Democratic Socialic Republic of Sri Lanka

Ministry of Transport and Civil Aviation

Colombo Suburban Railway Project
Project Preparatory Technical Assistance

Economic appraisal
Ticketing and fare collection system

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REPORT COVER PAGE

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
ATFCS	Automatic ticketing and fare collection system
CAPEX	Capital Expenditures
CMR	Colombo Metropolitan Region
CMRSP	Colombo Metropolitan Region Structure Plan
CTC	Central Traffic Control SLR
CoMTrans	Colombo Metropolitan Region Urban Transport Master Plan Study
CSRP	Colombo Suburban Railway Project
DNS	Do-nothing Scenario
EIRR	Economic Internal Rate of return
ENPV	Economic Net Present Value
FIRR	Financial Internal Rate of return
GDP	Gross Domestic Product
KPI	Key performance indices
LKR	Sri Lankan Rupee
OPEX	Operating expenditures
PPTA	Project preparatory technical assistance
SLR	Sri Lanka Railways
TA	Technical Assistance
TOR	Terms of Reference
USD	United States Dollar

GENERAL

1.1 Context

1. ADB's Country Partnership Strategy 2012-2016 aims at supporting sustainable economic growth by developing viable multimodal transport systems, including railways and the public transport system.

2. The ensuing project will be processed as a project loan; the scope being defined by this project preparatory technical assistance (PPTA) and project preparation including design and support for procurement and safeguards which will be provided under a proposed technical assistance loan (TA loan).

3. EGIS International in association with Resources Development Consultants (the Consultant), where selected to carry out the PPTA.

4. During the course of preparing the PPTA, the Consultant identified the need to assess potential development of intercity rail services and the capacity of the rail system in the suburban area of Colombo to cope with expected developments of suburban and intercity services. As per today, rail intercity services in Sri Lanka are limited. However, considering the current and expected future characteristics of road transport services especially in terms of price, journey time and comfort, a significant increase of rail modal share can be expected if suited services are being implemented.

5. Expected benefits include positive impacts on economic activities, the environment, and health of residents of Colombo Metropolitan Region (CMR), aligned with the Government of Sri Lanka's Strategic Plan for Transport Management in the CMR. The outcome will be improved transport capacity and service quality in the suburban railway network of Sri Lanka Railways (SLR).

1.2 Scope of the economic appraisal

6. The economic evaluation aims at determining the profitability of the project for the society, including passengers and SLR. Its process follows standard evaluation approach for transport project investments. The used methodology consists in a Cost/Benefit analysis between the project and the "do-nothing" situations.

7. The process takes into account factors which can be quantified, such as the project costs: the construction, operating and maintenance costs (CAPEX, OPEX). The economic appraisal also takes into account so called "externalities" or welfare benefits, i.e. the cost of non-financial impact such as travel time or safety. It provides measures of the overall economic rate of return obtainable from the project. The values used to price these non-financial impacts are issued from previous studies or governmental statistical agencies.

1.3 Purpose of this report

8. The purpose of the present report is to realise the economic assessment of the new ticketing system project.

METHODOLOGY OF THE ECONOMIC ASSESSMENT

1.4 Main components of the economic assessment and general methodology

The economic evaluation presented in the study aims at determining the profitability of the project for the society as a whole. Its process follows standard evaluation approach for transport project investments, using the ADB economic analysis of projects guideline.

The process takes into account factors which can be quantified, such as the construction and maintenance costs (CAPEX, OPEX), forecasted volumes of traffic. The economic appraisal also takes into account so called "externalities", i.e. the cost of non-financial impact such as travel time (in this case, waiting time at the counter). It provides measures of the overall economic rate of return obtainable from the project by balancing, on the one hand, investment, operating and maintenance costs, and on the other hand, expected benefits resulting from the project implementation, that are travel time savings and increased passenger revenues due to the reduction fraud.

The economic analysis relies on an incremental approach comparing a project scenario ("with project" situation) and a counterfactual scenario in which project is not realised: the reference scenario (or "without project" situation).

The methodology used for this assessment will allow computing standard financial indicators such as the Economic Net Present Value and the Economic Internal Rate of Return.

1.1 Socio-economic conditions in Sri Lanka

Population of Sri Lanka for each year is provided by the Department of Census of Sri Lanka:

	2 012	2 013	2 014	2 015	2 016
POPULATION	20 425 000	20 585 000	20 771 000	20 966 000	21 203 000

Assumption for population growth in the future is based on 2012 – 2016 growth trends, which is +0.96% per year.

GDP in volume of Sri Lanka is given in the table below:

	2 012	2 013	2 014	2 015	2 016
GDP (volume)	7 588 517	7 846 202	8 235 429	8 633 890	9 012 026

Assumptions for GDP growth is provided by ADB and is given below:

	2012-2016	2017-2018	After 2018
GDP annual growth rate	4.4%	5.0%	4.7%

Thus, the annual growth rate of per capita GDP for the analysis is deducted from previous data:

	2012-2016	2017-2018	After 2018
Annual medium growth rate GDP per capita	3.42%	4.02%	3.72%

1.2 Definition of "with project" and "without project" situations

Current ticketing system is a paper based system. The SLR has 175 stations and 155 sub stations. The only delivery channel available for Railway Daily Ticketing is the Ticketing Counter at the Railway Station. Colombo Fort and Maradana stations have 25 and 15 ticketing counters respectively. According to surveys, there are 16 stations with 5 counters, 32 stations with 3 counters, 98 stations with 2 counters and 165 stations with single counter.

The existing method has following disadvantages, being among others:

- Frequent shortages of tickets at stations due to delays in importing blank tickets, delays in printing tickets, printing machine breakages etc.

- Delays in issuing tickets at busy stations, due to entirely manual system

- Loss of revenue due to ticketless travel. The date imprinting machines are very old and are not printing the date properly.

- Difficulty in tracking fraud.

The proposed project is to implement by 2020 a new system consisting of a smart card based automatic ticketing and fare collection system (ATFCS). Among others advantages, the system will provides facilities for passengers to "top up" stored value tickets and purchase single trip tickets, and help reducing cash loss and increasing safety of the revenue (reduction of fraud).

The stations concerned by the implementation of this new system are the following:

Coast Line	Main Line
MARADANA	COLOMBO FORT
DEMATAGODA	SECRETARIAT HALT
KELANIYA	KOMPANNAVIDIYA
WANAWASALA	KOLLUPITIYA
HUNUPITIYA	BAMBALAPITIYA
ENDERAMULLA	WELLAWATTE
HORAPE	DEHIWALA
RAGAMA	MOUNT LAVINIA
WALPOLA	RATMALANA
BATUWATTA	ANGULANA
BULUGAHAGODA	LUNAWA
GANEMULLA	MORATUWA
YAGODA	KORALAWELLA
GAMPAHA	EGODA UYANA
DARALUWA	PANADURA
BEMMULLA	
MAGALEGODA	
HEENDENIYA PATTIGODA	
VEYANGODA	

1.3 Main parameters

Project lifespan

The economic appraisal is conducted on a 10-year period starting from the implementation of the new ATFCS system planned on January 1st 2020, and a 1-year investment pre-operation period. These are the durations usually considered for this kind of equipment.

Monetary value

Monetary values are in 2016 USD, and following general methodology for economic evaluations, the present assessment does not take into account inflation.

Discount rate

The discount rate is used in the economic analysis of investment projects to discount economic costs and benefits, and reflects the opportunity cost of capital from an inter-temporal perspective for society as a whole. In other words, it reflects the social view of how future benefits and costs are to be valued against present ones. In this sense, every discount rate entails a judgement concerning the future and it affects the weight attributed to future benefits or costs. A positive discount rate indicates a preference for current over future consumption.

According to ADB Guidelines for the economic analysis of projects, discount rate is set at 9%. Base year for net present value calculation is usually the year before the commissioning year, being in our case 2019.

1.4 Traffic

Traffic is provided by the model:

- For the stations for 2035,

- For the railway sections for 2020, 2025, and 2035.

In order to obtain 2020 and 2025 traffic for the stations, growth rates between 2035 and the other years of the directly linked sections are applied to the stations.

Ticketing system project is expected to be set up in 34 stations. By 2020, it is forecasted that 0.82 million of daily passengers will be concerned by this project. By 2035, their number is estimated to grow up to 1.05 million of passengers a day.

The table below shows the evolution of passengers number in the stations where the new ticketing system will be implemented:

	2020	2025	2035
N° of passengers (forecast)	822 712	895 825	1 047 890

PROJECT COSTS

1.5 Investment costs

Investment costs include:

- Ticketing system architecture for 34 stations of the Coast and Main Lines within the Colombo suburban area;

- Technical assistance during implementation of the ticketing system

The total amount for the ticketing system is estimated at 5 899 000 USD.

Here is below a detailed distribution of the cost components:

TICKETING SYSTEM CONTROL CENTER			
TICKETING SYSTEM CONTROL CENTER		$	910 000
TOTAL NUMBER OF EXTERNAL POINTS OF SALE	20	$	120 000
TOTAL NUMBER OF SYSTEM STATIONS (LOW DEMAND)	19	$	1 064 000
TOTAL NUMBER OF SYSTEM STATIONS (MEDIUM DEMAND):	3	$	303 000
TOTAL NUMBER OF SYSTEM STATIONS (HIH DEMAND):	5	$	635 000
TOTAL NUMBER OF SYSTEM STATIONS (VERY HIGH DEMAND):	7	$	1 617 000
SUBTOTAL TICKETING SYSTEM ARCHITECTURE		$	4 649 000
SUBTOTAL TECHNICAL ASSISTANCE DURING IMPLEMENTATION		$	1 250 000
TOTAL INVESTMENT - TICKETING AND FARE COLLECTION AND TECHNICAL ASSISTANCE		$	5 899 000

Considering a conservative 10 year project lifetime (usually taken for such projects) being the same duration as the economic assessment period, residual value is not taken into account.

1.6 Operation and maintenance costs

Operation and maintenance costs include staff and material costs, for preventive and corrective maintenance.

Costs may be distinguished between server maintenance and other material costs. It is assumed that:

- Annual costs regarding server maintenance represent 1% of its initial investment cost, that is 9 100 USD

- Annual costs regarding other material costs represent 2% of initial investment costs, that is 74 780 USD.

In total, annual operating and maintenance costs are estimated at 83 880 USD, with an annual 0.5% increase due to staff and material cost drift.

PROJECT BENEFITS

1.7 Time savings

Benefits from time savings rely on the estimated average passenger time saved from using the new ticket vending machines instead of queuing at the station counter. It is expected that each suburban railway passenger will save 5 seconds on average.

In order to monetarize time savings, unit value of time is obtained from Comtrans study and is estimated to 43.3 LKR per passenger.hour (USD 0.3 per passenger-hour). The passenger travel time value is estimated to grow like the GNP per capita, with an elasticity of 0.7.

Based on these assumptions and the passenger traffic, time savings benefits are estimated at 0.11 million USD for the first year of operation (2020), and follows traffic growth.

Given that the average queuing time reduction is uncertain, it is proposed to realise a sensitivity test by cancelling this benefit, so as to evaluate its impact on the project economic viability.

1.8 Fraud

The main benefit implied by the new ticket system implementation is expected to come from the reduction of fraud. The current level of fraud is estimated at 10% of the total passengers.

With the project, the level of fraud is estimated to decline by 2 percentage points, at 8%, implying a 2% rise in the passenger commercial revenues.

Based on an average USD 0.21 revenue per passenger (source: Sri Lankan passenger count & revenues, 2016) and the passenger traffic described above, benefit from fraud reduction is estimated at 1.06 million USD for the first year of operation (2020), and follows traffic growth while unitary passenger revenue is stable (conservative assumption).

RESULTS OF THE ECONOMIC ASSESSMENT

1.9 Main economic indicators

As a reminder, the economic assessment led in the study aggregates CAPEX, OPEX and economic benefits such as time savings and fraud reduction for the society as a whole. The discount rate for the new ticketing system project is set at 9% (ADB guidelines).

The following table presents the two main economic indicators needed to assess the viability of the project, the Net Present Value (NPV) and the Economic Internal Rate of Return (EIRR).

Table 1: main economic indicators

TOTAL NPV (2016 US $ million)	1.60
EIRR	14.5%

Based on these results, NPV is positive and EIRR is above 9%: the project is then considered economically viable.

Table 2: total project costs and benefits over the period, discounted 2016 value.

(2016 US $ million)		
BENEFITS		8.14
Additionnal revenues (reduction of fraud)		7.27
Time savings		0.87
COSTS	-	0.64
Operating, maintenance and renewal costs	-	0.64
INVESTMENT COSTS	-	5.90
TOTAL NPV		**1.60**

According to the table above, about 89% of the benefits of ticketing system is providing by the reduction of fraud and the additional revenues for Sri Lankan Railway. 11% is related to time savings for passengers.

The following graph presents the economic evaluation over the 10 years of operation period, The balance is getting positive in 2026, 6 years after the implementation of the ticketing system.
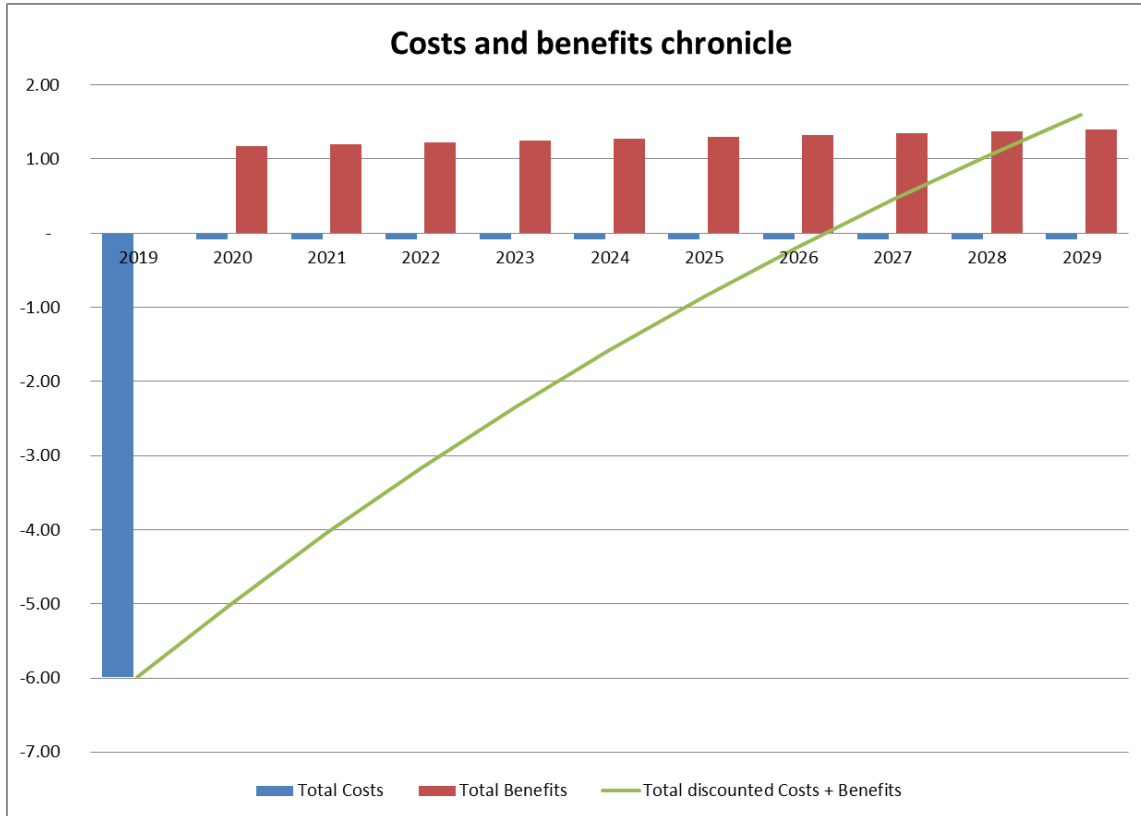

Figure 1: costs and benefits chronicles

1.10 Sensitivity tests

A sensitivity test on passenger time savings is proposed, as this benefit may be uncertain. Instead of 5-second unitary passenger time saving, the test is set at 0 second, with the result below:

Table 3: main economic indicators, time saving sensitivity test

TOTAL NPV (2016 US $ million)	0.73
EIRR	11.6%

Based on these results, NPV is still positive and EIRR is above 9%: despite the reduction of benefits, the project remains economically viable.