CHAPTER 7 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

The purpose of the EIA is to ensure that the potential environmental consequences of the proposed OCH are recognized early for required mitigatory action, which will be taken into consideration in project planning and designs. The present EIA assesses the existing environmental conditions in the 2 km wide corridor encompassing the proposed 100m wide right-of-way, identifies significant impacts on the environment, evaluates alternatives to the proposed road and recommends mitigatory measures for identified significant adverse impacts.

The summary of adverse environmental and social impacts of the OCH project is shown in the table on the next page.

The largest mitigatory action that can be taken for environmental conservation is to design the OCH road trace so as to minimize the negative impacts on object communities properties, and wetlands. For example the impact on drainage patterns can be avoided or minimized to an acceptable level by providing bridges culverts and other drainage structures of the required capacity where necessary. Any impacts on the Bolgoda wetlands, for example, can avoided by shifting the road trace away from the wetland system when necessary. In the eventuality that a community is affected, proper compensation should be promptly offered. Adequacy timeliness and reliability are the main criteria to be fulfilled in implementation of the compensation program.

The institutional requirement for environmental monitoring has been identified as the establishment of a project monitoring committee (PMC), which will be responsible for a implementation of the monitoring plan. The required monitoring activities of the PMC in regards to flood levels, air water quality, and noise level, biological aspects, and relocation and resettlement have been detailed in this Study.

This project has been determined to be environmentally acceptable provided that the environmentally acceptable road trace recommended in the environmental impact assessment (EIA) is taken into consideration and the proper mitigatory actions implemented. Moreover, the detailed design stage of this project should include environmental safeguards and recommended Project Monitoring Committee should closely monitor the implementation of the mitigatory measures. In addition a resettlement plan, including potential resettlement sites, compensation for different categories of people to be relocated, and a time schedule, should be formulated immediately after the determination of the final road alignment.

Tab.7.1 Summary of Environmental and Social Impacts

	PROJECT / ENVIRONMENT	Prep			Construction														Operation						
		geotech. investigat	land surveying	land acquisition	const.material	site clearing	cut&fill	blasting&drilling	surfacing&paving	land reclamation	ditching&drainage	spoil disposal	asp.concrt.plants	bridge const.	culvert const.	agro.chem use	labour force	displace.&resettle.	traffic increase	encroachments	road accidents	hazard.material	road maintain.	roadside develop.	unforeseen acts
P	Min. Resources																								
Y	Soil				■	■	■					▒													
S	Landform			■			■		▒			▒													
I	Surface Water Quantity								▒			▒													
C	Ground Wat. Quant.			▒						▒															
A	Surface Wat. Quality										▒														
L	Ground Wat. Quality																								
	Air Quality						▒						▒						▒			▒			
	Noise Level	▒			▒		▒	■						▒	▒				▒						
	Hydrology			▒			▒				▒														
	Erosion & Siltation			▒	▒		▒																		
	Earth Stability				▒			■																	
	Irrigation & Flood Protec			▒																					
B	Flora-terrestrial					▒										▒				▒				▒	
I	Flora-aquatic				▒							▒				▒									
O	Fauna-terrestrial					▒	▒	▒											▒		▒			▒	
	Fauna-aquatic				▒			▒					▒			▒				▒		▒			
	Avifauna						▒																		
	Biodiversity				▒	▒	▒	▒								▒				▒				▒	
	Land use			■	■	■	■	▒	▒	▒	▒	▒				▒		■							
	Tenure			■		▒			▒	▒	▒														
	Settlement Pattern			■		▒	▒		▒	■		▒						▒		▒				▒	
	Long term land use					▒	▒	▒	▒	■	▒							▒		▒				▒	
	Social struct.									▒							▒	▒		▒				▒	
	Popul.Migran.Settlem.									▒							▒	▒		▒				■	
S	Education																								
O	Access & Mobility								▒	▒				▒	▒			▒	▒					▒	
C	Access of Services																								
I	Public Health & Safety				▒		▒									▒			▒		▒	▒			▒
O	Housing			■						▒							▒								
E	Other Infrastruc. facilites									▒														▒	
C	Other transp.& Facil.									▒				▒	▒										
O	General Lifestyle									▒														▒	
N	Employment			■						▒							▒	▒		▒				▒	
O	Agriculture			■													▒	▒		▒				▒	
M	Tourism																▒	▒		▒					
I	Income Distribution																			▒				▒	
C	Structures			■		▒	▒	▒		▒										▒				▒	
	Business Volumes																			▒					
	Property Values			▒						▒								▒		▒				▒	
	Visual. & Landscape					▒	▒	■		▒				▒	▒								▒	▒	
	Hist.& Archaeo.Monu.																								
	Important Places					▒	▒	■		▒															

■ HIGHLY SIGNIFICANT
▒ SIGNIFICANT
□ COULD BE IGNORED

CHAPTER 8 ECONOMIC AND FINANCIAL EVALUATION

8.1 Economic Evaluation

The Economic Internal Rate of Return (EIRR) of the OCH Project, which represents the investment efficiency of the project, is estimated to be 18.87% per annum. According to the sensitivity analysis discussed in more detail below, the EIRR for the entire construction of the OCH could vary anywhere from 16.14% to 21.98% per annum. The sensitivity analysis consists of nine cases where OCH project costs and benefits increase or decrease by 10% from those of the Base Case (i.e., when there are no changes in costs or benefits). The EIRR exceeds the social discount rate or opportunity cost of capital of 12% per annum in Sri Lanka by a fair amount. Therefore, it can be said that the OCH would contribute greatly to the socioeconomic improvement of Colombo via the alleviation of traffic congestion and better spatial distribution.

As for any negative impacts on the social and natural environment along the OCH route, these would be mitigated via the timely application of appropriate countermeasures, which would include the design aspects of the OCH as well. These countermeasures would deal with the 11 negative impacts mentioned in the EIA of this study. Given this, any negative impacts should not be a reason for rejecting the implementation of the OCH.

Project Costs and Benefits of the OCH Project

Excluding operation and maintenance costs and taxes, OCH project costs for Part 1, Part 2, Part3 and Part 4 in 1999 prices is estimated to be about 15,367 millions Rs. As for the benefits of the project, a breakdown for the years of 2006, 2010, and 2020 are shown in Tab.8.1 below.

Tab.8.1 Project Benefits from the OCH Project

(unit: millions of Rs at 1999 economic prices)

	2006	2010	2020
Vehicle running reduction benefit	751.6	328.7	2,521.7
Running time reduction benefit	1,850.0	2,512.3	5,288.9
Air pollution reduction benefit	78.5	29.1	0
Traffic accident reduction benefit	75.9	39.5	240.0
Total	2,756.0	2,909.6	8,050.6

As the above table shows, the benefits from the OCH project are large.

As for air pollution reduction benefits, only cost reductions for emission control equipment and increases for the pre-installation of such equipment in future vehicles are considered.

Regarding the residual value of OCH facilities, this also was not taken into account in the evaluation of project benefits.

Economic Evaluation Method

The evaluation period is for 30 years, starting in the year 2001 and ending in the year 2030. The first six years are the construction period of the OCH facilities and the remaining 25 years the operation period, which would begin in the year 2006. The Study Team decided to adopt conventional cost-benefit analysis methods for the execution of the evaluation.

Sri Lankan domestic economic prices are adopted as the unifying value (i.e., numeraire) for expressing the benefits and costs of the OCH project. The selection of the numeraire was based on the fact that the residents of Sri Lanka would be the beneficiaries of the project.

Domestic economic prices are derived by converting Sri Lankan domestic prices and import prices into economic prices (equal to opportunity cost in Sri Lanka).

The evaluation, together with using the EIRR and the benefit/cost ratio, is also executed by applying the "With/Without Project" principle.

Evaluation of OCH Project Options

There are four possible OCH project options: (1) completion of Part 1 (Bandaragama – Rt. A4) only; (2) completion of Part 1 and Part 2 (Bandaragama – Rt. A1) only; (3) completion of Part 1, 2, and 3 (Bandaragama – CKE) only; (4) completion of the entire OCH (i.e., Part 1 to 4). The evaluation of these is carried out below in order to determine the feasibility of constructing the entire OCH as well as its separate components.

In Tab. 8.2, the benefit/cost (B/C) ratio and the net present worth (or benefits minus costs) were estimated for each of the four options of the OCH and are as indicated in the said table. A discount rate of 12%, which is a common threshold for developing countries, was applied in the calculation of these estimates.

Tab. 8.2 B/C and Net Present Worth for the 4 Options of the OCH

Option	B/C	B-C
Option 1 (Bandargama – Rt. A4)	2.17	Rs.4,767 million
Option 2 (Banadargama – Rt. A1)	3.23	Rs.13,869 million
Option 3 (Bandaragama – CKE)	1.93	Rs.8,826 million
Option 4 (entire OCH) (Panadura – CKE)	1.74	Rs.7,713 million

As the above table indicates, from the perspective of the B/C ratio and net worth, all of the OCH options can be said to be feasible. That is, anything over 1 for the B/C ratio, or a positive net worth, is theoretically worth constructing.

However, Option 2 is by far the most attractive or feasible portion of the OCH, with a net worth of Rs.13,869 million, or approximately 1.81 times that of Option 3, which is the next most attractive scenario. In addition, the return on per rupee spent for option 2 is 3.23 times.

Therefore, the issue here is whether or not to construct anything beyond Part 2, i.e., whether or not to implement Option 3 or 4. For this purpose, the economic internal rate of return is calculated for Option 2,3, and 4 below.

Tab. 8.3 (1) EIRR for the OCH Project (Option 2 (unit : % / annum))

		Cost		
		10% increase	Unchanged	10% decrease
Benefit	10% increase	26.35	27.92	29.75
	Unchanged	24.86	26.35	28.10
	10% decrease	23.29	24.70	28.46

Note: Colored box is base case for this option

Tab. 8.3 (2) EIRR for the OCH Project (Option 3 (unit : % / annum))

		Cost		
		10% increase	Unchanged	10% decrease
Benefit	10% increase	20.07	21.50	23.19
	Unchanged	18.71	20.06	21.66
	10% decrease	17.29	18.57	21.23

Note: Colored box is base case for this option

Tab. 8.3 (3) EIRR for the OCH Project (Option 4 (unit : % / annum))

		Cost		
		10% increase	Unchanged	10% decrease
Benefit	10% increase	18.88	20.30	21.98
	Unchanged	17.53	18.87	20.46
	10% decrease	16.14	17.4	19.91

Note: Colored box is base case for this option

The EIRR for all of the scenarios of the above three options is greater than the social discount rate of 12%, indicating that construction of the entire OCH can be deemed feasible (i.e., the implementation of Option 4). Construction of the entire OCH would produce an EIRR of 18.87, which is in itself sufficient justification for its completion.

However, the Base Case (i.e., no change in benefits or costs) for each of the above options illustrates a significant difference in EIRR levels. For Option 2 it is 26.35%, for Option 3 20.06%, and for Option 4 18.87%. The high EIRR for Option 2,which was shown to be robust in the above sensitivity analysis, indicates a need for this portion of the project to be implemented as soon as possible. The EIRR for Option 3 is also robust and remains well above 16% (a figure that usually signifies the borderline for a desirable project). As for Option 4, it declined to the 16% level during the sensitivity analysis, indicating that some consideration should be given prior to its implementation.

It should also be mentioned here that although the total net worth of the project declines with the implementation of options beyond Option 2, they still produce benefits that are significant in absolute terms. In addition, Option 2's high EIRR does not negate the justification for Option 3 or 4, but indicates the urgency in which it should be addressed. Finally, from a road network viewpoint, it is crucial that the CKE be connected with the Southern Highway via the OCH.

8.2 Financial Evaluation of the OCH Project

Introduction

The financial evaluation estimates and evaluates user charges for the proposed OCH. On the other hand, in the Progress Report submitted in March 1999, it was concluded that in order for the OCH to fulfill its intended functions, it should be a partially-controlled facility. As a result of this, it was determined that the OCH could not be a toll road. However, the Study Team decided to examine the case of the OCH as a toll road, since it is an importance topic that can affect project feasibility.

At present, there are no toll roads in Sri Lanka. However, this situation may have to change as a result of a lack of public funds, which is a common situation in both many developed and developing countries throughout the world. To examine the case of a toll road for Sri Lanka, theoretical analyses reflecting the real world situation as much as possible are carried out.

Methodology for Determining Tolls

As for the methodology in determining an appropriate toll, two methods are considered:

- The first method is based on the annual operation and maintenance costs of the OCH facilities, as well as the number of vehicle trips by vehicle type on the OCH. Accordingly, this approach is based on the OCH service supply curve (total revenue curve of a business entity). In addition, possible levels of expenditure by low-income car owners are adopted as criteria for determining the capability of users to bear a toll. The expenditure is estimated based on an RDA survey on these issues.
- The second method is based on the demand curve of potential car users. The demand curve shows the relationship between the level of the user charge and the total number of car trips on the OCH (see, Fig.13.9 in the main report). RDA survey results were used to estimate the demand curve.

In addition to the above, attention must be paid to two aspects of this Study's examination of tolls:

- The collection cost for tolls is not taken into consideration, and it is ambiguous whether or not forecasted total revenue is desirable when viewed from the financial standpoint of a business entity.
- Only car users are considered in this Study's examination on tolls. The reasons for this are as follows:
  - Potential car users have to pay for OCH tolls out of their own pocket, so they are more sensitive on average then users of other types of vehicles.
  - It is easier on average to make a general estimate of additional outlays required by car users as compared to users of other types of vehicles.

Conclusion

The conclusions of the evaluation are as follows:

- To cover the operation and maintenance costs of the OCH the toll level for cars is estimated to be 2-3rRupees/trip (1998 constant prices). in order. The toll is estimated on condition that the forecasted traffic demand for cars using the OCH is realized. Given the toll and the demand per car, an annual expenditure of 1,000-2,000 Rs /

annum / car would be required of potential OCH users.

- The above-mentioned annual expenditure is much less than the 3,100 annum that car users at the lowest income levels admit to being able to spend for using the OCH. Accordingly, it is possible to cover the operation and maintenance costs of the OCH. Moreover, it is possible to say that a business entity would be able to set a higher toll that would exceed operation and maintenance costs. On the other hand, it is estimated that potential car users are willing to pay a toll of about 5.2 Rs / trip (1998 constant prices).
- Taking into account the large negative demand elasticity (- 6.584) for tolls for existing car users (at the lowest income levels), it is recommended that the toll be set at 5.2 Rs / trip. Since it is foreseeable that traffic demand will decrease sharply if the toll is set above that level (see Fig. 13.9 in Main Report).

8.3 Evaluation of Available Funds for Realization of the OCH Project

As stated before, the implementation of a toll system has been deemed inappropriate by this Study. Therefore, it is not possible to introduce private capital into this project, meaning that the Sri Lankan treasury will have to bear the costs of the project (with the RDA as the implementing agency).

However, there will be a limit or ceiling on the amount of funds available from the national treasury for the OCH project. Therefore, it is important to grasp how much the national treasury will be able to supply to the OCH project, which is the financial basis for the realization of the OCH project.

Total OCH project cost (excluding operation and maintenance) is estimated to be approximately Rs 22,126 million at current prices for the period 2002 – 2009 including inflation. However, possible funding from the national treasury for the construction of OCH facilities during this period has been calculated at Rs 5,405 millions. This estimation is based on the assumption that the existing budgetary scheme for the road network for the country would be retained in the future and that 10% of the budget for the construction of new roads, a subcategory of its own, would also be allocated to the OCH. Given this background, the national treasury would be forced to raise another Rs 16,721 million from abroad. However, estimated funding should not have to cover the cost of the taxes and resettlement costs (or approx. Rs 8,745 million at current prices) for the OCH.

The operation and maintenance costs of the OCH facilities in 2010 are estimated to be Rs 67.8 million at current prices. Additional possible funding from the national treasury for operation and maintenance has been calculated at 400 million Rs at current prices, which would come

from a fund for road maintenance. It is estimated that the OCH would receive 5% of this budget, meaning that the national treasury could supply funds for the operation and maintenance of the OCH facilities without any trouble.

Estimation Methods

As for annual project costs till the year 2009 and operation and maintenance costs in 2010, they are estimated by using 1999 constant prices, (including inflation). As for funding availability, the annual RDA budget till the year 2010 provides the basis for two ways of forecasting the funding that would be available for the OCH :

- Method 1: It is assumed that the existing budgetary scheme of the RDA will be retained in the future. Based on this assumption, a formula for forecasting the whole RDA budget can be devised. Relationships between nominal GDP growth rate and national revenue, and national revenue and the RDA budget are set in the formula.
- Method 2: Using the RDA 1999 budget and the nominal GDP growth rate till the year 2010 (forecasted at 14% per annum), annual RDA budgets are forecasted.

CHAPTER 9 IMPLEMENTATION PLAN AND RECOMMENDATIONS

9.1 General

The implementation of the OCH project has been shown to be feasible and well justified in the previous chapters of this report. It therefore will clearly provide a valuable addition to the Colombo and CMR transport infrastructure. The cost, however, could be somewhat of a strain on the finances of the Government of Sri Lanka, therefore requiring foreign financing. Two funding sources should be investigated.

① Annual budgeted expenditures
② Soft loans

Other issues, such as the availability of land, possibilities for cost reduction, and effective construction staging must be also considered. Below, those issues are estimated from the viewpoint of generating other possible solutions.

9.2 Cost Reduction Options

The options below have been identified by this study as possible cost reduction measures. However, these options touch upon the roles and concept of the OCH, as well as on matters of RDA policy.

(1) Number of Lanes

4 lane construction only

(2) Frontage Road

Not constructed

(3) Grade Crossings

Crossing will be at-grade

(4) Bridge and Viaducts

4 lane only

(5) Right–of-Way(ROW)

ROW acquired is only for a 4-lane structure

9.3 Staging of Implementation

Staging the implementation of a project permits the financially most viable portion of the project to be built first and eliminates the need for large annual expenditures that can have an adverse impact on project finances and feasibility.

The southern portion of the OCH has already been launched and the RDA has called for

tenders for the design as a part of the Southern Transport Corridor, which is to be funded by the Japan Bank for International Cooperation (JBIC). The construction of this section will commence in the middle of 2001 and will be in service by the middle of 2005.

However, as shown in the table below, the OCH project would produce the greatest returns and have the largest net worth with the additional implementation of Part 2, which would extend from Rt. A4 to the crossing with the Colombo – Kandy Road (i.e., Rt. A1). It therefore goes without saying that the construction of the OCH should extend to Rt. A1 at a minimum and that the next appropriate staging should be the implementation of Part 2.

Tab. 9.1 Benefit/Cost Ratio and Net Present Worth for the 4 Options of the OCH

Option	Benefit/Cost Ratio	Benefits-Costs
Option 1 (Construction of Part 1 only)	2.17	Rs.4,767 million
Option 2 (Construction of Part 1 & 2)	3.23	Rs.13,869 million
Option 3 (Construction of Part 1,2,3)	1.93	Rs.8,826 million
Option 4 (Construction of entire OCH)	1.74	Rs.7,713 million

As for Part 3, its addition to Parts 1 and 2 (i.e., Option 3) would still result in a very attractive EIRR of 20.06% in comparison to the 26.35% for Option 2. In addition, from a road network viewpoint, it is crucial in the Study Team's opinion that the CKE and the Southern Highway be connected to each other via the OCH. Therefore, the portion between A1 and the proposed Colombo – Katunayake Expressway at Kerawalapitiya should be built taking into consideration the progress of the CKE Project.

As for the section between the proposed Southern Transport Corridor junction and the Colombo – Galle Road (Road A2), this would be built last. According to the sensitivity analysis in Chapter 13 (Main Text), the EIRR of including Part 4 drops to around 16%, which is usually the borderline for a project being desirable, with a 10% decline in benefits and a 10% increase in costs. Given this, an exmination of traffic volumes as well as a reexamination of the benefits and costs of this portion might be necessary prior to actual implementation.

9.4 Recommendations

As indicated above, the OCH will be a highly traveled facility that will contribute significantly to the socioeconomic betterment of Colombo, as shown by the EIRR of 18.87%. In addition, the EIA has determined that the OCH is environmentally acceptable if the proper

precautions are taken, which would be finalized in the detailed design stage of this study. Bellow, the implementation plan and related recommendations for the construction of the OCH are briefly described.

1.Initial construction is proposed for a 4-lane dual carriageway with grade separated interchanges, with the provision for subsequent widening to 6 lanes. The widening should be executed when traffic volumes reach critical thresholds. It is anticipated that traffic volumes of the OCH on some sections will reach about 55,000 PCUs by about 2020 (i.e.10 years after opening) and that at this time widening may therefore be warranted.

2.Optional staging of the project should be considered as follows:

Part 1 Bandaragama - Kottawa

This section will be implemented as a part of the on-going Southern Transport Corridor Project to Kottawa on the Rt. A4, which is to be funded by the JBIC.

Part 2 Kottawa - Kadawata

The section extending from the north end of the Southern Transport Corridor at Kottawa to the Rt. A1 (Colombo – Kandy Road) should be constructed in parallel with Part 1.

Part 3 Kadawata – CKE (Colombo – Katunayake Expressway)

This section also should be constructed immediately after Part 1. However, the construction schedule should be determined based on progress of the CKE Project.

Part 4 Bandaragama - Panadura

This section can be deferred until the economic situation of the country has improved and until traffic demand requires its construction.

The staging of construction is shown in Fig.9.1

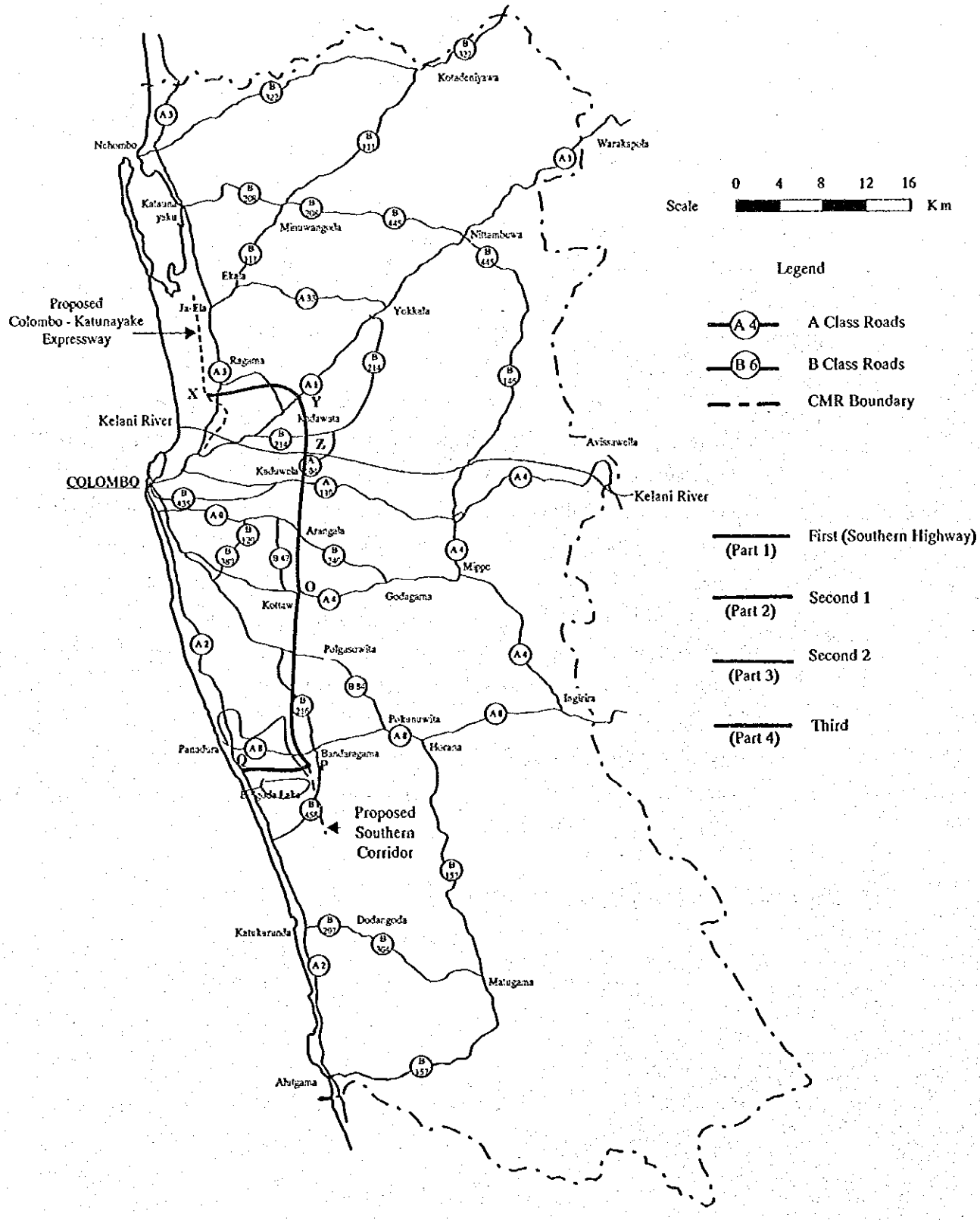


Fig 9.1 Staging of Implementation

9.5 Implementation Schedule

A project implementation schedule should be consistent with the technical realities of a project and should ensure the proper sequencing of activities, taking into account institutional capabilities and the availability of resources for construction. The suggested project implementation is shown in the bar chart in Fig.9.2.

It should also be noted that project construction should be divided into work packages that would be attractive to and manageable by international contractors, but not so large as to limit the numbers likely to bid. Each of these packages will be scheduled for completion in a period of about 2.0-3.0 years.

It is suggested that the commencement of construction would begin at the end of the rainy season. The construction of first stage should commence around the end of 2003 and be completed by the middle of 2006.
The schedule is subjected to a number of events occurring, including the following:

Loan Processing
A request by the Sri Lankan Government by September 2000 for a project loan. Nine months is required for the processing of the loan.

Engineering Services
The final alignment based on the trace of the feasibility study should be established at the preliminary design stage prior to the detailed design. Eighteen months is required for the preliminary and detailed design.

Right-of-way Acquisition and Resettlement
The legal process and resettlement actions required should be undertaken in parallel with the detailed design, All land should have been acquired and cleared prior to the award of the construction contracts.

Utility Relocation
Utilities, such as high-voltage lines, local electricity distribution facilities, water mains, telephone lines, etc., must be identified at the early stage of the detailed engineering and be relocated. The relocations should be undertaken in parallel with the detailed design.

Access Limitation Legislation
The project requires that the constructed facility be access controlled. There is therefore a

need to strengthen legal powers to restrict access and evict those found to be trespassing. Legislation should be in place prior to the award of the construction contracts.

Pre-construction and Supervision Consultant Selection

The consultant for pre-construction services and supervision services should be selected prior to the pre-qualification of the contractor.

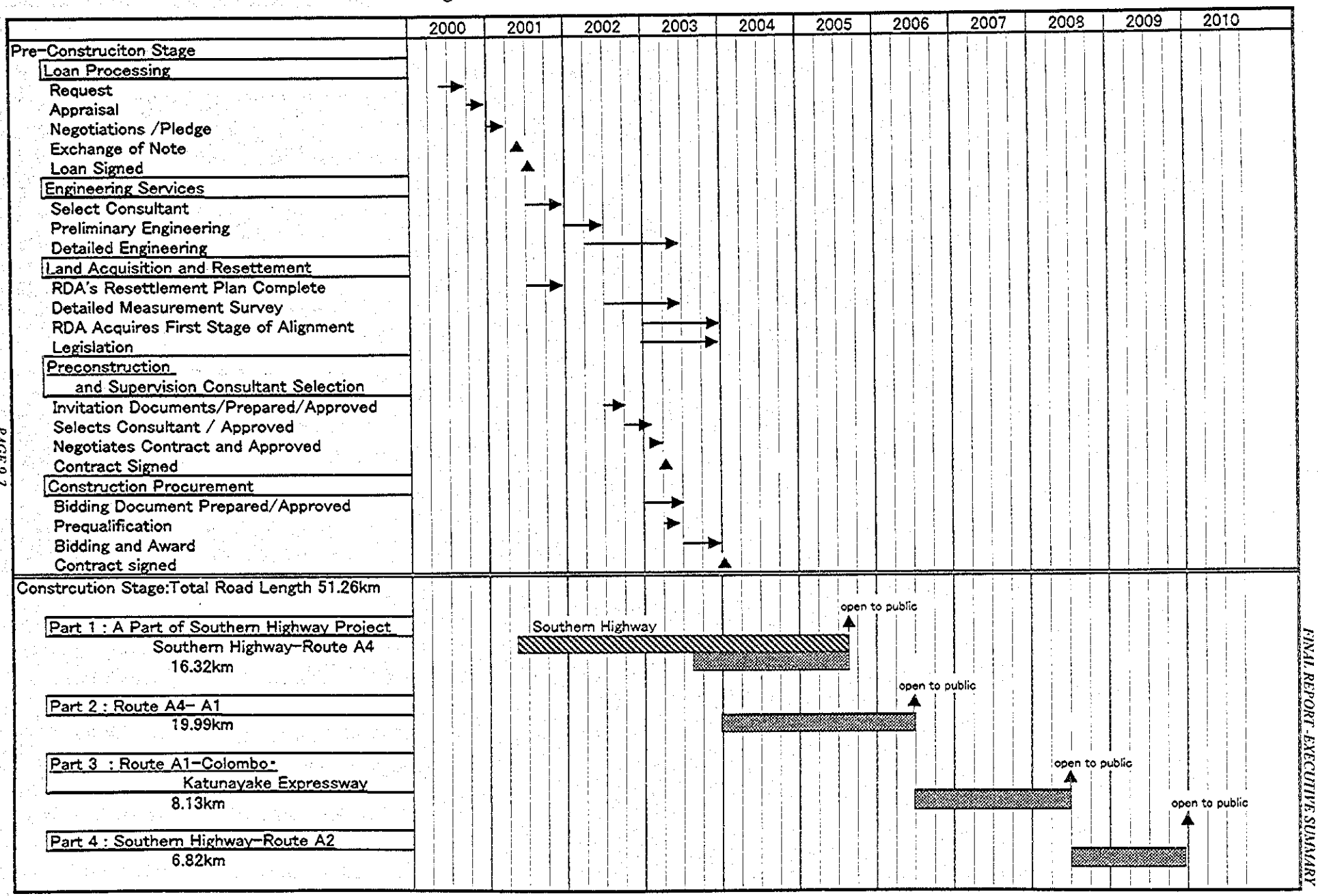
Contractor Selection

Nine months is required prior to the commencement of construction for contractor pre-qualification, tendering, and the evaluation and award of the contract.

Construction Specification

The initial construction should be carried out as a 4-lane dual carriageway with grade-separated interchanges, with the provision for subsequent widening to 6 lanes. Widening should be carried out around 2020. The construction should be divided into 4 parts and implemented as mentioned in Chapter 11.5 (Main Text).

Fig. 9.2 PROJECT IMPLEMENTATION SCHEDULE



JICA