ERASMUS UNIVERSITEIT ROTTERDAM

ORET Evaluation 2007 — 2012 – Case Study of the ORET Transaction BD00023

Railway Signalling and Interlocking in Bangladesh

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Cover Photo: Signalling equipment near Chatmohar Railway station, Bangladesh

Contents

Annexes

Tables

Figures

Photos

Executive Summary

Introduction and Methodology

The Railway Signalling and Interlocking project in Bangladesh (BD00023) is one of the case studies of the ORET Evaluation 2007-2012. The transaction involved the design, supply, installation, testing, and commissioning of a signalling and interlocking system of seven train stations of the section Ishurdi–Jamtoil of Bangladesh West Zone railway. The total transaction value amounted to EUR 8,493,474. The definitive ORET grant was EUR 4,246,737, determining the grant element at 50%. The direct objectives of the project were to increase the transport capacity on this railway section and to reduce the number of accidents on this track, which fitted nicely into the government's policy of upgrading the country's railway system. Vialis BV was the Dutch applicant for this transaction executed on a turnkey basis for the client Bangladesh Railway (BR). Vialis designed the signalling and interlocking system, supplied the equipment and trained a number of BR employees to operate it. Vialis cooperated closely with BR during the course of the transaction from design to commissioning.

The evaluation of this case study is based on the following sources of information:

- Relevant documents in the ORET archives, such as the grant agreement, feasibility studies, technical reports, progress reports, monitoring reports and the final report.
- Documents and data provided by Bangladesh Railway and other authorities in Bangladesh.
- Various publications on the situation of the railway services in Bangladesh.
- Interview with the Dutch supplier in March 2014.
- Site visits to several railway stations in Bangladesh.

Efficiency

Application. The preparation of the transaction started in 2000. The period from the date of submission of the application to the grant agreement was more than three years, which is longer than the average time taken for the application procedure for an ORET grant. The main reason was the two revisions of the transaction at the instigation of the government of Bangladesh. Due to the depreciation of the Bangladesh taka vis-à-vis the euro, the local currency equivalent of the euro-denominated transaction increased considerably during the processing period of the application. As a result the project substantially exceeded the originally allocated budget. Despite the delays, representatives of BR, the client of the project, expressed their satisfaction with the flexibility of the ORET programme, which gave them the opportunity to complete the required bureaucratic procedures on their side. The contract between Vialis and the Government of Bangladesh was agreed through direct negotiations. It was approved by the Executive Committee of National Economic Council (ECNEC), Bangladesh's highest authority for approving development activities.

Implementation. During implementation some differences of opinion about technical specifications surfaced between the contractor and the client. Some elements of the design turned out to be inappropriate for the local conditions. These differences were resolved, but this took more time than foreseen in the original planning of the project. Representatives of BR mentioned that BR is very satisfied with the equipment and the services provided. BR is also very satisfied with the quality of the training provided by Vialis. Apart from some initial delay, the transaction was implemented smoothly: starting on 21 August 2003 the works were finished on time, on 4 August 2005.

Price/quality ratio. A price/quality check of the application done by an independent price consultant (SGS) resulted in minor downward revisions in the prices of some components (mainly reduction of profit) of the transaction. Although satisfied with the equipment and services delivered, BR noted that the transaction was more expensive than similar transactions with other suppliers. For other sections of the railway system BR uses three types of signalling equipment funded by various donors. According to the Project Director of BR, the Dutch supplier was more expensive than Korean or Indian companies, sometimes even twice as high for certain components, but overall the quality of the Dutch equipment was much better than that of other suppliers.

Training. Four engineers were sent to the Netherlands for training in the use of the installed system. Upon return they were assigned to check the functioning of the system installed between Jamtoil and Ishurdi on a rotational basis. Engineers trained in France are currently in charge.

Because the Vialis equipment does not need much maintenance, the operation and maintenance of the system installed in the seven stations is now being executed by station masters and technical workers. In total 48 persons received local training in project maintenance and operation through the ORET project: 20 technical officers of BR were trained in signal system maintenance and 28 station masters received training in signal system operation and supervising the signal system.

Effectiveness

Transport capacity. An Impact Assessment Study undertaken by the Implementing Monitoring and Evaluation Department (IMED) of the Ministry of Planning mentioned that as a result of this project, passenger trains can now run on the section more safely at a maximum speed of 60 to 70 km/hour. This is much faster than the speed of 15 km/hour before the project. Interviews during the evaluation confirmed this observation. Since completion of the project, the number of trains that use the Jamtoil–Ishurdi section has increased substantially. Information collected from station masters shows that before the improvements were introduced, on average eight to ten trains passed per day in each direction. Now, 15 trains pass in both directions. Of the total of 30 trains, 25 are passenger trains and five are goods trains. This information was validated with the handwritten administration books at the railway stations. These figures also show that the transport of bulk commodities through these sections has increased considerably.

Safety. Since no national statistics are collected on accidents for each station and railway section, the information about the Ishurdi–Jamtoil section is based on interviews with the station masters and their own administration. A significant reduction of accidents has been achieved during the last decade. Station records show the number of accidents decreased after the installation of the new system. The information book of the Chatmohar rail station shows only two accidents in the 2005–2011 period whereas the book in the Ullahpara station reports no accidents and the Ishurdi station records only one accident during the same period. It is unclear whether the reduction in the recorded accidents can be attributed to the ORET transaction. The trend of decreasing railway accidents is also observed in the national statistics of Bangladesh Railway, except in 2005, when there was an increase in derailments, though not in the section targeted by the project.

Sustainability

Financial. BR performed reasonably well during the first decade of the post-liberation period, within the constraints of its inherited structural and physical constraints. But today the rail sector performs less well due to inefficiencies that reduce the productivity of both physical and human capital. This adversely affects BR's financial performance. Nowadays BR receives most revenues from passenger travel, whereas in the 1970s earnings from freight transport were much more important. It is expected that the gap between earnings and the resources needed for investments and maintenance of existing infrastructure will not disappear in the near future. This might have a negative effect on the future maintenance of the project equipment.
Technical. In spite of BR's financial constraints, the interviews with the station masters and the field visits made clear that all equipment installed under this project is operational and well maintained by the assigned engineers and station managers. According to the Project Director there were some problems with maintenance in the two years after completion of the works, because the local agent of Vialis did not perform as expected. After Vialis took over, the problems were solved. After the warranty period some equipment was replaced due to lightning damage, but this was considered to be normal. BR also replaced copper compounds between stations on the section with optical fibre. In addition, BR bought spare parts from Alstom but still needed some spare parts from Vialis. BR tried to contact Vialis but did not succeed, which points to a coordination problem between BR and Vialis. The engineers responsible for the section stations are very satisfied with the Vialis equipment since it does not require much maintenance, at least much less than the old system. BR employees are handling the equipment properly and efficiently, which enhances the sustainability of this equipment.

Institutional. BR is a big state company responsible for the country's railway system, including the section between Jamtoil and Ishurdi. All procedures to manage the system are in place but the company faces serious financial constraints. This particularly affects investments in new and modernised operational systems and other capital goods. The company also suffers from a lack of coordination between different departments, which is partly caused by the division of the network into eastern and western parts. The supervision and management of this section appears to be well

organised and executed. The responsible staff officers have been trained, either during the implementation of the project or in BR's own training institute.

Environmental. The backup batteries have already been replaced in all stations because five years have passed since installation. We observed that the equipment was very clean and seemed to be working well. Air conditioning was installed in the technical room housing the equipment. The generator room also looked clean: everything is functioning properly, according to the BR employees.

Relevance

The project has contributed to more efficient and safer transport of both passengers and goods in the targeted railway section, which is an essential link between the eastern and western zones in Bangladesh. The project complemented the recipient country's economic and development plans. Transport demand in Bangladesh is expected to increase considerably in the coming years, largely because of increasing demand for freight transport and greater personal mobility. The opening of the Jamuna Bridge in June 1998 removed one of the major national transport obstacles in the country. The ADB-financed rail link projects and the planned construction of the Padma Multipurpose Bridge are expected to allow further growth in domestic freight and passenger movements. When this occurs, the contribution to the modernisation of the seven stations from Jamtoil to Ishurdi towards the transport efficiency of the railway linkages between the eastern and western zones will be even more significant.

Additionality

The ORET transaction fitted well in the overall strategy to improve the railway system in Bangladesh. This strategy ranks high on the development agenda of the Government of Bangladesh, and fitted well in the Five-Year Plan of the Planning Commission of the Government of Bangladesh. It is financially supported by International Financial Institutions, such as the ADB, EBRD and bilateral donors. Given this situation it is likely that a similar transaction would have taken place with financial support from other sources. However, it is doubtful whether this alternative financing would have been provided at similar "soft" conditions to those in the ORET programme.

Policy Coherence

Although the transaction contributed to the economic performance of the country, it was somewhat isolated from the Dutch aid programme to Bangladesh at that time. It was not an important component of the Dutch trade policy towards Bangladesh. The non-grant funding of the transaction was provided by a Dutch bank and insured by Atradius DSB against the credit risk.

1. Introduction

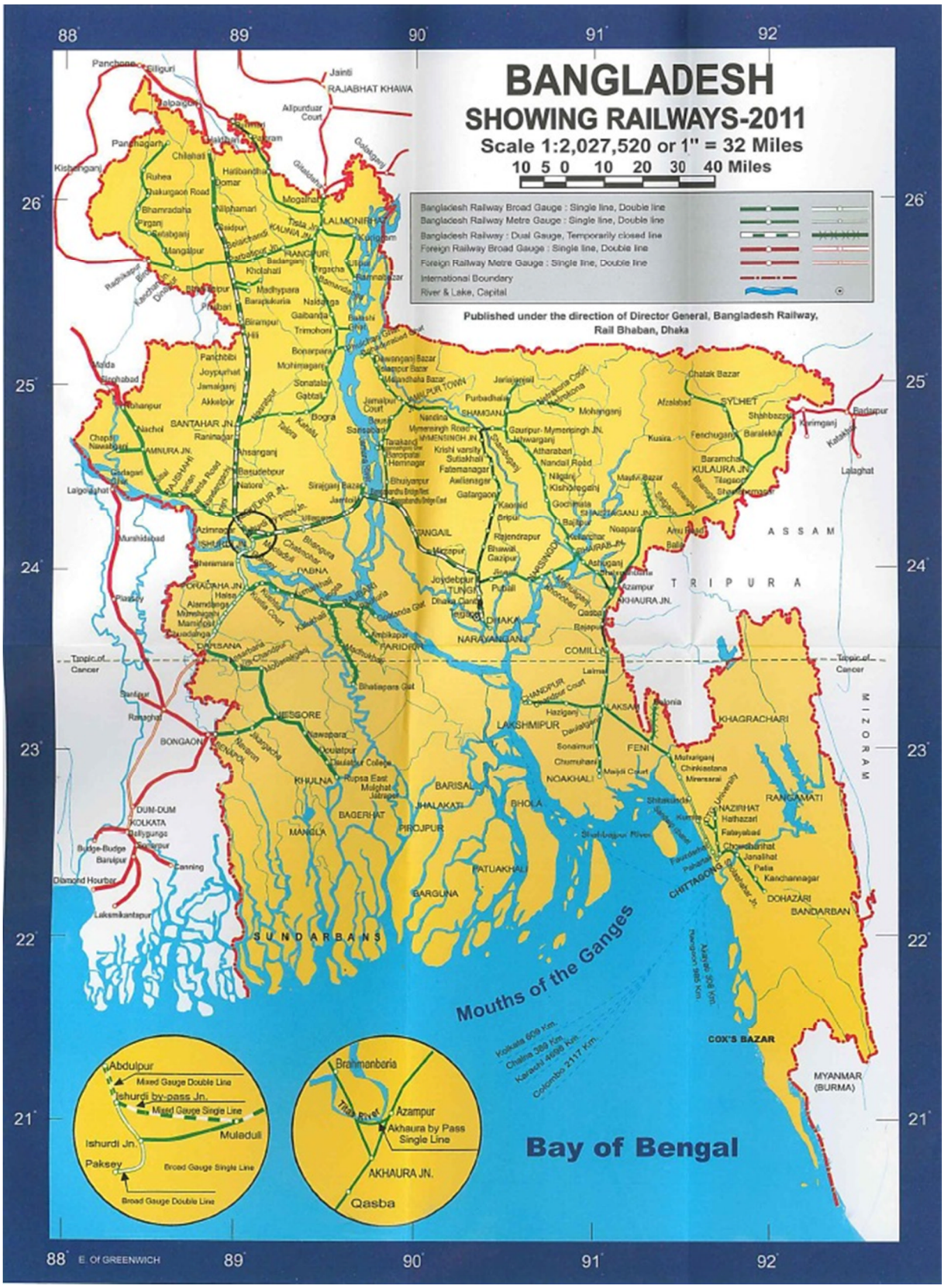
This case study evaluation is part of the overall evaluation of the ORET programme, covering the period 2007–2012 and beyond. This document presents the results of the evaluation of an ORET supported transaction to Bangladesh. The transaction "Railway Signalling and Interlocking, Bangladesh" (BD00023) involved the design, supply, installation, testing, and commissioning of a signalling and interlocking system on a turn-key basis of seven stations of the section Ishurdi–Jamtoil of Bangladesh West Zone railway. The total transaction value amounted to EUR 8.493.474 million and the definitive ORET grant was EUR 4.246.737 million. Bangladesh Railway was the recipient organisation and the project was executed by the Dutch company Vialis BV.

The evaluation of this case study is based on the following sources of information:

- Relevant documents in the ORET archives, such as the grant agreement, feasibility studies, technical reports, progress reports, monitoring reports and the final report.
- Documents and data provided by Bangladesh Railway and other authorities in Bangladesh.
- Various publications on the situation of the railway services in Bangladesh.
- Interview with the Dutch supplier in March 2014.
- Site visits to several railway stations in Bangladesh.

The structure of this report is as follows. After this introduction the second chapter describes the transaction, its context and the main stakeholders. The third chapter explains the results chain and the method to evaluate the results. The subsequent chapter assesses the transaction according to the evaluation criteria efficiency, effectiveness, sustainability, relevance, additionality and policy coherence. Chapter five summarises some of the main conclusions.

Figure 1: Railway Map of Bangladesh



2. Project Overview

2.1 Context

The Bangladesh economy faces serious transportation constraints caused by a combination of factors. These include geographical and physical circumstances, constraints resulting from a low-level of infrastructural investments and maintenance, and constraints related to institutional-cum-policy framework issues. In combination these lead to lower efficiency, higher transport costs, and more significantly, "transport unreliability", with major adverse consequences for the economy.

The history of the railway system in the present geopolitical boundary of Bangladesh dates back to 1862, when a Broad Gauge (BG) single line was constructed and opened to traffic between Darsana and Jagoti near Kushtia (see Figure 1). In the British India railway system, there were considerable expansions of the railway network in this territory. The Meter Gauge (MG) network on the eastern side was constructed to connect Chittagong Port with Assam and on the western side the network was Kolkata bound BG, running down from the north. These two types of networks remained isolated by the river Jamuna, which was only partly solved with the opening of the Jamuna Multipurpose Bridge. Up to today, a fully integrated railway system between the two zones (East and West) does not exist yet. Besides, the present rail links of the two zones are not straight; rather they have huge rounding loops in many important sections.

Major expansions of the rail system in Bangladesh stopped since 1947. Since the liberation of Bangladesh, instead of constructing new rail-routes, some of the branch line railway sections were declared redundant and subsequently closed and no proper attention to maintain the existing asset was being given. The condition of locomotives (rail engines) is also miserable and some of the railway land and properties are occupied.

Only an 80 kilometres rail line has been constructed during the last 50 years. Moreover 1,200 kilometres rail lines are under risk for operation due to a lack of proper maintenance and attention, which is mainly the result of insufficient allocations of funds (Hasan 2009). As a consequence, derailment has become a common phenomenon creating an adverse impact on the efficiency and reliability of railway services. Besides, shortage of locomotives and route capacity are other major problems recently facing the country's rail system. It is suffering of an excess of traffic in comparison with the capacity of the main routes. Therefore both passengers- and freight trains incur major delays and frequent cancellations.

Nevertheless in each year huge development budgets were allocated by the government to the transport and communication sector, but especially for roads and highways. Little attention was given to the rail sector. Hence, Bangladesh Railway (BR), the national executing agency of rail traffic can hardly compete with other modes of transport. This creates a major challenge for the company to eliminate its inherited structural and physical weaknesses and to survive as an efficient mode of transport for the public.

Against this background the country started with the improvement of the national railway system a decade ago. Considering the total length of the network this is a major task, complicated by the fact that the system consists of two different networks. The network's total length of close to 3,000 kilometres is divided into Broad Gauge (900 km) and more than 1,800 km Meter Gauge.

Part of the modernisation of the network was focused on the increase of the capacity and the development of a corridor between Calcutta and North East India. Since Bangladesh Railway did and does not have the resources to finance the total upgrading of its railway these investments are co-financed by international donors, such as ADB, EBRD, World Bank and several bilateral donors.

2.2 Signalling and Interlocking Project

A modern signalling system is a pre-requisite for a safe, speedy and efficient operation of trains. At the same time, it is a step towards eliminating the inherited structural and physical weaknesses of Bangladesh Railway (BR). The country wide constraints were also present on the Jamtoil–Ishurdi section, which was targeted by the project. The signalling system of the stations from Jamtoil to Ishurdi was out-dated, worn out and fully based on human operation. This was a threat to safe and efficient train operations. The speed of trains and operational capacity was limited in the section due to the only human-based non-interlocked signalling system at the stations. Under

this condition, Jamuna Bridge railway was established connecting east and west of which Jamtoil-Ishurdi is a part. Therefore, modernisation of the signalling and interlocking system of these seven stations was essential. The aim of the project was to improve the efficiency, capacity and safety of the Ishurdi-Jamtoil section by improving the interlocking and signalling system on seven railway stations in this section. The Ishurdi-Jamtoil section is an important section of the Bangladesh railway system. It is part of a connection between the Western and Eastern parts of the system, and it is part of the connection between Calcutta (India) and North-East India. At the start of the project, this section depended on outdated signalling systems in which most components were operated manually. This is slow, decreases the maximum capacity of the railway, and increases the risk of accidents.

The Bangladesh government was already working on modernising its railway system with help from ADB, France, Spain and Germany at the time of the grant application. The section east of Ishurdi-Jamtoil had already been modernised, and the modernisation of the section to the West was prepared at the time of the grant application. The section on which the project is focused therefore represented a missing link in the system. The project developed a new signalling system for the section, and also created interfaces to integrate with the Eastern and Western sections. Physical goods delivered included signalling devices, cables, warning systems and overpass-gates. The project also included technical assistance and training for the BR employees who use the system. The training was partly carried out in Bangladesh, and partly in the Netherlands.

The project was expected to lead to shorter travel times for passengers and an increase in travel safety. It also allowed BR to use more trains on the section, increasing the passenger capacity, while it also was possible that cargo trains use the section. The latter was expected to reduce pollution because it would substitute for the use of more polluting trucks. Because the new system is more efficient than the old manual controlled system, it was expected that it resulted into a decrease in jobs, but the long-term effects, such as more passenger and/or cargo traffic should result in employment gains.

The main signalling equipment and features that are brought and installed under the project were:

- Microprocessors based software controlled interlocking system;
- Electrically operated point machine;
- Track circuit for train detection, route and signal control;
- Colour light signals;
- Token less block working system;
- Computer and video display unit (VDU) used as Man machine interfacing for command control function;
- Software control trouble shooting facilities and operating commands are recorded/ stored in the computer system.

Other project activities were:

- The construction of functional buildings,
- Importing machineries and equipment including spare parts,
- Design, erection, training and maintenance.

The original project completion period mentioned was 2000–2003. As the project agreement was not signed in time, it was not possible to start the project activities within the proposed period. At last the agreement was signed on 19 July 2003 and from then onwards the project work started officially. The actual project completion period mentioned in the project documents was 2003–2007, including an after-sales period. The contractor completed the project work on 4 August, 2005 after which a two years maintenance period started.

2.3 Financing

The total transaction amount was EUR 8.493.474. The definitive ORET grant was EUR 4.246.737 a grant element of 50% of the transaction value. The non-grant part of the transaction amount was paid by the Government of Bangladesh. Payments were guaranteed through a Letter of Credit from a commercial bank in Bangladesh. It is unknown how much costs were related to the L/C for the Government of Bangladesh. It is however known that the signing of the contract was postponed twice among others because the local currency equivalent of the non-grant part of the transaction had increased considerably as a result of the depreciation of the Bangladeshi Taka vis-à-vis the Euro, which had a considerable impact on the budget.

Another reason was that the costs related to the L/C were higher than foreseen earlier. Table 1 presents the payment schedule of the transaction.

Table 1: Payment Schedule According to the Grant Agreement (in Euro)

	Bangladesh L/C	Grant	Total
Down-payment		849,347	849,347
Payments for equipment	2,829,588	2,200,791	5,030,379
Payment for services	992,476	771,925	1,764,401
Final payment based on Certificate of Completion	424,674	424,674	849,347
Total	**4,246,737**	**4,246,737**	**8,493,475**

2.4 Stakeholders

Bangladesh Railway

Bangladesh Railway (BR) is the principal rail transport agency of Bangladesh. It is state-owned and operates and maintains the entire railway network of the country serving a population of approximately 160 million living in an area of 155,598 square kilometres. Since the railway is an important mode of inland transport, BR plays an important role in the economic development of the country.

BR is controlled by the Directorate General of Bangladesh Railway under the Ministry of Railways along with Bangladesh Railway Authority (BRA) which provides policy guidance of BR. Key features of the railway system in Bangladesh are the coexistence of several gauges, Broad gauge, Metre gauge and Dual gauge (shown on the cover photo), and the separation of the system by the Jamuna River (Brahmaputra) into a Western and Eastern Zone of operations with only one bridge, the Jamuna Bridge opened in 1998 and connects the two zones. Bangladesh Railway covers a length of 2,855 route kilometres and employs 34,168 people. BR operates internationally, inter-city and suburban rail systems on its multi-gauge network. It also owns coach production facilities.

After independence, the railway was first supervised by a Railway Board which was abolished in 1982. Thereafter, BR came under the jurisdiction of the Railway Division of the Ministry of Communications with the Secretary of the Division working as the Director General of BR. In 1995, instead of being part of the Ministry, BR came under control of a Director General supervised by BRA that is chaired by the Minister of Communications.

BR is divided into main departments respectively responsible for the two zones, East & West, each under control of a general manager who is accountable to the Director General of BR. The two zones have their separate departments for operation, maintenance, and finances. BR manages its own Railway Training Academy. A separate Directorate under the Ministry of Communications is charged to inspect different works of BR in relation to safety.

The Ministry of Finance

The grant agreement of this transaction was signed by the Ministry of Finance of Bangladesh (MoF). The agreement specified the financial conditions, including the payment schedule of the transaction. MoF was responsible for financing the non-grant part of the transaction amount.

Executive Committee of National Economic Council (ECNEC)

Executive Committee of National Economic Council (ECNEC) is Bangladesh's highest authority for approving development activities in the framework of long-term national policies and objectives. As such it had to approve the transaction. ECNEC's structure and functions were laid down in the Cabinet Division Resolution in 1982. The Committee's functions are:

- To consider and approve development projects costing above 50 million Taka;
- To consider and approve investment projects in the private sector costing above 150 million Taka;
- To review the progress of implementation of development project;
- To consider proposals for investment companies as private or joint ventures or with foreign participation;

- To promote the economic situation and review over-all performance of the economy and related policy issues;
- To consider financial performance of statutory corporations and specially their financial results;
- To consider rates, fees and prices of public utility services or products of public enterprises.

ECNEC underwent many changes since it has been inaugurated. Today the Prime Minister is the chairperson of ECNEC and the Minister of Finance acts as the alternate chairperson. In addition seven other ministers are members of the Committee, among them the Minister of Communication who is ultimately responsible for this project.

Vialis BV

The Dutch applicant was Vialis BV who was responsible for design, supply, installation, testing, commissioning and training related work. At the time of the application the applicant company was owned by Volker Wessels Stevin for 70% and by NMA Holding (Nederlandse Machinefabriek Alkmaar) for the other 30%. It employed about 60 employees and had a turnover of above EUR 10 million (NLG 22 M) of which EUR 4 million was generated through exports. The company was (and is) specialised in design, construction, and installation of signalling equipment for among others railways.

3. Methods of Evaluation

3.1 Introduction

This evaluation was focused on the results of the transaction in Bangladesh and analysed whether the transaction has met its own formulated objectives and outcomes. The evaluation approach did undertake:

1. A policy reconstruction of the transaction;
2. A desk analysis of the transaction based on the available project files and interviews with key informants;
3. An outcome evaluation of the transaction.

The evaluation method comprised a mixed-method approach and triangulates all available data sources to reach well founded conclusions and findings. Information was collected from:

- Desk review of transaction documents and other relevant project materials from project office of Signal and Telecommunication, Bangladesh Railway;
- Semi-structured face-to-face interviews (based on standardized checklists) with project officers of Signal and Telecommunication, Bangladesh Railway;
- Semi-structured face-to-face interviews (based on standardized checklists) with officers of the Dutch Embassy in Dhaka about the transaction;
- Secondary data collection from the Ministry of Railway;
- Collection of secondary materials (documentation) on project's effectiveness and impact,
- Field visits to the selected transaction points to validate transactions results;
- Semi-structured face-to-face interviews with the applicant.

3.2 Theory of Change

The inputs, activities, outputs, outcomes and long-term results of the project are summarized in Table 3.1. This results chain is used to formulate a "theory of change" for the project. It presents an overview of the main elements of the causal relations that have been investigated in this evaluation.

The project's main objective was to improve the railway connection between Ishundi and Jamtoil in the Western Zone of Bangladesh Railways through the installation and application of a modern signalling and interlocking system of seven stations. The overall aim of these improvements was to create an efficiently operating railway connection between these two cities with a view to improve the efficiency of the railway transportation and to reduce the number of accidents. As such it is an important link between the eastern and western part of the country. This was expected to improve the social and economic climate, with a positive effect on the economic capacity of the country.

The efficiency of the railway system also depends on factors external to the project, such as the availability of financial and human resources to maintain the track, political decisions and changes in the management of the system. Most importantly, the equipment delivered with support of ORET makes up only a part of the upgrading of the national railway system in Bangladesh. The intensity of the use of the section also depends on the capacity of the sections east and west of this section. Therefore it is virtually impossible to isolate the impact of this ORET transaction on improved conditions for economic development.

The evaluation of the transaction was conducted according to six criteria: Efficiency, Effectiveness, Sustainability, Relevance, Additionality and Coherence. Below follows a description how these criteria were evaluated. The major evaluation tasks formulated were:

1. Assess the efficiency of the investment through analysing the transaction time, the procedure and requirements, outputs in accordance to the time, delay of service delivery, maintenance cost and services and training services.
2. Assess the effectiveness of the program in terms of its own objectives, such as safety and use of increased capacity, but also to what extent the completed ORET project has contributed to the economic development of Bangladesh among others reflected in increased employment (directly and indirectly) and desired effect on infrastructural development of Bangladesh economy.
3. Justify the sustainability of the project, i.e. financial and economic, technical and environmental sustainability.

4. Assess the relevance and policy coherence of the programme, i.e. whether the project was in line or supported policy in the recipient country? And did the program result in sustainable trade relations with the Dutch exporters?

Table 2: Results Chain

Inputs	Activities	Outputs	Outcomes	Long-term Outcomes
• ORET-grant • Finance from Government of Bangladesh (I/C) • Signalling and other equipment • Inputs for training of staff Bangladesh Railways	• Delivery and installation of physical infrastructure (signalling devices, cables, warning system, overpass gates) • Technical assistance to and training of staff of Bangladesh Railways in the use and maintenance of the equipment • Environmentally friendly clean-up decommissioned signalling system	• Upgraded signalling system for 7 stations in the Ishurdi-Jamtoil railway section • Trained engineers at Bangladesh Railways able to correctly use and maintain the modernised system • Interfaces that allow integration with other modernised sections	• Faster train traffic on the section • Intensification of train traffic • More passengers and freight on the section • Less accidents • Loss of some jobs at Bangladesh Railways • Cost savings for Bangladesh Railways	• Reduction of pollution because passengers / freight substitute bus/truck/car for trains • Higher job accessibility for residents living or working near the railway section terminals • More economic activity in the region due to better accessibility • Fewer casualties due to train accidents

Efficiency

Efficiency measures how inputs and the way they were used translate into outputs. Efficiency was analysed on the basis of existing documents of the implementing agencies in the project (e.g. dossiers at ORET.nl, Bangladesh Railway and the archives of the Embassy). Visits to some of the stations of the railway section were conducted during the summer of 2014. The station masters of the stations not visited were interviewed by telephone.

For evaluating the technical aspects of the supplies under the efficiency criterion, the following indicators were used concerning the functioning of the signalling system. These indicators are also important to analyse the technical sustainability of the project:

- Availability of the signalling equipment delivered.
- Present quality and status of the signalling equipment delivered.
- Number of staff trained.

Effectiveness

Effectiveness relates the direct results of the intervention (outputs) to the achievement of policy objectives (outcomes). An intervention is considered effective if the outputs have made a contribution to the intervention's intended objectives. Efficiency and effectiveness refer to two successive levels in the results chain. Effectiveness is analysed on the basis of in-depths interviews with the stakeholders.

The responsibility for the railway section is with Bangladesh Railway. The evaluation questions here concerns especially whether the provided equipment is actually working, used and whether they have enhanced the capabilities guiding the train traffic along the track in a safe and efficient way. It also included the questions if the newly established signalling system has improved the effectiveness of the railway traffic as a result of the training started under the project.

As part of the analysis, interviews with BR-staff and with local Station Chiefs were conducted. The institutional analysis was based on in-depth interviews with management of Bangladesh Railways. Semi-structured questionnaires were used covering information on technical, financial and administrative aspects. These questions shed light on whether the newly installed system is working as expected and planned.

Sustainability

The concept of sustainability comprises a number of dimensions that are relevant for evaluating the intervention, such as the financial and technological capacity of the recipient, in casu Bangladesh Railway; social and cultural factors affected by the intervention (or affecting the intervention); financial and economic aspects; political, economic, environmental and socio-cultural circumstances.

Information collected in the interviews regarding these indicators supported the analysis on different aspects of sustainability. Financial sustainability is analysed on the basis of the financial accounts of BR and of the budgetary allocations made by the government of Bangladesh. Institutional sustainability is explored by disentangling the operational process of the signalling system. Technical analysis was done during the field visits.

Relevance

Relevance as a criterion indicates whether the objective of the intervention is consistent with the requirements of the beneficiaries, country needs, global priorities and partners' and donors' policies. Relevance should also demonstrate whether the intervention made a sustainable contribution in achieving the ultimate objective (the impact). An intervention has been regarded as valuable, or relevant, if it has generated effects that contribute to the ultimate development objective.

The contributions of the different stakeholders to the success of the project and the ultimate development objective have been evaluated throughout the study by investigating the communication processes and the cooperation of the implementing and operating institutions to assess whether the intervention has been valuable to the extent of contributing to efficiency and safety on the target railway section.

Additionality

With the criterion of additionality the study has established whether the transaction would have taken place without the ORET co-funding and/or has fulfilled a catalytic role in mobilising additional finance for the investments it supported in the recipient country that would otherwise not have taken place.

Coherence

The criterion coherence is focused on whether and to what extend the ORET-contribution has complemented or contradicted other instruments of Dutch development cooperation and foreign (economic) policy.

4. Results of the Evaluation

4.1 Efficiency

Appraisal Phase

The preparation of the transaction started around 2000. The feasibility study by Railplan was dated October 2000 and the evaluation of the application, done by the Netherlands Economic Institute (NEI) was dated June 2011. The period from the date of submission of the application to the grant agreement (29 July 2003) was almost three years, which exceeds the average period of the application procedure for an ORET grant. Main reason was that the transaction has been revised twice on instigation of the government of Bangladesh. The project documents show that the project was approved by ECNEC in September 2000 on the basis of a total transaction amount of Tk. 460,735,000, which was the equivalent of EUR 8,860,000 at that time.

The original implementation period of the project was planned from January 2000 to March 2002. However, the project agreement was not signed in time, resulting in a delay of the project activities. The main reasons for the delay were two subsequent project revisions. The revision of the original proposal was related to cost overruns that were mainly related to a depreciation of the exchange rate. As a result:

- The quoted price of transaction was higher than the estimated cost of the original project.
- Increase of the cost of foreign materials.
- Increase of local construction materials of the functioning building.
- Inclusion of some new items like the charge for the opening of the Letter of Credit (LC), and pre-shipment inspection charges.

The project proposal was revised a second time, again due to a substantial increase of the euro. Finally, the agreement was signed on 19 July 2003 and from then onwards the project work started officially and continued for four years. The actual implementation period was 2003–2006. The completion date was 9 June 2005. At the end of the project there was disagreement between Vialis and BR about the power backup system. The issue was solved by placing additional power supplies by Vialis. This was the reason why it took until 31 March 2008 until the final certificate of completion was issued.

Despite the delays of the project, representatives of BR, the client of the project, expressed their satisfaction with the flexibility of the ORET-programme, giving them the opportunity to process the required procedures in Bangladesh. In general it was noted that the contribution from ORET was crucial for this type of transaction in Bangladesh. Without ORET, this section from Jamtoil to Ishurdi would not have been improved so fast, and not by a Dutch supplier.

Implementation Phase

Equipment and Installation

During the implementation of the project there were some differences of opinion between the contractor and the client about the technical specifications. These have been resolved, but it took more time than foreseen in the original planning of the project. During implementation some elements of the design turned out to be inappropriate for the local conditions in Bangladesh. Adapting the design (and negotiating about this with Bangladesh Railways) delayed some of the construction work until the rainy season, which led to further delay because working during the rainy season turned out to be even more difficult than already expected. Nevertheless the representatives of BR mentioned in the interviews during this evaluation that Bangladesh Railway is very much satisfied with the quality of the equipment and the services of Vialis. In their view the people of Vialis were very dedicated to finish the project on time.

Price/Quality Ratio

Although the client is satisfied with the equipment and services delivered they noted that the services provided by Vialis were more expensive than similar services from other suppliers. For other sections of the railway system, BR is using three different types of signalling equipment delivered by several donors. According to Mr. Hoque, the Project Director (Signal), Dutch suppliers are much more expensive compared to Korean or Indian companies, sometimes the prices are two times higher, but the quality of the Dutch equipment is also much better than other suppliers. Table 3 presents the origin of the various components of the transaction. It shows that the large majority of the goods and services delivered originated from the Netherlands. It also shows that

the final costs of the project exceeded the budget with more than EUR 400,000. This budget overrun was paid by the contractor.

Table 3: Product Expenditures by Origin

	Budget		Actual		Difference
	Euro x 1,000	% Total	Euro x 1,000	% Total	Euro x 1,000
Goods and services from Vialis	2,098	25%	2,344	26%	246
Other products Netherlands origin	3,958	47%	4,773	54%	815
Other products foreign origin	544	6%	2	0%	-542
Local activities	1,894	22%	1,807	20%	-87
Total	**8,494**	**100%**	**8,926**	**100%**	**432**

Training

Four engineers were sent to the Netherlands for training on managing the functioning of the installed signalling and inter-locking system. Interviews with some of the engineers revealed that after coming back from the Netherlands they were assigned to check the functioning of the installed system between Jamtoil to Ishurdi on a rotation basis. Now there are additional engineers in charge who have received training on executing the same system from France. As the Vialis equipment does not need a lot of maintenance compared to the old system, the maintenance and operation of the installed system is now being executed by station masters and technical workers in the seven stations. They received local training on maintenance and operation of the system. It is to be mentioned that under this project a total of 49 people received local training on project maintenance and operation. Twenty of them are technical officers of BR receiving training on signal system maintenance and 29 station masters got training on signal system execution and direction.

4.2 Effectiveness

Effectiveness of this project is defined by the ultimate outcomes of the project. The outcome has several components such as the reduction of accidents and benefits from travel time savings, the increase in number of consumers being served, higher operating speed, and the incentive for further socio-economic development.

An Impact Assessment Study undertaken by the Implementing Monitoring and Evaluation Department of the Ministry of Planning, Government of Bangladesh (IMED, 2008) mentions that this project installed a modern computerized signalling system in the seven stations from Jamtoil to Ishurdi. As a result, the passenger trains can now pass the signals more safely with the highest sectional speed of 60-70 km/hour, which was only 15 km/hour due to old and worn out signalling system before the project. Mr. Oshim Kumar Talukdar, the additional chief Engineer confirms this driving speed during the spot interview. He mentioned that the driving speed is approximately 75 km per hour, which is much faster than before the transaction took place. The old system lowered the train speed and made the journey time consuming. According to the main signal and telecommunication engineer/telecom (west) Md. Abul Kalam Azad, the train speed has increased significantly due to the placement of the new signalling machineries in the Jamtoil-Ishurdi section and travel time has decreased with in total 30–35 minutes.

After completion of the project, the number of trains that pass through the Jamtoil–Ishurdi section increased considerably, thereby increasing the number of passengers carried. Visits to some of the stations, i.e. Chatmohor, Ullahpara, Ishurdi, and information collected from the station masters show that before the improvements of the signalling system on average eight to ten trains passed per day in each direction or a total of 16 to 20 trains. After the improvement 15 trains now pass in each direction or a total of 30 trains per day. Among them about 25 are passenger trains and five are cargo trains. This information is validated from the handwritten administration books at the railway stations. Another change is the transport of bulk commodities over a longer distance through these sections (IMED 2008).

During the installation of the equipment and construction process, temporary jobs were created for low-skilled labour in the field. After completion of the installation, involvement of low-skilled labour

was strongly reduced, and skilled labour did not change much compared to the situation before the project. During execution of this project man-power of another project looked after the work of this project with additional responsibilities. This included the project director/signal. According to the project documentation the reason was a shortage of project funds to pay for the required man-power for this project.

Another observation is the reduction of accidents. The national statistics of total accidents by rail show a decreasing trend in numbers of rail accidents (Table 4). Only in 2005–2006 there was an increase in the number of total accidents due to an increase in derailments. But a decreasing trend is observed in the subsequent years. Overall, from 2003–2012, a drop of around 80 percent (754 to 154) of total train accidents is reported. There are no national statistics available on accidents by station, which would allow a comparison between the number of accidents on this section with the national figures. During visits to the stations we collected data on accidents from station records and interviews. Station records show that the number of accidents at these stations decreased after 2005. At Chatmohor station only two accidents were recorded from 2005 to 2011, whereas in Ullahpara station there is no record of accidents at all, and at Ishurdi station only one accident is recorded after 2005 until 2014. Although a causal relation with the project cannot be established, a reduction in accidents is observed.

Table 4: Trends in Total Number of Rail Accidents (per year)

Year July-June	**Collisions**	**Derailments**	**Fire in trains**	**Train running into obstruction**	**Total**	**Incidence per million (train kilometres)**
2003-04	8	723	0	23	754	50.6
2004-05	7	592	30	78	707	45.9
2005-06	3	790	0	37	830	54.6
2006-07	1	510	0	17	528	35.0
2007-08	3	419	0	25	447	28.7
2008-09	7	408	0	34	449	28.6
2009-10	2	403	0	34	439	27.7
2011-12	0	138	0	16	154	9.0

Source: Bangladesh Railway Information Book, Different years, Ministry of Railway.

The national statistics on numbers of passengers carried in trains by different zones show an increasing trend. Table 5 shows that the total number of train passengers has increased from year 2003 to 2012. Initially it was 43,435,000 and increased to 66,139,000 by year 2012. Only the year 2004–05 shows a small drop in number of passengers.

Table 5: Total Number of Passengers per Year

Year July-June	**Number of Passengers Carried (Thousands)**		
	East Zone	West Zone	Total System
2003-04	28,962	14,758	43,435
2004-05	26,925	15,628	42,254
2005-06	28,004	16,804	44,520
2006-07	28,536	17,520	45,758
2007-08	32,848	21,711	53,816
2008-09	38,863	26,467	65,029
2009-10	40,138	25,813	65,627
2010-11	41,271	22,538	63,536
2011-12	43,711	22,616	66,139

Source: Bangladesh Railway Information Book, Different years, Ministry of Railway.

4.3 Sustainability

Financial and Economic Sustainability

In the post-liberation period and up to the early eighties, BR seemed to perform well, optimally realizing its full potential, of course subject to the inherited structural and physical constraints. Currently the company is performing poorly due to inefficiencies and lower productivity of both physical and human capital which is caused by resource, institutional and policy constraints. This in turn adversely affects the financial performance of BR.

Analysing the annual operating revenues of Bangladesh Railway, it is noticed that revenue has increased from 303 to 6,254 Million Taka within 40 years. Today, BR's main source of revenue comes from passenger whereas in 1969 freight was the main source. Over time passenger earnings and miscellaneous earnings increased while earnings from other coaching and freight earnings decreased (see Table 6).

Table 6: Operating Revenues of Bangladesh Railway (Millions ofTaka)

Year	Passenger Earnings	%	Other Coaching	%	Freight Earnings	%	Miscellaneous Earnings	%	Total
1969-70	102	34	26	8	169	56	6	12	303
2003-04	1,732	44	104	3	1,344	34	761	19	3,942
2004-05	1,661	37	101	2	1,262	28	1,432	32	4,456
2005-06	1,750	39	97	2	1,269	29	1,327	30	4,443
2006-07	1,831	40	91	2	1,245	28	1,360	30	4,528
2007-08	2,240	40	97	2	1,410	25	1,869	33	5,616
2008-09	2,716	43	108	2	1,314	21	2,116	34	6,254

Source: Bangladesh Railway Information Book, Different years, Ministry of Railway.

On the other hand the operating expenditures of BR strongly increased over time. From 2001 to 2012 total expenditures rose from 5.4 million Taka to 15.7 million Taka, an increase of 193 percent. BR's major expenditures are caused by repairs-maintenance and miscellaneous expenditures, which are 31 respectively 27 percent of total expenditures. Over time, general administration cost and operation staff cost decreased from 18% to 13% and from 15% to 5% of total expenditures. Repairs and maintenance cost, operation fuel, operation other than staff and fuel costs remained more or less at the same level over time. However, miscellaneous expenditures increased strongly from 13% to 27% (Annex Table B1).

During the 2001–2012 period, BR's net operating income showed an increasing deficit, rising from 1.5 million Taka to 9.6 million Taka (see Table 7; details are in Annex C).

Table 7: Net Operating Income of Bangladesh Railway (Millions of Taka)

Year (July-June)	Total Revenues	Total Expenditures	Operational Deficit
2001-2002	3.9	5.4	1.5
2003-2004	3.9	6.4	2.5
2004-2005	4.5	7.0	2.5
2005-2006	4.4	9.6	5.2
2006-2007	4.5	9.3	4.8
2007-2008	5.6	1.9	5.3
2008-2009	6.3	1.7	5.5
2009-2010	5.7	1.6	6.9
2010-2011	6.3	14.9	8.6
2011-2012	6.0	15.7	9.6

Source: Bangladesh Railway Information Book, Different years, Ministry of Railway.
Note: Without considering PSO & Welfare grant.

The main factors behind these trends are institutional shortcomings and physical bottlenecks, such as poor infrastructure and antiquated rolling stock. BR is also severely restricted by its two different gauge systems (broad and meter gauge).

The operational problems facing BR are:

- Inherited physical problems due to a number of missing links for direct through traffic.
- Gauge problems involving transhipments of traffic at the break of gauge points. Recently, Dual Gauge (DG) has been constructed in some important sections to ease the problems.
- Geographical constraints due to the river which divides the system into two, more or less, separate parts.
- Managerial problems due to experimental organisational reforms for management and development responsibility.
- Lack of government attention as no remarkable project/program has been taken to develop and strengthen the railway network.
- Lack of modernisation & development of rail-routes and lack of proper attention to maintain the existing assets.
- Lack of coordination and association of different departmental heads & subordinates.

Therefore, long-term financial sustainability of BR is questionable in view of its institutional shortcomings and physical bottlenecks.

Technical Sustainability

Under this project, computerised signalling and inter-locking with token less block system was established in the seven stations of the Ishurdi–Jamtoil section. In addition, functional buildings were constructed in each station for signal equipment, battery and generator. A pick-up micro was also bought which is now used, with permission of the authorities, in the project titled modernization of signalling and inter–locking system of 12 station of Akhaura to Sylhet section. During the field visit to some of the stations and the telephone interviews with the rest of the stationmasters, it became clear that all the equipment installed is operational and well-maintained by the engineers assigned. According to Mr. Hoque, Project Director (signal) there were problems with maintenance in the two years after completion of the works as Vialis outsourced these activities to a local agent and this did not work well. After Vialis took over themselves, problems were solved. The relation between the local agent and Vialis is not good, according to Mr. Hoque. After the warranty of the signalling equipment at the section ended, some equipment was replaced due to lightning damage which is normal according to Mr. Hoque. BR also replaced copper compounds between stations on the section with optical fibre. BR received some spare parts from Alstom but they also needed some spare parts from Vialis. Mr. Hoque tried to contact Vialis but did not succeed and he therefore asked for help, which indicates an after completion co-ordination problem between BR and Vialis.

Engineers responsible for the section are very satisfied with the Vialis equipment as it does not require a lot of maintenance; much less compared to the old system. According to Washim Kumar Talukdar, Additional Engineer BR, they needed to replace an element ten times in Chatmohor station due to lightning, which is considered normal. In all the stations, the equipment was delivered with an industrial CPU and this is replaced by a regular CPU which needs to be replaced every two years, while the original installed CPU can hold for about four years. But replacing the regular CPU is much cheaper than replacing it with an industrial CPU.
Therefore, the equipment installed with help of this ORET grant was and is functioning well and BR employees are handling the equipment properly and efficiently which ensures the long term sustainability of this equipment.

Institutional Sustainability

Bangladesh Railway is a big company responsible for the country's railway system, including the Jamtoil–Ishurdi section. Most procedures and the staff to manage the system are in place. Yet the company suffers from a lack of coordination and association of different departmental heads & subordinates, which is partly a result of the division of the network into an eastern and western part, further complicated by the two different gauge systems. As explained above the company faces serious financial constraints, which in particular affects investments in new and modernised operational systems and in other capital goods. This is partly caused by the lack of attention from the national government for an explicit program to develop and strengthen the country's railway network. As a result the modernisation and development of rail-routes lags behind what is needed. Despite these strategic issues the supervision and management of this particular section appears to be well organised and executed. The staff is trained, either during the implementation of the project or in BR's own training institute.

Environmental Sustainability

The backup batteries were replaced already in all the stations five years after the installation. We observed that the equipment was very clean and seemed to be working well. Air-conditioning was installed in the technical room where the equipment was placed. The generator-room also looked very neat and everything is functioning properly according to the BR-employees. Old equipment was disposed within Bangladesh, specific information about waste treatment could however not be collected.

4.4 Relevance

Transport demand in Bangladesh is increasing day by day and it is expected to increase further during the coming years, largely because of the increasing demand for freight transport and the expected increase in personal mobility. The opening of the Jamuna Bridge in June 1998 removed a major national transport barrier in Bangladesh. This, together with the ADB-financed rail link projects and the planned construction of the Padma Multipurpose Bridge it is expected that freight and passenger movements will increase further. Modernisation of the seven stations from Jamtoil to Ishurdi was a major improvement because it contributed to the transport efficiency of the railway linkages between the east and west zones of the country. This also explains the priority given by the Government of Bangladesh to this project.

4.5 Additionality

The ORET supported transaction fitted well in the overall strategy to improve the railway system in Bangladesh. This strategy ranks high on the development agenda of the Government of Bangladesh, and is financially supported by International Financial Institutions, such as the ADB, and by bilateral donors. Given this situation it is most likely that a similar transaction would have taken place with financial support from other sources. However, it is doubtful whether this alternative financing would have been provided at similar conditions as provided with the ORET programme.

4.6 Policy Coherence

The project fitted in with and complemented the recipient country's economic and development plans and the Five Year Plan of the Planning Commission of the Government of Bangladesh. Although it contributed to the economic performance of the country, the transaction was rather isolated from the Dutch aid programme to Bangladesh at the time neither was it an important component of the Dutch trade policies focused on Bangladesh.

5. Conclusions

Under this project, modernised signalling equipment was installed in seven different railway stations, functional buildings were constructed, machineries and equipment, including spare parts were supplied and training was provided to BR employees in the area of use and maintenance of the installed system. The study reveals that BR is very much satisfied with the services provided by Vialis and the quality of the work done by them. The system is functioning well and maintenance is done adequately by station masters and technical workers. The project benefitted the train-passengers by saving travel time, and increasing the total number of consumers served.

After completion of the contract, project components are effectively used and can be considered sustainable on technical, financial and institutional grounds. The outsourcing of after-sales maintenance created a problem after two years of the completion of the works, but BR is able to overcome this issue by getting some spare parts from Alstom. At the same time, the training provided to selective engineers contributed positively to the technical sustainability of the project. The investment has contribution to the accurateness of the transport sector since it improved the railway linkages between the east and west zones of the country and was complementary to ADB-financed road and rail link projects. ORET was important for this type of transaction in Bangladesh: without the subsidy this section from Jamtoil to Ishurdi would have been improved later or at much higher costs.

Annexes

Annex 1: References

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- Bangladesh Railway (2005). "Information Book", Railbhaban, Dhaka
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Annex 2: List of Interviewees

- Engr. Md. A. Hoque – Chief Signal & Telecom Engineer and Project Director
- Mr. M. Salim – Assistant Signal & Telecommunication Engineer/Project
- Mr. M. Ahmed- Bangladesh Railway
- Mr. W. Kumar Talukdar– Additional Chief Engineer BR (west)
- Mr. S. Khondoker - Station manager BR
- Mr. Jakaria – Engineer BR
- Mr. Jahangir – Engineer BR
- Mr. H. van Asch van Wijck - First Secretary Political Affairs - Dutch Embassy Dhaka
- Ms. M. Khanam - Advisor Economic & Commercial Affairs - Dutch Embassy Dhaka
- Mr. A. van Velzen – Project leader Bangladesh project - Vialis
- Mr. K. van Diepen – Business Development Manager - Vialis
- Mr. M. Koster – Sales - Vialis

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Annex 3: Additional Tables

Table 8: Operating Expenditures of Bangladesh Railway per Year

Year	General Administration		Repairs and Maintenance		Operation Staff		Operation Fuel		Operation Other Than Staff&Fuel		Miscellaneous Expenditures		Total
July-June	Taka	%	Taka	%	Taka	%	Taka	%	Taka	%	Taka	%	Taka
2001-02	960,688	17.9	1,755,968	32.8	788,687	14.7	779,558	14.6	393,845	7.4	676,091	12.6	5,354,837
2003-04	1,025,420	16.0	2,289,880	35.8	873,703	13.67	903,694	14.1	495,455	7.8	805,904	12.6	6,394,056
2004-05	1,129,513	16.3	2,461,130	35.4	1,034,003	14.88	920,740	13.3	462,648	6.7	942,823	13.6	6,950,857
2005-06	2,645,632	27.6	2,718,264	28.3	617,039	6.43	1,208,086	12.6	962,201	10.0	1,450,481	15.1	9,601,703
2006-07	1,385,582	14.9	3,152,522	33.8	978,348	10.48	1,609,307	17.3	554,312	5.9	1,651,201	17.7	9,331,272
2007-08	1,370,653	12.6	3,995,565	36.7	604,389	5.55	1,870,287	17.2	1,084,529	10.0	1,960,034	18.0	10,885,457
2008-09	1,514,424	12.9	3,976,287	33.9	713,582	6.09	2,214,313	18.9	1,025,440	8.7	2,283,448	19.5	11,727,494
2009-10	1,725,467	13.7	4,339,518	34.5	809,309	6.44	2,058,057	16.4	988,879	7.9	2,650,817	21.1	12,572,047
2010-11	2,345,351	15.7	4,529,277	30.4	832,456	5.58	2,104,039	14.1	1,272,855	8.5	3,834,216	25.7	14,918,194
2011-12	1,990,390	12.7	4,827,563	30.8	767,558	4.90	2,561,018	16.3	1,265,510	8.1	4,259,117	27.2	15,671,156

Source: Bangladesh Railway Information Book, Different years, Ministry of Railway.

Table 9: Additional Information about Bangladesh Railway

	Number of Trains Run									Train kilometres		
	Passenger Trains			***Mixed Trains***			***Total Number of Trains***			**Passenger Kilometres (Thousands)**		
Year July- June	*East Zone*	*West Zone*	*Total*	*East Zone*	*West Zone*	*Total*	*East Zone*	*West Zone*	*Total*	*East Zone*	*West Zone*	*Total*
2003-04	42,052	14,668	56,720	4,392	3,660	8,052	46,444	18,328	64,772	8,398	1,660	10,050
2004-05	43,891	13,193	57,084	4,386	3,650	8,030	48,271	16,843	65,114	8,438	2,144	10,582
2005-06	46,277	14,031	60,308	3,650	3,650	7,300	49,927	17,681	67,608	7,822	2,368	10,190
2006-07	44,458	13,397	57,955	3,650	7,300	7,200	48,208	17,047	65,255	7,676	2,443	10,119
2007-08	48,895	13,457	62,352	3,660	3,252	6,912	52,555	16,709	69,264	7,756	2,463	10,219
2008-09	50,751	12,672	63,423	3,338	2,920	6,258	54,089	15,592	69,681	7,717	2,478	10,195
2009-10	52,437	11,357	60,874	2,190	2,920	5,110	54,627	14,277	68,904	7,737	2,508	10,245
2010-11	52,341	9,417	61,758	2,190	2,920	5,110	54,531	12,337	66,868	7,998	2,777	10,775
2011-12	55,865	10,100	65,965	1,464	2,196	3,660	57,329	12,296	69,625	7,940	2,928	10,868

Source: Bangladesh Railway Information Book, Different years, Ministry of Railway.

Table 10: Revenue per Passenger Kilometre in Cents (poisha)

Year	Class					
(July-June)	*Air-Conditio-ned Class*	*First Class*	*Shovan Class*	*Second Class*	*Shulov Class*	*Total*
1969- 1970	16.0	11.8	-	3.3	-	3.0
2003-2004	173.2	72.2	38.9	34.9	34.5	38.2
2004-2005	163.1	72.0	38.4	35.5	34.6	38.0
2005-2006	158.1	71.4	38.6	35.6	34.4	38.1
2006-2007	161.6	71.5	38.7	35.5	34.4	38.2
2007-2008	161.5	71.6	39.4	34.5	35.1	39.1
2008-2009	154.5	72.0	39.7	32.0	34.4	38.5
2009-2010	152.9	74.0	38.9	32.1	-	38.6
2010-2011	141.3	68.4	39.1	32.3	-	38.6
2011-2012	152.9	73.4	39.3	29.6	-	38.6

Source: Bangladesh Railway Information Book, Different years, Ministry of Railway.

Table 11: Passengers and Freight Revenues of Bangladesh Railway

Year July-June	Total Revenue Passengers (Thousand Taka)	Revenue per Passenger (Taka)	Revenue per Passenger Kilometre (Cent (Poisha))	Total Revenue Freight (Thousand Taka)	Revenue per Freight Tonne (Taka)	Revenue per Tonne Kilometre (Cent(Poisha)
1969-70	101,711	1.38	3.0	163,831	33.5	12.7
2003-04	1,732,435	39.89	38.2	1,339,865	385.8	144.8
2004-05	1,661,041	39.31	38.0	1,258,367	392.5	149.2
2005-06	1,749,986	39.31	38.1	1,263,845	413.4	149.5
2006-07	1,831,477	40.03	38.2	1,241,965	418.6	155.8
2007-08	2,240,468	41.63	38.5	1,406,455	428.5	156.4
2008-09	2,715,962	41.77	38.5	1,311,236	435.6	158.4
2009-10	2,917,686	44.45	38.6	1,163,612	428.7	157.7
2010-11	3,215,503	50.61	38.6	1,143,654	447.8	158.9
2011-12	3,509,663	53.06	38.6	961,121	438.5	158.8

Source: Bangladesh Railway Information Book, Different years, Ministry of Railway

Table 12: Number and Cost of Employees

Year	Total Number Employees	Total Cost Employees	Number of Employees per 1.000 Trains	Average Cost per Employee per Month	Share of Employee Costs in Operating Expenditures
June-July		*Thousand Taka*	*Kilometres*	*Taka*	*Percent*
1969-70	55,825	123,715	3.23	185	48.9
2003-04	34,168	2,569,673	2.28	6,267	40.2
2004-05	35,172	2,882,108	2.28	6,829	41.5
2005-06	34,206	3,259,014	2.25	7,940	33.9
2006-07	33,195	3,680,800	2.19	9,240	39.4
2007-08	31,874	4,237,606	2.05	11,079	38.9
2008-09	30,444	4,018,992	1.93	12,711	39.6
2009-10	27,971	4,355,686	1.76	12,976	34.6
2010-11	26,349	5,614,720	1.59	17,758	37.6
2011-12	26,458	5,659,200	1.55	17,824	36.1

Source: Bangladesh Railway Information Book, Different years, Ministry of Railway.

Table 13: Number of Employees per Sector

Year July-June	Administration	Nirapatta Bahini	Accounts	Engineering	Signal & Telecommunication	Estate	Mechanical	Traffic	Electrical	Medical	Stores
1969-70	3,138		1,440	12,019	-	-	20,005	11,885	2,160	3,204	1,974
2003-04	1,223	2,043	1,289	6,303	1,425	195	10,534	7,000	1,781	1,400	975
2004-05	1,260	2,587	1,257	6,150	1,472	201	10,952	6,977	1,865	1,429	1,022
2005-06	1,223	2,449	1,214	5,982	1,443	198	10,749	6,703	1,821	1,403	1,021
2006-07	1,178	2,408	1,150	5,775	1,409	195	10,409	6,481	1,814	1,332	1,044
2007-08	1,129	2,401	1,089	5,500	1,412	190	9,900	6,255	1,760	1,250	988
2008-09	1,052	2,369	1,019	5,285	1,379	181	9,392	6,012	1,644	1,180	931
2009-10	998	2,273	941	4,918	1,305	170	8,519	5,361	1,493	1,132	861
2010-11	953	2,184	845	4,674	1,256	163	7,910	5,085	1,430	1,054	795
2011-12	948	2,467	1,120	4,437	1,241	170	8,134	4,838	1,353	1,024	726

Source: Bangladesh Railway Information Book, Different years, Ministry of Railway.

Table 14: Punctuality of Passenger Trains (BG & MG)

Year (July-June)	BG			MG		
	Intercity Trains	*Mail Express Trains*	*Local Trains*	*Intercity Trains*	*Mail Express Trains*	*Local Trains*
1969-70	-	90.5	90.1	-	72.4	79.0
2003-04	64.5	43.8	40.7	79.8	60.9	59.7
2004-05	61.4	44.3	31.7	69.8	60.5	57.2
2005-06	78.9	48.8	38.0	62.8	50.7	58.9
2006-07	81.9	59.5	47.4	68.9	50.9	68.4
2007-08	90.7	89.4	68.8	63.2	63.7	79.0
2008-09	88.3	83.6	62.3	61.0	65.5	83.1
2009-10	67.3	71.4	58.5	69.3	57.5	72.0
2010-11	69.6	68.4	59.0	41.9	42.5	77.6
2011-12	75.2	71.9	69.4	46.0	50.8	81.2

Source: Bangladesh Railway Information Book, Different years, Ministry of Railway.

Table 15: Casualties per Year

Year July-June	Passenger		Railway Employees		Other Persons		Total Casualties		Casualties per million passenger originating	Compensation paid to victims (Taka in thousands)
	Killed	*Injured*	*Killed*	*Injured*	*Killed*	*Injured*	*Killed*	*Injured*		
1998-99	3	85	4	266	28	57	35	408	2.43	13.1
2003-04	-	4	12	55	26	90	38	149	0.09	17.0
2004-05	-	15	-	-	17	96	17	111	0.36	33.0
2005-06	-	-	7	102	13	126	20	228	-	74.0
2006-07	-	-	-	158	35	169	35	327	-	28.7
2007-08	5	10	11	38	67	85	83	133	0.28	51.5
2008-09	1	10	1	25	20	64	22	99	0.17	30.4
2009-10	-	-	-	98	11	40	11	138	-	88.0
2010-11	-	-	7	143	10	17	17	160	-	-
2011-12	-	-	11	94	35	56	46	150	-	13.0

Source: Bangladesh Railway Information Book, Different years, Ministry of Railway.

Annex 4: Relevant Documents and Installed Equipment

Photo 1: Record of Train Signals, Bangladesh Railway

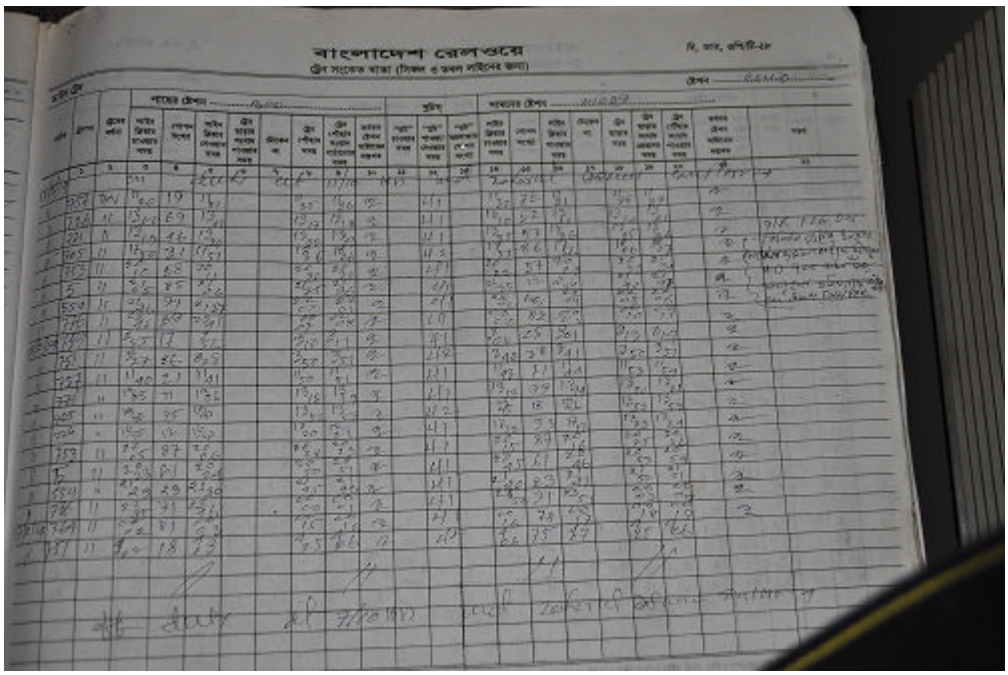

Photo 2: Installed Vialis Equipment (1)

Photo 3: Installed Vialis Equipment (2)

Photo 4: Complementary Equipment: Batteries and a Generator

Photo 5: Replaced Battery