Council are included in the Corporation's annual budget. Funds for approved projects are sourced from the Corporation's own revenue surpluses (this is usually the Corporation's own share of the total project cost as well as small sized projects), development grants from GoK and grants from GoI (for example under JNNURM).

Urban Transport Roadmap

The Corporation has a number of transport proposals and projects under consideration. These have been generated by previous studies including the City Mobility Plan (CMP). Details of these projects are contained in Figure 4 below:

Figure 4: Detail of Investments Proposals

Rs. Million

Particulars	CoC	Railways	NHAI	PPP	BOOT	Total
1. Construction of Pedestrian Sub-ways	92.8					92.8
2. Construction of Flyovers at intersections	1969.8		303.5			2273.3
3. Construction of Railway over bridges / under bridges across Railway Tracks		819.0				819.0
4. Construction of Bridges across Waterways	2291.9					2291.9
5. Construction of New Roads and Improvement of Roads	2665.9					2665.9
6. Construction of Multilevel Parking				459.4		459.4
7. Construction of suburban railway works		946.0				946.0
8. Improvements to waterways and construction of Jetties		413.4				413.4
9. Rail cum Air terminal at Nedumbassery		140.0				140.0
10. Metro rail (rerouting and stations) 20:80					32900.0	32900.0
11. Truck terminal (2 Nos.)				40.0		40.0
12. Shifting of bus terminal	50.0					50.0
13. Purchase of urban buses (20 Nos.)	20.0					20.0
Grand Total	**7090.4**	**2318.4**	**303.5**	**499.4**	**32900.0**	**43111.7**

From the list contained in the figure, a number of projects have been earmarked for the first phase of the CMP. These are listed in Figure 5.

Figure 5: Detail of Phase 1 Investments

Out of the above - list of works to be taken up in the first phase as per CMP Report

Rs. Million

Particulars	CoC	Railways	NHAI	PPP	BOOT	Total
1. Construction of Pedestrian Sub-ways	92.8					92.8
2. Construction of Flyovers at intersections	1969.8	0.0	303.5	0.0	0.0	2273.3
3. ROB / RUB						
RUB - 2 Nos. at Thevara		7.0				7.0
RoB - Atlantis, Ravipuram, Pachalam, Ponnurunni		396.0				396.0
4. Bridges - Kannangattu Bridge	366.0					366.0
5. Roads	2665.9					2665.9
6. Suburban Railways		946.0				946.0
7. Construction of three major Jetties		30.0				30.0
Grand Total	**5094.5**	**1379.0**	**303.5**	**0.0**	**0.0**	**6777.0**

Source: CMP March 2008

Detailed project proposals have been developed for various urban transport projects as per the CMP and City Development Plan (CDP) of Cochin to be financed under JnNURM. The status of these project proposals are as follows:

Total value sanctioned:

Rail over Bridges (RoBs)	Rs. 672.8 million (50% - 33.64 million to be funded by Railways)
Urban Road Transport	Rs. 760.2 million
Total	Rs. 1433.0 million
Less: funded by railways	Rs. 336.4 million
Net approved	Rs. 1096.6 million

The value of sanctioned urban road and rail overbridge projects is listed in Figure 6 below:

Figure 6: Details of Urban Road Transport Proposals

Road Name	Amount as per Original DPR (Rs. Millions)	Amount Sanctioned (Rs. Millions)	Remarks
1) Edapally to Highcourt Road; (already tendered work in progress)	173.4	162.1	
2) SA Road; (already tendered work in progress)	97.1	89.6	
3) Stadium Link Road	78.2	51.2	
4) Construction of Thammanam Pullepady Road; (LA in process)	263.1	149.4	One bridge excluded
5) Goshree Mamangalam Road (LA initiated) and	331.0	257.8	
6) SA road extension	28.4	28.0	
7) Contingencies 3% on all above		22.1	
Total	**971.2**	**7602**	

Name of Rail over Bridge	Amount as per Original DPR (Rs. Millions)	Amount Sanctioned (Rs. Millions)	Remarks
1) Pachalam	248.4	448.3	Roads included later
2) Atlantis	179.6	103.0	
3) Ponnurni	162.6	101.9	
4) Contingencies 3% on all above		19.6	
Total	**590.6**	**67.28**	

The principal obstacle in the implementation of the above projects has been land acquisition. The value of the land required exceeds the construction cost.

The cumulative release of funds into the Corporation's project account up until the year ended 31st March 2010 is Rs. 74 million.

Figure 7: Details of Projects (DPRs have been prepared, submitted but not approved)

Road Name	Amount as per Original DPR (Rs. Millions)	Remarks
1) Edakochi Bund Road	128.9	2.83 kms width 11 m
2) Chelavanur Bund Road	242.5	5.04 kms 2 lane
3) Kalamassery Municipal Roads	47.3	Many small roads
4) Small bridges		
Chettichira Culvert canal SC Bose road	27.8	
TP Canal at Girinagar	6.4	
Pashnithodu Bridge	12.5	
Vaduthala Bridge across TP	31.8	

Canal RCC culvert at Polakkandam Market	2.5

A number of detailed project reports (DPRs)have been prepared for consideration for funding. The list of those DPRs which have been prepared but not submitted for approval and sanctioning include:

1. Karkatha Link Road;
2. Bund Road – MG Road to NH Bye pass;
3. Mathai Manjooran Road;
4. Vytilla toTripunithira Peta upto SN Junction;
5. Old Thoppumpudy to Permpadappu Junction (Edakochi Road);
6. Salim Rajan Road and Kumaranasan Road;
7. Kaloor Kadavandthara North and South Extension roads;
8. Fort Kochi – Chellanam Road

Current financing capacity (and ability to borrow from the State

Figure 8 summarises the balance sheet of the Corporation for the past three financial years.

Figure 8: Corporation Balance Sheet 2008-10

	Rs. Million		
Particulars	**28-Feb-10**	**31-Mar-09**	**31-Mar-08**
LIABILITIES			
Reserves and Surplus			
Municipal (General) Fund	1064.4	707.7	661.9
Reserves	300.0	268.9	270.8
Sub-total Reserves and Surplus	**1364.4**	**976.6**	**932.6**
Grants, Contributions for specific purpose	1009.6	472.4	132.7
Loans			
- Secured Loans	209.8	218.5	205.8
- Unsecured Loans	1.6	1.6	1.6
Sub-total Loans	**211.4**	**220.1**	**207.4**
Current Liabilities and Provisions			
- Deposits received	28.2	8.7	6.9
- Other Liabilities (Sundry Creditors)	63.2	49.3	119.8
Sub-total Current Liabilities and Provisions	**91.4**	**58.0**	**126.7**
Total Liabilities	**2676.8**	**1727.0**	**1399.4**
ASSETS			
Fixed Assets	888.4	761.1	568.2
Less: Accumulated Depreciation	-92.9	-75.6	-74.9
Capital work-in-progress	322.5	231.3	155.6
Sub-total Fixed Assets	**1117.9**	**916.7**	**648.9**
Investments - General Funds	2.1	21.6	21.6
Current Assets, Loans and Advances			
- Stock in Hand (Inventories)	48.6	23.4	7.8
- Sundry Debtors (Receivables)	479.4	209.4	286.2
- Cash and Bank Balances	892.5	431.0	329.9
- Loans, Advances and Deposits	136.1	124.9	105.1
- Other Assets	0.1		
Sub-total Current Assets, Loans & Advances	**1556.8**	**788.7**	**729.0**
Total Assets	**2676.8**	**1727.0**	**1399.4**
Source: Cochin Corporation's accounts			
Note: Above figures are exclusive of KSUDP account			

A summary of the status of the Corporation's Balance Sheet for the past three years is included in Figure 9.

Figure 9: Summary of Corporation Balance Sheet – 2008 to Feb 2010

Particulars	28-Feb-10	31-Mar-09	31-Mar-08
Net Worth	2374.0	1448.9	1065.4
Loans	211.4	220.1	207.4
Debt : Equity Ratio	0.09	0.15	0.19
Debts Outstanding	479.4	209.4	286.2
Total Assets	2676.8	1727.0	1399.4
Debts as Percentage of CC's Revenue	48.4%	38.7%	47.8%

The Corporation has taken a loan from HUDCO with repayment obligations over the next 15 years. Other than this loan the Corporation has not taken any other loans. An analysis shows that the Corporation as having very favourable debt equity ratio and suggests potential for further loans and borrowings. Current assets of the Corporation include substantial current debts (arrears of property tax, other taxes and user charges etc.). This accounts for approximately 48% of the annual outstanding income of the Corporation.. This indicates the Corporation's collection efficiency needs substantial improvement for reduction in the quantum of debts outstanding.

The large cash and bank balances, reflected as part of current assets, is due to the amount received as grants for specific purposes and use lying unutilized at particular point of time. The Corporation may not be able to mobilize the necessary resources for developing the infrastructure projects proposed. While some of the development schemes such as the development of bus bays / stops, bus terminals, parking development schemes etc can generate a revenue stream and therefore be considered for PPP to private sector, other development schemes including road widening, IWT development etc. need to be taken up by the Corporation through any of the other options including BoT, Public Supply Operation, Lease Contracts or Service Contracts.

Funds required for infrastructure development schemes need to be sourced from diverse sources such as grants-in-aid or an allocation from the Central Road Fund, other centrally sponsored schemes such as JnNURM, a proportion of State motor vehicle tax, a special cess (tax) on petrol / diesel, government subsidy, parking fees, congestion pricing, advertising revenues etc. With these diverse options, the Corporation can set up a Road Fund Board with initial equity participation

Such a fund would need to be used judiciously to resolve those traffic and transportation problems which require top priority and urgent attention for both the short term and long term,. Such a fund can also be used to pay off the annuity requirements, initial investment, operating and maintaining cost for these projects. A properly approved financial management system will be required for managing the road fund.

Financial Projections of CC

The assumptions used to assess the financial position of the Corporation are as follows:

Particulars	Financial Operating Plan Assumptions
Income:	
Tax revenue	2%
Rental income from Municipal Properties	2%
Fees & user charges	2%
Sale & hire charges	2%
Revenue grants, contributions & subsidies	2%
Income from investments - genral fund	2%
Interest earned	2%
Other income	2%
Total Income	
Expenditure	
Establishment expenditure	8%
Administrative expenditure	5%
Operation and maintenance expenses	3%
Interest and finance charges	3%
Program expenditure	1%
Revenue grants, contributions & subsidies	5%
Miscellaneous expenditure	2%
Depreciation	2%

Plan I – JnNURM Funds

Projections with Investment Proposals	1	2	3	4	9	14	19	20
	2010-11	2011-12	2012-13	2013-14	2018-19	2023-24	2028-29	2029-30
Opening Balance		-72.4	-340.9	137.5	2327.7	4119.4	5029.6	5093.7
Project Income of CC with existing operations	928.1	946.6	965.5	984.9	1087.4	1200.5	1325.5	1352.0
Projected Expensese of CC with existing operations	639.3	673.4	709.7	748.6	987.0	1321.8	1795.7	1912.2
GoI Grant - JnNURM	451.5	677.3						
GoK Grant - JuNURM	270.9	406.4						
Equity Contribution - CC	180.6	270.9						
Capital Expenditure under Inv Proposal	903	1354.5						
Income under Investment Proposal 1	0.0	0.0	314.0	314.1	476.6	632.0	954.5	957.5
Expenses under Investment Proposal 2	-	-	91.43	100.6	162.0	260.9	420.1	462.2
Net Cash Flow	-72.4	-268.4	478.4	449.8	415.0	249.9	64.1	-64.9
Closing Balance	-72.4	-340.9	137.5	587.2	2742.7	4369.3	5093.7	5028.9

Plan II – Loan from ADB / Other Agencies
Projections with Investment Proposals

Opening Balance	0	-284.6	-871.5	-472.1	1109.7	2229.8	2567.1	2528.5
Project Income of CC with existing operations	928.1	946.6	965.5	984.9	1087.4	1200.5	1325.5	1352.0
Projected Expensese of CC with existing operations	639.3	673.4	709.7	748.6	987.0	1321.8	1795.7	1912.2
Loan 70% from ADB / Other Agencies	632.1	948.15						
Equity Contribution - CC 30%	270.9	406.35						
Capital Expenditure under Inv Proposal	903	1354.5						
Income under Investment Proposal 1	0.0	0.0	314.0	314.1	476.6	632.0	954.5	957.5
Expenses under Investment Proposal 2	0	0	91.4	100.6	162.0	260.9	420.1	462.2
Debt Servicing								
Loan Principal outstanding	632.1	948.2	1580.3	1580.3	1264.2	869.1	474.1	395.1
Interest on Loan @ 5%	31.605	47.4	79.0	79.0	63.2	43.5	23.7	19.8
Repayment of Loan					79.0	79.0	79.0	79.0
Net Cash Flow	-284.6	-586.9	399.3	370.7	272.8	127.4	-38.6	-163.6
Closing Balance	-284.6	-871.5	-472.1	-101.4	1382.5	2357.2	2528.5	2364.9

Source: Analysis

Appendix 5
Economic Analysis

Appendix 5
Economic Analysis

Economic Cost

1. The economic costs of capital works and annual operation and maintenance have been calculated from the financial cost estimates on the following basis:

(i) Price contingencies are excluded however physical contingencies are included as they represent a real consumption of resources;

(ii) Import duties and taxes are excluded since they represent transfer payments. For this the shadow exchange rate factor in Figure 1 below has been used.

Figure 1: Shadow Exchange Rate Factor

Details	2008-09 RE	2007-08 Actual	2006-07 Actual	2005-06 Actual
National export (free on board) = Ex *	766,934	655,864	571,779	456,418
National import (CIF) = Im*	1,305,503	1,012,312	840,506	660,409
Customs Duties =Ct*	84,710	72,029	62,819	46,645
AD-HOC STANDARD CONVERSION FACTOR				
(CF = (Ex + Im)/(Ex + Im+Ct))	0.961	0.959	0.957	0.960
Shadow exchange rate factor (Y):(Y=1/CF)	1.04	1.04	1.04	1.04

* - Source : Reserve Bank of India
RE - Revised Estimates
Note: Calculation Method based on the handout on Economic Analysis

(iii) The presence of unemployment and under-employment for unskilled workers within the Indian economy suggests that the opportunity cost of unskilled labour can be considered to be lower than the standard wage rate. Accordingly a factor of 0.5 of the market wage rate for agriculture casual labour has been used to estimate the shadow wage rate. Figure 2 below contains the relevant details.

Figure 2: Shadow Wage-rate Factor (Y)

Casual agriculture labor cost in Kerala (Rs. per day)* (L)	72
National minimum wage of unskilled worker (Rs. per day)** (M)	100
Shadow Wage-rate Factor (Y); Y = L/M	0.72

*- The Minimum Agricultural Labor wage fixed by Kerala on 12/12/2009 was Rs. 72 a day (for men working six hours for light work). Source: Labor and Rehabilitation Department, Govt. of Kerala
** With effect from November 2009 the National Floor Level Minimum Wage has been increased to Rs 100 from Rs 80 (in September 2007). http://www.paycheck.in/main/officialminimumwages

(iv) The market wage rate for skilled labour and the acquisition cost of land are considered to represent opportunity costs, as both resources are currently in in demand;

(v) All costs have been valued using the domestic price numeraire, to enable an easier comparison with the data used to measure benefits (i.e. a significant component of the benefit will be in savings in resources. These resources could be used elsewhere in the "without project" scenario).

2.The estimated financial base cost without contingencies and allowances (excluding utility shifting, R&R, L&A and environment management expenditure) for the proposal components is estimated at Rs 2112 million (US$46 million) (Figure 3). The economic cost (resource cost) has been estimated for both capital cost and operation & maintenance costs by including the contingency and other costs, and through the process discussed above. These costs are presented in Figures 4 and 5. Estimating the economic cost from the financial cost has been achieved by using the following assumptions:

A. For Capital Cost

- Contingences and other allowances considered to the base cost (12%):
  - Design Supervision Consultancy (DSC)+ Third Party Inspection (TPI) - 3%,
  - Information, Education & Communication (IEC) activities 1%,
  - Incremental Administration (PIU) – 2%,
  - Physical contingency 3%,
  - Environmental mitigation 1%,
  - Social intervention 1%,
  - Institutional development and capacity building activities1%

- Share of foreign cost to total project cost

Share of Foreign Cost (%)

Sector	Services	Materials	Total
Urban Transport	0.75%	0%	0.75%

- Tax and duties
  - Local cost – 12%
  - Foreign Cost – 4%
- Share of unskilled labour in Local Cost – 12%

B. For Maintenance Cost

- Share of foreign cost to total project cost
  - Urban Transport (Ferry Services) – 1%
- Tax and duties
  - Local cost – 12%
  - Foreign Cost – 4%
- Share of unskilled labor in Local Cost – 15%

Figure 3: Details of Base Financial Cost

Item	2010-12 Rs. Million
Base Cost	2112
Total	**2112**

Source: Consultant

Figure 4: Details of Resource Cost

Details	Financial Cost (Capital)		Resource Cost (Capital)	
	Rate	Rs Million	Rs Million	S P Factor
Base Cost		2,112.09		
Allowances	12%	253.45		
Foreign Cost				
- Base cost & allowance	1%	17.74	16.39	0.92
- Taxes & Duties	4%	0.69	-	-
		18.43	**16.39**	
Local Cost			-	
- Unskilled labour	12%	281.74	140.87	0.50
- Skilled labour & Others	88%	2,066.06	2,066.06	1.00
- Taxes & Duties	12%	273.28	-	-
		2,621.08	**2,206.93**	
Total		**2,639.51**	**2,223.32**	

Note: 1. The Shadow Exchange Rate Factor was derived from RBI data on national exports, imports and exports and using the method based on the ADB Handout on Economic Analysis.

Figure 5: Details of Resource Cost Estimation – O&M Cost

Details	Financial Cost		Resource Cost (Capital)		
	Rs Million (coll. & trans.)	Rs Million (Dist.& treat.)	Rs Million (coll. & trans.)	Rs Million (Dist.& treat.)	S P Factor
O&M Cost	63.36	-			
		-			
Foreign Cost	0%				
- Base cost	0.00	0.00	-	-	0.92
	-	**-**	**-**	**-**	
Local Cost	100%		-		
- Unskilled labour (25%)	15.84	0.00	7.92	-	0.50
- Skilled labour & Others (75%)	47.52	0.00	47.52	-	1.00
	63.35	**-**	**55.44**	**-**	
Total	**63.35**	**-**	**55.44**	**-**	

Source: Consultants Estimates.
Note: 3% of the Base Cost is assumed for O&M cost.

3. The cash outflow for the economic cost has been calculated by using 2010-11 as the base year and allowing for two years construction period and 20 years operation. Figure 6 presents the details.

Figure 6: Details of Phasing and Expenditure Cash Flow

Phasing	Year	Capital Cost Rs. Million	O & M Cost Rs. Million
0.00%	2010		
40.00%	2011	889	-
60.00%	2012	1,334	22
	2013		55
	2014	-	55
	2015	-	55
	2016	-	55
	2017	-	55
	2018	-	55
	2019	-	55
	2020	-	55
	2021	-	55
	2022	-	55
	2023	-	55
	2024	-	55
	2025	-	55
	2026	-	55
	2027	-	55
	2028	-	55
	2029	-	55
	2030	-	55
	2031	-	55
	2032	-	55

Source: GlobalWorks analysis.

Economic Benefits

4. The benefits arising from improved ferry infrastructure and vessels translate into improved services for existing and future passengers. Economic benefits are achieved through more effective connectivity, improved operating speed, safer operations and improved personal comfort and convenience for passengers.

5. Project beneficiaries will be those passengers for whom accessibility to economic and social activities will be improved through reduced travel times and improved service levels and improved connectivity with other modes. These improvements are achieved by reducing the effort or inconvenience of travel between the trip origin destination.

6. This Investment Proposal will improve conditions for general traffic in Fort Kochi through reduced crowding and passenger loading delays at stops and reduced need for buses on existing bus routes linking the island to the mainland. This translates to reduced traffic congestion, reduced traffic conflict at junctions, an increase the travel speed/service reliability resulting in savings in general vehicle operating cost (VOC) and travel times. Pedestrian safety and reduction in road crossing times are also achieved through this reduction in bus volumes and reduced congestion.

Investment Proposal 1 - Ferry Services

Proposal I – Ferry Services has the component categories of: i) improved ferry services, ii) developed ferry terminals and iii) park & ride facilities close to the terminals that will facilitate the modal shift from private vehicles to the ferry services.

7. The economic benefits considered in the analysis for the components include:

(i) Value of Travel Time Savings
- for the traffic using existing ferry services
- for the passengers diverted from road to ferry services

(ii) Value of VOC savings
- for the passengers diverted from road to ferry services
- for people who are shifting private vehicles to IWT system by using park & ride facilities

Estimation of Project Benefits

8. In the absence of detailed traffic modelling, assumptions were made regarding impact of improvements in the ferry and road network performances. These assumptions addressed those benefits including savings in travel time and related costs as well savings in vehicle operating costs (VOC). The basis of these assumptions is as follows:

(i) The average travel speed for general between Fort Kochi and the mainland is assumed to increase from the existing levels (this increase in speed/service level can be achieved by reduced delays to general traffic caused by overcrowded buses loading at overcrowded bus stops. Even though increased speed levels are expected more, a 20 percent improvement is assumed on conservative side. This improvement in travel speed has been used to estimate the savings in travel time and further costing the time saved.
(ii) Provision of park & ride facilities at the ferry terminals will encourage a modal shift towards public transport that will result in reduced private vehicular traffic and consequently improve general traffic travel speed on road network.

The value of the VOC savings and travel time savings for general traffic through increased use of the ferry services has been calculated using unit rates for time value ,and established VOCs for different vehicle categories. These have been estimated from field surveys as well as the guidelines stipulated by Indian Roads Congress (IRC), and relevant study reports. The calculations include the following assumptions:

- Average vehicle occupancy – the number of passengers by vehicle type;
- Traffic composition – the percentage of each vehicle type in the traffic stream;
- Passenger composition – the percentage of each socio-economic category using each vehicle type and the percentage of passengers who are in the workforce;
- Savings in VOC and travel time – estimated on the basis of the VOC savings generated by the reduction of existing travel speeds and average VOC in congested travel conditions through the impact of this investment proposal;
- Unit cost of VOC and travel time for different vehicle users – based on background study data and reports with unit time costs at 2010 levels.

i) VOC Savings

9. The implementation of the identified components will improve the speed and capacity of the road corridor from Fort Kochi to the mainland. This will improve the service quality in terms of reduced vehicle operating costs. Savings in VOC are assumed from the following:

- Improvement in traffic flow through reduced congestion levels;
- By effecting modal shift from private vehicles to the ferry services through park & pay facilities integrated with the bus/ferry terminals

Updated unit VOC rates have been adopted for the analysis based on i) VOC rates per vehicle km and ii) savings per vehicle km for different vehicle categories. These rates are shown in Figure 7 and Figure 3.8.

Figure 7: Details of Road User Cost adopted for the Study

Vehicle Category	VOC (Rs. / Vehicle Km)	
	2008 [1]	2010 [2]
Car - New Technology (Maruti 800)	4.1	4.7
Bus	16.4	18.7
TW	1.4	1.6
Auto rickshaw	4.0	4.6
Share-Auto	4.5	5.1
Taxi	4.7	5.4
2-Axle Truck	14.8	16.9
LCV	11.0	12.6
Goods Tempo	4.6	5.3
Goods Auto	3.6	4.1

Source:

1. Approach for Economic and Operation Assessment for Identified Urban Roads and Transportation Sub-projects, Working Paper No. : WP-05, Comprehensive Transportation Study for Chennai Metropolitan Area, May 2008

2. Escalated to 2010 with 7% annual growth.

Figure 8: Estimation of VOC Savings

Vehicle Category	VOC (Rs. / Vehicle Km) [1]	Savings in VOC (%) [2]	Savings in VOC (Rs. / Vehicle Km) [3]
	2010		
Car - New Technology (Maruti 800)	4.7	29.51%	1.4
Bus	18.7	42.04%	7.9
TW	1.6	23.14%	0.4
Auto rickshaw	4.6	23.14%	1.1
Share-Auto	5.1	23.14%	1.2
Taxi	5.4	29.51%	1.6
2-Axle Truck	16.9	35.35%	6.0
LCV	12.6	32.29%	4.1

Note:
1. Approach for Economic and Operation Assessment for Identified Urban Roads and Transportation Sub-projects, Working Paper No. : WP-05, Comprehensive Transportation Study for Chennai Metropolitan Area, May 2008
2. Estimated using HDM-4 Economic Analysis Model for a urban road condition with widening option of to four lane.
3. Estimated

ii) Value of Passenger Travel Time Savings:

10. Similarly the implementation of the components will result in reduction of the existing travel delay for all the vehicles due to increase in speed and subsequently savings in travel time for the road and ferry users, including pedestrians. The estimates of the value of travel time unit rate for different vehicle categories are presented in Figures 9 and 10. Vehicle occupancy details and travel speed for different project scenarios are presented in Figures 11 to 12.

Figure 9: Derivation of the Value of Passenger Time – 2010

Details		**Unit**	**Value**	**Datum yr**	**Annual Growth (%)**	**2010**
Input…						
Net State Domestic Product at Factor Cost for Kerala State (NSDP)	A	Rs million	859,829	2007-2008	7	984,418
Population	B	million	31.838	2001	0.9	34.82
Working population: main	C	%	25.87%	2001*	0.9	9.01
Working population: marginal and unemployed	D	%	18.65%	2001*	0.9	6.49
Working population: FTE**	E=C+D/2	%	35.20%			12.26
Computed…						
Assumed NSDP (50%) to households	F=A´0.60	Rs million				492,209
Average income per FTE worker	G=(F/B)/E	Rs/year				115,333
Average income per FTE worker***	H=G/2400	Rs/hour				48.06
Work time value, with 33% overheads	I=H´1.33	Rs/hour				63.91
Non-work time value at 30%	J=H´0.30	Rs/hour				19.17

Note:
*- Census; in the absence of evidence to the contrary it is assumed that average household size and the proportion of people in the working population have remained constant.

**-Full-time equivalent workers, assuming marginal workers are employed half-time.

***-Assuming 2,400 worked hours per year.

Source:

1. Statistical Hand Book of India-2009, Reserve Bank of India
2. Hand Book of Statistics on Indian Economy, Reserve Bank of India, 2007
3. Economic Review, 2003, Dept. of Planning, Govt. of Kerala

Figure 10: Derivation of the Value of Passenger Time – 2010

Vehicle Type	Time value at Kerala State Level (Rs / Hour), 2010			Time value at Cochin Urban Level (Rs / Hour), 2010		
	Work	Non work	Combined	Work	Non work	Combined
Bus	51.13	15.34	36.81	56.24	16.87	40.50
Mini Bus	56.24	16.87	40.50	61.87	18.56	44.55
TW	41.93	12.58	30.19	46.12	13.84	33.21
Car	83.34	25.00	60.01	91.68	27.50	66.01

Note:
1. Time value for Work and Non-Work Trips is estimated as shown in Figure 4.
2. Estimated travel time at state level indicators is converted to urban conditions for Kochi City with the assumption of 10% increase.

Figure 11: Vehicle Occupancy (No. of passengers/vehicle)

Bus	
Bus	40
Minibus	15
Private & IPT	
Car/Jeep/Van	3.5
Two Wheelers	1.5
Autorickshaws	2
Goods Vehicles (crew)	
Trucks	2
MAV	2
LCV	1

Source: Indian Roads Congress (IRC)

Figure 12: Average Travel Speed

Without Project	Km/Hour
Peak	22
Off-peak	25
With Project*	
Peak	26
Off-peak	30

Source: Field Survey, 2010

11. Using the parameters discussed above, the Project Benefits for Proposal I -Ferry Services were estimated. The estimates of project benefits in terms of VOC and travel time savings for the existing and diverted ferry passengers along with the assumptions used is presented in
Figure 13. Similarly, the details of the economic benefits estimation for the vehicle users using the three park & ride facilities provided is presented in Figure 14.

Figure 13: Estimation of Project benefits for Terminals & Ferry Services

Sl. No.	Details	Route 1	Route 2	Route 3	Route 4	Route 5	Total
1	Number of Boats	2	4	1	2	3	12
2	Number of trips per day (Round Trips/Boat)	60	60	45	30	20	215
3	Number of single trips per day	240	480	90	120	120	1050
4	Number of passengers/day (taking 100 as capacity [1])	24000	48000	9000	12000	12000	105000
5	Ferry Fare (Rs/person)	6	6	7	10	15	
6	Number days / year	320	320	320	320	320	320
7	Fare increase proposed (every 3rd year)	15%	15%	15%	15%	15%	15%
	Daily Passengers (Nos)	24000	48000	9000	12000	12000	105000
	i) Existing Passengers (60%)	14400	28800	5400	7200	7200	63000
	ii) Passengers Diverted from Road (40%)	9600	19200	3600	4800	4800	42000
	Travel Time Savings (minutes/trip)						
	i) Existing Passengers (60%)	10	10	12	17	25	
	ii) Passengers Diverted from Road (40%)	5	5	6	8	13	
	Travel Time Savings (Hours / Year)						
	i) Existing Passengers (60%)	768,000	1,536,000	336,000	640,000	960,000	4,240,000
	ii) Passengers Diverted from Road (40%)	256,000	512,000	112,000	213,333	320,000	1,413,333
	Travel Time Savings (Rs. Million Year)						
	i) Existing Passengers (60%)	31.104	62.208	13.608	25.92	38.88	171.72
	ii) Passengers Diverted from Road (40%)	10.368	20.736	4.536	8.64	12.96	57.24
	iii) Total	41.472	82.944	18.144	34.56	51.84	228.96
	VOC Savings (Rs./Trip) @ 3 km Trip						
	i) Existing Passengers (60%)						
	ii) Passengers Diverted from Road (40%)	0.96	0.96	0.96	0.96	0.96	
	VOC Savings (Rs. Million Year)						
	i) Existing Passengers (60%)						
	ii) Passengers Diverted from Road (40%)	78.64	157.29	34.41	65.54	98.30	434.18
	iii) Total	78.6432	157.29	34.4064	65.536	98.304	434.18

Note:
1. Though the capacity of the proposed boat is 100 passengers, only 100 passengers were considered for analysis on conservative side.

Figure 14 : Estimation of Project Benefits for Proposed Park & Ride Facilities

Details	Parking-Mattancherry	Parking-Fort Kochi	Parking-Vypeen	Total
Average User cost Savings (Rs. / Vehicle)				
i) Car	44.19	44.19	44.19	
ii) TW	12.20	12.20	12.20	
Parking Demand (No. of Vehicles/ Day)[1]				
i) Car	200	200	200	600
ii) TW	150	150	150	450
Capacity Utilisation	75%	75%	75%	
Annual Parking Vehicles (No.) [2]				
i) Car	48,000	48,000	48,000	144,000
ii) TW	36,000	36,000	36,000	108,000
Annual User Cost Savings (Rs. Million)				
i) Car	2.12	2.12	2.12	6.36
ii) TW	0.44	0.44	0.44	1.32
iii) Total	2.56	2.56	2.56	7.68

Note:
1. 100 car parking spaces with 2 daily turnover rate and 50 TW parking spaces with 3 turnover rate are assumed for the analysis.
2. 320 days only considered for annual calculations.

Exclusions. The following benefits of transport component have not been quantified for want of adequate data and quantification techniques. These qualitative benefits along with the quantifiable benefits discussed above, the proposed urban transport subprojects covered in Proposal I -Ferry Services will provide better living condition in the project city.

(i) Improvement in the environment of the project region; and
(ii) Effects on tourism and tourist-related businesses.

Analysis Period

In accordance with the previous studies and the guidelines of the Indian Roads Congress (IRC), the following analysis period is considered suitable for Life Cycle Cost Analysis (LCCA):

1. Base Year (2010)
2. Construction period (2011 & 2012)
3. Project opening for traffic (2013)
4. Project operating period (2013- 2032)
5. End of the analysis period (2032)
6. Consideration of Salvage Value (2032)

Thus, 20 years of operation, in effect, from the start of the proposed project road, is considered for economic evaluation.

Alternatives

The following scenarios are considered for the economic analysis.

A. Without project scenario: The first is a 'without project' (do minimum) where the existing network/facility (without the proposed improvement) will be considered as such in its present condition and without improvement.

B. With project scenario: This corresponds to the improvement to the general traffic conditions as a result of the implementation of the proposal. This later scenario comprises of the strategy of the 'with project' situation in the economic analysis model

By comparing the above scenarios, the net agency costs and net user costs and finally net project benefits associated with the project during its analysis period are estimated for the proposed improvement options separately during the analysis period, in order to arrive at their economic internal rate of return (EIRR) and economic net present value (ENPV).

Economic Feasibility Criteria:

Economic Opportunity Cost of Capital (EOCC): Given the complexity of estimating country-specific economic opportunity cost of capital (EOCC), a discount rate of 12% in constant economic prices is generally used as a proxy for EOCC in the economic analysis of ADB-financed projects. The EIRR must be compared with the economic opportunity cost of capital, for interpretation purpose of project feasibility

Economic Cost-Benefit Analysis Results

As part of the economic feasibility analysis, the following feasibility parameters were worked out as given in Figure 15 and the discounted net revenue is mentioned in the Figure 1.

1. Economic Internal Rate of Return (EIRR)
2. Economic Net Present Value (ENPV)

Sensitivity tests were carried out, including 20% increase in capital and operating costs, 20% decrease in benefits, and 20% increase in capital and operating costs combined with 20% decrease in benefits, and in all the EIRR remained positive, confirming the projects' viability.

Figure 15: Economic Cost-Benefit Analysis

(Rs. In Million)

Year Ending March	Economic Cost			Economic Benefits				Net Cash Flow
	Capital Cost	O & M Cost	Total Cost	Savings in Travel Time Cost - Ferry Users	Savings in VOC - Ferry Users	User cost Savings to Parking Users	Total Benefits	
2010		-		-	-	-	-	)
2011	889	-	889	-	-	-	-	(889)
2012	1,334	22	1,356	-	-	-	-	(1,356)
2013	-	55	55	183	347	6	537	481
2014	-	55	55	189	358	6	553	497
2015	-	55	55	194	368	7	569	514
2016	-	55	55	200	380	7	586	531
2017	-	55	55	206	391	7	604	549
2018	-	55	55	212	403	7	622	567
2019	-	55	55	219	415	7	641	585
2020	-	55	55	225	427	8	660	605
2021	-	55	55	232	440	8	680	624
2022	-	55	55	239	453	8	700	645
2023	-	55	55	246	467	8	721	666
2024	-	55	55	254	481	9	743	687
2025	-	55	55	261	495	9	765	710
2026	-	55	55	269	510	9	788	733
2027	-	55	55	277	525	9	812	756
2028	-	55	55	285	541	10	836	781
2029	-	55	55	294	557	10	861	806
2030	-	55	55	303	574	10	887	832
2031	-	55	55	312	591	10	914	858
2032	-	55	55	321	609	11	941	886
Total	**2,223**	**1,131**	**3,354**	**4,922**	**9,333**	**165**	**14,420**	**11,066**

NPV at 12% Discount Rate (Rs. Million)	**1,658**	**311**	**1,969**	**1,177**	**2,233**	**40**	**3,450**	**1,481**

EIRR								**22%**

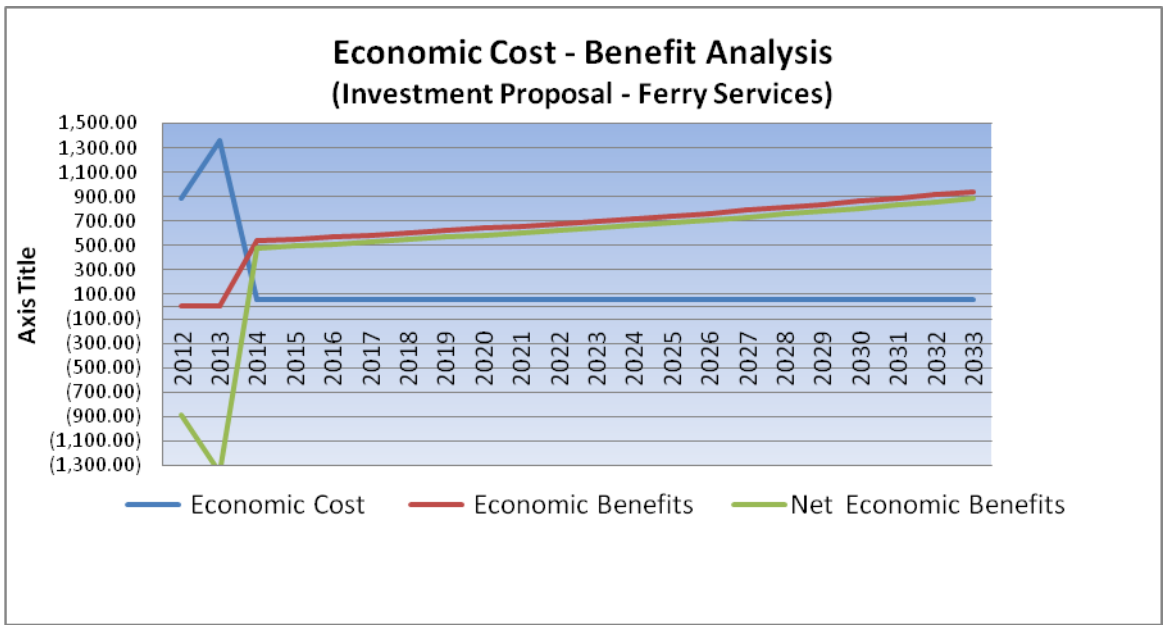
Sensitivity Analysis

Increase / Decrease	20.00%	20.00 %					20.00%	Combined Scenario
IRR	**19%**	**22%**					**18%**	**14%**
Switching Value	89%	475%					43%	

Note:

1. only 80% of the project benefit is considered as 20% of the traffic is assumed as not using the facility
2. Traffic is assumed to grow at 3% annually.

3. For sensitivity analysis, 20% increase in capital and O&M costs; 20% decrease in project benefits ; and combined effect of 20% increase in capital and O&M costs and 20% decrease in benefits along with one year delay in construction were considered.



Conclusion

The analysis above has demonstrated that the proposed Investment Proposal 1 – Ferry Services for Cochin is economically viable, with the calculated EIRR values exceeding the economic opportunity cost of capital. The sensitivity analysis has demonstrated the robustness of this result, with the proposal components economically viable even when the combination of changed assumptions was tested. Furthermore, the calculated EIRR value is considered to be a conservative estimate as there are a number of economic benefits of reduced water pollution related issues, improvement in sanitation, tourism benefits and a cleaner city that have not been quantified in the above analysis.