

2.4 Project Idea for Technology 3: Electrification of the existing railway system

Project Idea:

'Electrification of five percent of the existing railways of Sri Lanka for reduced greenhouse gas emissions'

2.4.1 Introduction/Background

The railway network in Sri Lanka, which has a length of ~1500 km, was initially built and used only for transporting export plantation products, and with increasing population and traffic needs, rail transport became more passengers oriented. Currently the existing trains are diesel powered, and electrification of part of the railway network has been proposed. In the past, during the first half of the twentieth century, an electric tram car system was operating in certain parts of Colombo. This early tram system is the only electrified rail experience Sri Lanka has had so far, and it has been more than half a century since the operation of the tram car system terminated. Therefore, the proposed electrification of ~5% of the existing railway system to meet the current passenger transport needs will bring a different experience with reduced greenhouse gas emissions. A feasibility study has been already done on electrification of the railway system¹. However, the success of its operation will be dependent on the running frequency, the number of commuters, and the sustainable operation of the system.

The problems addressed by the current project include the lack of finances, lack of better locomotives and infrastructure, and proper training for facing any emergency situation in sustainable operation of an electrified railway system. Therefore the current project is aiming at fulfilling these needs that are required for sustainable operation and maintenance of such a system.

¹ IESL, 2008

2.4.2 Objective

The main objectives of the project are as follows:

- Establish a better, electrified railway system in a selected fragment of the existing railways of Sri Lanka, through installing necessary infrastructure changes, new locomotives and signal systems for efficient railway system with reduced GHG emissions
- Training and capacity building for proper and sustainable operation of the electrified railway system

2.4.3 Outputs of the Proposed Project

The expected, measurable outputs under the overall project are listed below.

Outputs:

- ~70 km of the existing railway track electrified with better infrastructure, locomotives, and signal systems
- The number of personnel (mostly engineers, technical officers, and planners) trained in the countries within the region (e.g. Singapore, Japan) and other developed countries (e.g. Europe, USA) are expected to contribute to the sustainable functioning of the electrified railway system
- Improvements and capacity building within the overall transport sector in Sri Lanka

2.4.4 Relationship to the country's sustainable development

Since the transport sector is one of the major GHG emitting economic sectors in Sri Lanka, reducing the emissions by shifting to electrification will yield better environmental benefits. It will also help the improvement of overall quality of life and development in the country. For proper operation of such a system, better infrastructure, locomotives, and enough capacity and training are needed. Development of human and physical resources to a higher level is also one of the transport sector priorities under the '*Mahinda Chintana*', the development policy framework of the government of Sri Lanka (Department of National Planning, 2010),

2.4.5 Project Deliverables

- Smoother train operation by having an electrified railway system in place of diesel powered locomotives, for avoiding unnecessary idle times and system failures which finally result in reduction of GHG emissions.
- Improved standard in the infrastructure and locomotives
- Capacity strengthening of the nationally available experts and skilled people for proper operation and maintenance of the system

2.4.6 Project Scope and Possible Implementation

The project aims at improving part of the railway system in Sri Lanka, focusing reduced emissions and better passenger transport in a railway sector with heavy passenger load. It also plans on obtaining international training on the operation, management, and maintenance of an electrified railway system. The entire project is planned to be implemented within 3 years, and the required training is planned to be implemented in batches of government officers for obtaining experience needed for smooth operation and management of such a system.

2.4.7 Project activities

The following are the main project activities:

1. Identification of the fragment/s for electrification and electrification links
2. installing necessary infrastructure changes, new locomotives and signal systems
3. Fulfilling the maintenance requirements of the system
4. Capacity building and institutional strengthening through required training in collaboration with the countries with better experiences on electrified train systems.

2.4.8 Timelines for the Proposed Activities

Specific timelines for these activities are provided in Table 2.6.

Table 2.6: Timelines corresponding to activities and sub-activities relating to the electrification of the existing railway system												
Activity/Sub-Activity	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Activity 1 Identification of the fragment/s for electrification and electrification links												
1.1 Identification of the fragment/s for electrification												
1.2 Obtaining the support from the Transport Ministry to identify electrification links												
Activity 2 Installing necessary infrastructure, new locomotives and signal systems												
2.1 Provision of electricity through overhead lines (25 kilovolt) drawn above the railway lines and loops, better tracks, new locomotives, and signal systems, as needed												
Activity 3 Fulfilling the maintenance requirements of the system												
3.1 Periodic maintenance of the system for smooth functioning												
Activity 4 Capacity building and institutional strengthening through required training in collaboration with the countries with better experiences on electrified train systems												
4.1 Training of the relevant government officials needing specialized training, considering their area of expertise, qualifications, and experience												

2.4.9 Budget/Resource requirements

Budget requirements for project activities under the electrification of the existing railway systems provided in table 2.7.

Table 2.7: Budget requirements for Proposed Project 3

Activity	Budget requirement US \$ million	Potential funding source
1. Identification of the fragment/s for electrification and electrification links	0.01	Local
2. Installing necessary infrastructure changes, new locomotives (EMUs) and signal systems	47.3	Local or donors
3. Fulfilling the maintenance requirements of the system*	N/A	N/A
4. Capacity building and institutional strengthening through required training in collaboration with the countries with better experiences on electrified train systems	0.3	Local or donors
Total	47.61	

* - Maintenance will cover by the income generated

2.4.10 Measurement/Evaluation

- a) Project Progress Monitoring: The quarterly or half-yearly monitoring will be carried out by the Ministry of Transport or an expert committee appointed by the Ministry of Transport
- b) Project Evaluation: Periodic (i.e. Annual or Bi-annual) evaluation of the project will be carried out by an independent team of experts appointed by the Ministry of Transport in consultation with funding agency.

2.4.11 Possible Complications/Challenges

The success of an electrified railway system depends on the frequency of its daily use. The success of such a system in Sri Lanka is still not known, and needs to be evaluated in the future.

2.4.12 Responsibilities and Coordination

The project will be implemented by the Sri Lanka Railways and the Ministry of Transport. The overall project will be coordinated by a team consisting of the officers from the Ministry of Transport, Sri Lanka Railways, The Institute of Engineers, Sri Lanka (IESL), Arthur C Clarke Institute of Sri Lanka, Ceylon Electricity Board, and Academia.

2.4.13 List of References

1. Mahinda Chintana, 2010. Department of National Planning, Sri Lanka the emerging wonder of Asia. 90-110 pp, Ministry of Finance and Planning
2. IESL (The Institute of Engineers, Sri Lanka), 2008. A proposal for railway electrification. IESL.