



Project Completion Report

PCR

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|------------------------|--|
| Project Name: | Mahaica-Rosignol Road Rehabilitation Project |
| Country: | Guyana |
| Sector: | Transportation |
| Original Project Team: | Iwan Sewberath-Misser, Jacob Greenstein, Vera Lucia Vicentini, Gordon Lewis, Valnora Leister and Maria R. Sosa |
| Project Number: | GY-0056 |
| Loan Number: | 1094/SF-GY |
| QRR Date: | January 28, 2010 |
| Approval Date: | June 1, 2010 |

PCR Team:
Principal Author: Christopher Persaud, (TSP/CGY)

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ACRONYMS AND ABBREVIATIONS

| | |
|-------|--|
| ADT | Average Daily Traffic |
| AFS | Audited Financial Statements |
| CTPU | Central Transport Planning Unit |
| DO | Developmental Objective |
| EA | Executing Agency |
| GOG | Government of Guyana |
| GDP | Gross Domestic Product |
| GPF | Guyana Police Force |
| IDB | Inter-American Development Bank |
| IRI | International Roughness Index |
| MPW&C | Ministry of Public Works and Communication |
| PCR | Project Completion Report |
| RMMS | Routine Maintenance Management System |
| VOC | Vehicle Operating Cost |
| WCP | Weight Control Program |
| WGS | Work Services Group |

I. BASIC INFORMATION

| BASIC DATA (AMOUNTS IN US\$) | |
|---|--|
| Project No: GY0056 | Title: Mahaica-Rosignol Road Rehabilitation Project |
| Borrower: Cooperative Republic of Guyana | Date of Board Approval: 07 Nov 2001 |
| Executing Agency (EA): Ministry of Public Works & Communication | Date of Loan Contract Effectiveness: 15 Jan 2002 |
| | Date of Eligibility for First Disbursement: 15 Nov 2002 |
| Loan: 1094/SF-GY | Months in Execution |
| Sector: Transportation | * from Approval: 82 |
| | * from Contract Effectiveness: 79 |
| Lending Instrument: Investment / Specific Investment Operation | Disbursement Periods |
| | Original Date of Final Disbursement: 15 Jan 2007 |
| | Current Date of Final Disbursement: 30 Sep 2008 |
| | Cumulative Extension (Months): 20 |
| | Special Extensions (Months): 0 |
| | Loan Amounts |
| | * Original Amount: 33,000,000 |
| | * Current Amount: 31,204,000 |
| | * Pari Passu (if applicable): 90.01% |
| Poverty Targeted Investment (PTI): No | Disbursements |
| Social Equity (SEQ): No | * Amount to date: 31,036,490 (%) 99.46 |
| Environmental Classification: | Total Project Cost (Original Estimate): 40,000,000 |
| | Redirectioning |
| | Has this Project? |
| | Received funds from another Project [] |
| | Sent funds to another Project [X] |
| | N/A [] |
| On Alert Status | |
| Is project currently designated "on alert" by PAIS: No | |
| If yes then why is the project on alert (DO , IP Ratings and/or relevant PAIS indicators): N/A | |
| Comments on relevance of "on alert" status for this project N/A | |

| Summary Performance Classifications | | | | |
|-------------------------------------|---|--|---|---|
| DO | <input type="checkbox"/> Highly Probable (HP) | <input checked="" type="checkbox"/> Probable (P) | <input type="checkbox"/> Low Probability (LP) | <input type="checkbox"/> Improbable (I) |
| IP | <input type="checkbox"/> Highly Satisfactory (HS) | <input checked="" type="checkbox"/> Satisfactory (S) | <input type="checkbox"/> Unsatisfactory (US) | <input type="checkbox"/> Very Unsatisfactory (VU) |
| SU | <input type="checkbox"/> Highly Probable (HP) | <input checked="" type="checkbox"/> Probable (P) | <input type="checkbox"/> Low Probability (LP) | <input type="checkbox"/> Improbable (I) |

II. THE PROJECT

A. Project Context

- 2.1 The Mahaica-Rosignol Road Project was conceptualized in the year 2000 at a time when the Guyana economy was slowing down after having good performances in the mid 1990's. Economic progress between 1998 and 2001 was impeded by political uncertainty and outbreaks of civil unrests following the 1997 elections. During the same period, Guyana experienced a number of external and internal shocks that significantly weakened the economy. These shocks included the En Nino drought, La Nina flooding, deterioration of export prices for bauxite, gold, timber and rice, Euro depreciation that reduced the value of preferential sugar exports, a public service strike

and rising oil prices. Guyana's GDP stood at US\$785 per capita, one of the lowest in the region, with much of its transport infrastructure being in a state of deterioration and the country was in a process of rehabilitating key infrastructures with funding from the IDB and World Bank.

- 2.2 The condition of the Mahaica-Rosignol road at the time of project design was poor as it was in a state of disrepair with potholes, failed road sections and International Roughness Index (IRI) values between 4 and 9 m/km. The road is an important 66 kilometer road link in the 410 kilometer national road network which facilitates the movement of people, farm produce and commercial commodities in a highly populated area. The entire road is located on the coastal belt of the country and traverses an almost continuous ribbon of houses and businesses on both sides of the roads with intermittent breaks and small villages. The Mahaica-Rosignol region has 27,500 hectares of rice land and 10,000 hectares of coconut groves. Approximately 52,000 people live along the road, while 305,000 people live west of the road. East of the Mahaica-Rosignol road, across the Berbice River, there is another large agricultural region of the country with a population of about 122,000 people. In total the road serves directly and indirectly a population of approximately 479,000 people which more than 60% of the country's population.
- 2.3 The project was a natural progression for the Government of Guyana (GOG) and the Bank in the transport sector since it followed on the heels of two other projects funded by the Bank in the sector. The Main Road Rehabilitation Project (Loan 890/SF-GY) for US\$23.4 million was approved for the repaving of main segments of the national road network while the Bridges Rehabilitation Program (Loan 999/SF-GY) for US\$41 million was approved to rebuild or rehabilitate existing bridges along the main road network including along the Mahaica-Rosignol Road.

B. Project Description

- 2.4 The project consisted of four components which were:
1. Institutional strengthening of the Ministry of Public Works and Communication;
 2. Implementation of a Weight Control Program;
 3. Rehabilitation of the Mahaica-Rosignol road segment; and
 4. Feasibility and design studies of the Southern Approaches to Georgetown and of the New Amsterdam to Crabwood Creek – Moleson Creek road and associated rural roads.

i. Development Objective

- 2.5 The general objective of the Project was to increase competitiveness by reducing vehicle-operating costs and improving traffic safety in the road network. The objective stated in the last PPMR read "Reduced vehicle-operating costs and improved traffic safety on the Mahaica-Rosignol road" since the interventions were confined to the Mahaica-Rosignol Road.

ii. Components

The program was designed with the following components.

Component 1: Institutional Strengthening of the Ministry of Public Works and Communications (MPW&C) - Total Financing \$7.35 million, IDB \$1.1 million, GOG \$6.25 million

- 2.6 This component was designed to continue the Bank's support of the GOG effort to define a strategy and action plan for the modernization of the public sector. An execution mechanism for the proposed Project was developed to ensure efficient implementation while at the same time supporting the longer-term efforts for public sector modernization. To achieve these two objectives, the MPW&C proposed the creation of the Work Services Group (WSG). It was envisaged that the WSG be in charge of highway planning (HDM-IV), design, procurement, implementation, quality control, quality assurance and monitoring of all contracts for investment and maintenance of roads and bridges. WSG would also have the capability to plan for investment and maintenance of public works. The staff of the WSG would receive competitive salaries to attract and retain personnel of a high caliber. Therefore, the establishment of the WSG can be considered as a first, tangible step for the modernization of the MPW&C in accordance with the principles that were established for the modernization of the public sector.
- 2.7 The activities to be financed by the component were divided between loan and counterpart resources in the following manner.

Loan Resources

- a Advisory services (individual or firms) for the WSG.
- b Training for the staff of the WSG on management, contract management, highway design and management (HDM), pavement evaluation and design, contracting and procurement procedures, and computer use.
- c Training on environmental analysis.
- d Training for local engineering and construction firms on contract management, quality control, quality assurance procedures and environmental analysis.
- e Short-term consultants in planning (HDM), public sector management, finance, legal issues, and materials testing.
- f Consultants to assist in the monitoring of the environmental aspects of the Mahaica-Rosignol Road Project.
- g Computer equipment and software.
- h Material testing equipment and instituting a laboratory testing program.
- i Ex-post evaluation of the use of lump sum contracts.

Counterpart Resources

- a All local staff salaries in the WSG.
- b Other operating costs such as electricity, telephone, office materials, etc.
- c Set up costs, including modifications of an existing building for the WSG and the necessary renovations.
- d Incremental road maintenance costs that will be prioritized using the Routine Maintenance Management System (RMMS) and will be used for the national paved road network.

Component 2: Weight Control Program - Total Financing \$0.4 million, IDB \$0.35 million, GOG \$0.05 million

- 2.8 The Weight Control Program (WCP) was designed to assist the GOG to re-establish the WCP to safeguard the road investments being made. Information from the previous World Bank WCP indicated that there are vehicles exceeding the allowable weight limit. The Bank's support was requested to review of the existing weight limits with the objective of setting these limits on par with international standards. A review of local legislation was planned and this would also consider penalties for overloading vehicles and mandatory compliance by vehicle operators with weight control procedures. In addition, the component catered for the installation six permanent scales at approximately 100km intervals or at key locations of the national paved road system. A quantity of portable units would also be procured and used for random checks and axle loads.

Component 3: Rehabilitation of the Mahaica-Rosignol Road Segment - Total Financing \$24 million, IDB \$23.8 million, GOG \$0.2 million

- 2.9 The main objective of this component was to reduce road user costs by improving riding quality and highway safety through rehabilitation works. The proposed road rehabilitation works included:
- a Pavement and shoulder strengthening and widening.
 - b Improvement of drainage works.
 - c Construction of curbs, sidewalks and parking lanes in priority areas.
 - d Installation of traffic signs, pavement markings, road lighting and surface rumble strips to encourage speed reduction.
 - e Pavement and shoulder widening to improve safety of motorized and non-motorized traffic.
 - f Maintenance of the road for three years

- 2.10 The component also funded the services of an engineering consulting firm that will supervise the civil works.

Component 4: Feasibility and Design Studies - Total Financing \$3.25 million, IDB \$3.05 million, GOG \$0.2 million

- 2.11 This component was designed to investigate feasible interventions for important sections of the road network. The first being the Southern Approach to the city of Georgetown which is highly congested road section (approximately 18,000 ADT) with numerous traffic accidents. It was therefore considered likely that a project to reduce congestion and increase safety would be economically viable. The second intervention was the New Amsterdam to Moleson Creek Road and associated rural roads, which is located in a highly populated area in the country. The Project was to finance feasibility studies for investments to improve the Southern Approach to the city of Georgetown and for rehabilitation of the New Amsterdam to Moleson

Creek Road and associated rural roads. The Project also financed the detailed designs and the preparation of bidding documents for feasible and affordable solutions.

C. Quality -At- Entry Review

- 2.12 The Project was approved in 2001 and at that time the quality-at-entry review had not been adopted as an element within the approval process. However, from a qualitative perspective, the quality-at-entry was satisfactory.

| Quality -At- Entry Review | | | |
|---|---|--|---|
| <input type="checkbox"/> Highly Satisfactory (HS) - 1 | <input type="checkbox"/> Fully Satisfactory (S) - 2 | <input type="checkbox"/> Less than Satisfactory (LS) - 3 | <input type="checkbox"/> Unsatisfactory (U) - 4 |

III. RESULTS

A. Outcomes

- 3.1 Ultimately the success or failure of any program is assessed by the extent to which it has met its objectives. Since the goal and objective of the Mahaica-Rosignol Road Rehabilitation Project are given in its logical framework the key concepts contained in these are evaluated to determine the outcomes of the project.

Goal: To “increase economic competitiveness”.

Objective: To “reduce vehicle operating costs and increase road safety” along the Mahaica-Rosignol Road.

1. Has the vehicle operating cost reduced after construction?

- 3.2 The reduction in Vehicle Operating Cost (VOC) was measured using the following indicators.

i) International Roughness Index (IRI) indexes on the Mahaica-Rosignol road less than 3.5 after rehabilitation is completed.

(ii) Ex-post Internal Rate of Return (IRR) using actual traffic and HDM4 greater than 16%.

- 3.3 The post construction IRI for the road was between 2 and 2.5 m/km compared to pre construction values between 4 and 9 m/km; thus giving rise to reduced VOC. The main contributors to VOC which were impacted by reduced IRI are; fuel, spares, tires and maintenance. Improvement in the surface condition of the Mahaica-Rosignol road has impacted positively on all of these main contributors as discussed below.

- a. Fuel: After rehabilitation, the road could be continuously driven at constant speed while previously the vehicle speed had to be lowered in many locations along the road to traverse bad sections of the road. A vehicle traveling at varying speeds usually uses more fuel than one travelling at a

constant speed, as such, the rehabilitated road results in less fuel being used to travel the same distance.

- b. Spares: The vehicle suspension, breaks and drive train undergo significantly more wear and tear along a rough road as opposed to a smooth road; thus requiring more frequent parts replacement.
 - c. Tires: Tire wear and damage along a smooth road is much less than that along a rough road because there is less use of vehicle breaks and unevenness in the road surface such as pothole edges to damage the tire.
 - d. Maintenance: Less vehicle maintenance would be required for vehicles traversing a smooth road as opposed to a rough road which causes damage to the vehicle.
- 3.4 The Ex-post IRR was 22% exceeding the 16% required by the indicator. The benefits for the project are derived from the VOC for each type vehicle multiplied by the 66.0 km road and the annual traffic estimated above. In the first year of operation after completion of the project, the benefits were about US\$6.5 millions. The Net Present Value (NPV) of the benefit and cost flows from 2006 to 2025 were then discounted at a 12% rate. The project yielded a NPV of US\$18,191,608 and the Economic Internal Rate of Return (IRR) was 22%. The ex-post analysis appended in Annex V of the PCR.

2. Has road safety improved along the Mahaica-Rosignol Road?

- 3.5 Fatal accidents per million kilometer of vehicle travel reduced by 19 percent, three years after completion of the road works thus surpassing the indicator. The indicator in the log frame for the project anticipated a 15% reduction in severe (fatal) accidents per million kilometer of vehicle travel by three years after the completion of the construction. Since the logframe indicator was a future one an intermediate indicator measuring the fatalities was chosen to monitor during the progress of the works. Annex 3 shows the computation of the Baseline and Outcomes.
- 3.6 Fatal accidents per million kilometer of vehicle travel was 0.071 at 31 December 2003 and was reduced to 0.057, three years after completion of the road works which represents a 19 percent reduction. However, it was noted that the number of fatalities increased by a similar percentage which indicates that fatalities per accidents had increased. The statistics also showed a reduction of accidents between the Mahaica Bridge and Abary Bridge (STN 0+00 to STN 48+00) while accidents increased between the Abary Bridge and Rosignol (STN 48+00 to STN 66+00). In the three years after the construction, the distribution of day and night time accidents moved from a ratio of 60:40 to 70:30. This is an indication that the Road Safety works such as, traffic signs, road markings, reflectors and street lights has contributed positively to the reduction of night time accidents.

| ACHIEVEMENT OF DEVELOPMENT OBJECTIVES (DO) | | | | | | | | | | | | | | | | | | | |
|--|------------------------|-----------------------|-----------------------|----------------------|------------------------|--|-----------------|---------------------|-----------------------|--------------------|--|---------------------|-----------------|---------------------|-----------------------|------------------|--|-------------------|---|
| Development Objective(s) (Purpose) | Key Outcome Indicators | | | | | | | | | | | | | | | | | | |
| 1. Reduced vehicle-operating costs and improved traffic safety on the Mahaica-Rosignol road. <i>Classification:</i> Probable | | | | | | | | | | | | | | | | | | | |
| <p align="center"><u>Planned Outcomes</u></p> <p>1.1. International Roughness Index (IRI) on the Mahaica - Rosignol road less than 3.5 after rehabilitation is completed.</p> <p>Unit: m/km</p> <table border="0"> <tr> <td><u>Baseline</u></td> <td><u>Intermediate</u></td> <td><u>End of Project</u></td> </tr> <tr> <td>4 to 9 (14 Jan 2002)</td> <td>1.1 3.5 (30 Sept 2008)</td> <td></td> </tr> </table> <p>1.2. Road safety along the Mahaica -Rosignol road enhanced through a reduction of 15% in the number of severe/fatal accidents 3 years after construction.</p> <p>Unit: Accidents per million vehicle km traveled</p> <table border="0"> <tr> <td><u>Baseline</u></td> <td><u>Intermediate</u></td> <td><u>End of Project</u></td> </tr> <tr> <td>0.071(31 Dec 2003)</td> <td></td> <td>0.060 (31 Dec 2007)</td> </tr> </table> <p>1.3. Ex-post Internal Rate of Return (IRR) using actual traffic and HDM4 greater than 16%.</p> <p>Unit: %</p> <table border="0"> <tr> <td><u>Baseline</u></td> <td><u>Intermediate</u></td> <td><u>End of Project</u></td> </tr> <tr> <td>16 (14 Jan 2002)</td> <td></td> <td>17 (30 Sept 2008)</td> </tr> </table> | <u>Baseline</u> | <u>Intermediate</u> | <u>End of Project</u> | 4 to 9 (14 Jan 2002) | 1.1 3.5 (30 Sept 2008) | | <u>Baseline</u> | <u>Intermediate</u> | <u>End of Project</u> | 0.071(31 Dec 2003) | | 0.060 (31 Dec 2007) | <u>Baseline</u> | <u>Intermediate</u> | <u>End of Project</u> | 16 (14 Jan 2002) | | 17 (30 Sept 2008) | <p align="center"><u>Outcomes Achieved</u></p> <p>1.1 2.5 m/km (31 Oct 2005) The IRI measurement made along the rehabilitated road indicates that the IRI varied between 2.0 m/km and 2.5 m/km which was better than the planned end of program target of 3.5 m/km.</p> <p>1.2 0.057 Accidents per million vehicle km traveled (31 Dec 2007). This figure represents a 19% reduction over the baseline statistic.</p> <p>1.3 The Ex-post IRR was 22%</p> |
| <u>Baseline</u> | <u>Intermediate</u> | <u>End of Project</u> | | | | | | | | | | | | | | | | | |
| 4 to 9 (14 Jan 2002) | 1.1 3.5 (30 Sept 2008) | | | | | | | | | | | | | | | | | | |
| <u>Baseline</u> | <u>Intermediate</u> | <u>End of Project</u> | | | | | | | | | | | | | | | | | |
| 0.071(31 Dec 2003) | | 0.060 (31 Dec 2007) | | | | | | | | | | | | | | | | | |
| <u>Baseline</u> | <u>Intermediate</u> | <u>End of Project</u> | | | | | | | | | | | | | | | | | |
| 16 (14 Jan 2002) | | 17 (30 Sept 2008) | | | | | | | | | | | | | | | | | |
| Reformulation N/A | | | | | | | | | | | | | | | | | | | |
| PPMR Retrofitting. Indicate if and when the PPMR was retrofitted and explain any changes resulting from this exercise. N/A | | | | | | | | | | | | | | | | | | | |
| Development Objective(s) Classification (DO): | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> Highly Probable (HP) <input checked="" type="checkbox"/> Probable (P) <input type="checkbox"/> Low Probability (LP) <input type="checkbox"/> Improbable (I) | | | | | | | | | | | | | | | | | | | |
| <p>Briefly justify DO classification, based on degree to which planned targets were met, explaining the differences between planned and achieved outcomes as well as any other relevant factors. Include references to evidence that can support these results.</p> <p>The International Roughness Index (IRI) for the road after completion was in the range of 2.0 to 2.5 m/km, as such, the DO has been achieved. This reduction in IRI has translated to reductions in travel time and vehicle operating costs.</p> <p>Street lighting and road safety aids were installed on this corridor under the project to promote safety on the road. Fatal accidents per million kilometer of vehicle travel reduced by 19 percent, three years after completion of the road works thus surpassing the indicator.</p> | | | | | | | | | | | | | | | | | | | |

Country Strategy:

At the time of approval this project was expected to contribute to the following Country Strategy objective(s):
Expanding and maintaining public infrastructure investments in priority areas as required for private sector development.

Given the results described above, briefly discuss how the project contributed to the Bank's strategy in the country.

The Bank strategy in the road sector was to rehabilitate, maintain and complete critical components of the road network in order to reduce transportation costs, and thus promote national integration and economic growth. The main component of this project was the rehabilitation of the Mahaica-Rosignol Road, which is a critical stretch of road in Guyana. Completion of the rehabilitation works resulted in reduction of travel time along the road and reduction of vehicle operating cost. The program also financed feasibility studies for the Southern Approach to Georgetown and the New Amsterdam to Moleson Creek and associated rural roads as part of future interventions of the Bank.

B. Externalities

- 3.6 The cost of petroleum products increased dramatically on the international market during the execution period of the civil works contract. For instance, the cost of asphalt and diesel increased by 58% and 98% respectively above prices at the time of tender. This created in cash flow problems for the Contractor which translated into delays in the execution of the works and claims from the Contractor for escalation of prices.
- 3.7 Decision making at the Government level delayed the implementation of the Drill – Mahaicony realignment and was a major cause for the time overrun on the construction contract.
- 3.8 There were no positive externalities.

C. Outputs

Institutional Strengthening of the Ministry of Public Works and Communications (MPW&C)

- 3.9 The funds from this category were used to procure the following goods and services:
 - a Consultancy services for the drafting of Terms of References for Institutional Strengthening and Transport studies being funded by Bank programs.
 - b Training of WSG staff in the fields of Project Management, Human Resource Management and Bridge Engineering.
 - c The preparation of a Manual of Standard Operating Procedures for WSG.
 - d Computer equipments such as desk tops, lap top, scanners, printers and power protection equipment.
 - d Software for the design of road safety improvement for roads.
 - e Laboratory testing equipment for soils, cement concrete and asphalt concrete.

- f Vehicles and radio communication equipment for the field monitoring of Bank funded programs.
 - g Automated traffic counters and electrical tools to maintain the traffic lights.
- 3.10 The environmental monitoring of the Mahaica - Rosignol Road Project was included as part of the Terms of Reference of the Construction Supervision Consultant. In the case of the ex-post review of the use of lump sum contracts, an individual Consultant was procured, however, GOG considered cost of the contract excessive. The WSG was delegated to undertake the review and work has commenced but is progressing at a slow pace because of other priority commitments.
- 3.11 The WSG staff was not trained in the technical areas envisaged under the Institutional Strengthening component of the program since the GOG considered the staff employed in the unit to be Consultants who should possess the requisite qualifications and skills to execute their mandate and as such do not need training. The training for local Contractors and Consultants was also not undertaken under the program, however, the GOG through the Ministries of Finance and Public Works and Communication held two workshops for Contractors and Consultants in the engineering technology and procurement.

Weight Control Program

- 3.12 Four (4) permanent weigh stations and twenty-four (24) portable vehicle weigh scales were procured under this component for use in the monitoring of vehicle weight. In a bid to make the operation of the weigh stations sustainable, the locations of the four fixed scales were chosen to coincide with facilities where some measure of control is already exercised. In this respect, major bridge sites over the Berbice River at De Edward, Demerara River at Schoonard and Wismar, and Takutu River at Lethem were chosen for the weigh stations. To date only the scale at De Edward is operational; the others are in place but are not being utilized as yet. The program had envisaged the installation of six (6) permanent, however, only four could have been afforded with the available resources.
- 3.13 The review of the local legislation with regards to weight limits and penalties was not undertaken as planned. The GOG had taken the decision not to use loan resources to review the legislation because of the high cost of the contract with a consultant procured to do the review. WSG was instructed to do the study and this was not completed up to the time of the drafting of the PCR.
- 3.14 The current law with regards to the permissible vehicle axle load is outdated with the current limits being well below that of the country's current truck fleet capacity. While the standards adopted for road design has increased to match the axle loads of the truck fleet, the laws have not been amended to make these axle loads legal. Should enforcement be carried out using the current axle load limits then a significant part of the truck fleet would be in default. The present monitoring of the weight control at the bridges focuses on gross vehicle weight. However, for weight control on roads the axle loads are of more importance.

Rehabilitation of the Mahaica-Rosignol Road Segment

- 3.15 The rehabilitation of the Mahaica-Rosignol road was the main component of the program. Dipcon Engineering Services Limited was the contractor procured to carry out the works at a cost of \$22,094,217.84 under a lump sum contract. The works completed under the contract included:
- a. Widening of the road from 7.0 m to 10.4 m comprising of two driving lanes of 3.7m each and two shoulder of 1.5 m each.
 - b. Overlaying of existing pavement.
 - c. Realignment of 4.2 km of road to bypass the roadside villages between Drill and Mahaicony.
 - d. Repairs to 6 km of rural road from Rosignol to Ithaca.
 - e. Repairs to, extending and construction of new culverts; 51 in number.
 - f. Installation of 2170 traffic signs, reflectors and road markings along the length of the roadway.
 - g. Installation of 618 street lamps along the road corresponding to accident black spots.
 - h. Construction of 5.2 km of sidewalks.
 - i. Construction of 106 farm access ramps.
 - j. Three years routine maintenance works.
- 3.16 The final contract amount exceeded the original amount by \$979,619.16 which was largely due to increases the provision for extra works and the rehabilitation of a 6 km stretch of rural road from Rosignol to Ithaca which passes a Stelling used by a passenger ferry that provides service across the Berbice River and also passes through the sugar estate and neighboring villages. Commencement date for the Works was June 5, 2003 with a completion date of December 5, 2004, however, substantially completion was not achieved until July 15, 2005 for the main works. The Contractor was given up to December 15, 2005 to complete the Drill - Mahaicony realignment (which commenced late since after the GOG had requested that the Contractor not do the works and then reconsidered). The works were completed with the original execution period of the project.
- 3.17 The works supervisor provided good support to the Employer and Contractor during the execution of the works and ensured that a quality product was delivered by the Contractor

Feasibility and Design Studies

- 3.18 Two studies were funded from this component.
- a. The feasibility study and designs for the New Amsterdam to Moleson Creek Road and Rural Feeder Roads (East Canje, West Canje and Black Bush Polder) was completed under this component. This study led to the preparation of the GY0076 for the New Amsterdam to Moleson Creek Road.

- b. The feasibility study for the Southern Approach to the city of Georgetown was completed with different options for entering and bypassing the city from the south.

| IMPLEMENTATION PROGRESS (IP) | | |
|--|---|--|
| Components (Outputs): | | |
| 1. Component 1: Institutional Strengthening of the Ministry of Public Works and Communications (MPW&C) Total cost of Component 1: 5,386,889 Counterpart:4,963,139 IDB: 423,750 IDB Disbursement: 100% <u>Classification:</u> S | | |
| Key Output Indicators: | | |
| <u>Planned Outputs</u> | <u>Outputs Achieved</u> | |
| 1.1 Description: The strengthening of WSG through support in 5 areas completed by the end of 2006. Unit: Strengthened Areas <u>Baseline</u> <u>Annual/Intermediate</u> <u>End of Project</u> 0 (07 Nov 2001) 0 (date) 5 (31 Dec, 2006) | 1.1 5 (31 Dec, 2006) The areas supported were (i) advisory services (ii) staff training (iii) preparation of operating procedures for WSG (iv) provision of computers and software and (v) provision of laboratory equipment and tools. | |
| Briefly explain differences between planned and actual outputs (if applicable). N/A | | |
| Restructuring. Indicate if this component was restructured (date of approval by Manager). Briefly discuss the consequences of these changes. N/A | | |
| 2. Component 2: Weight Control Program Total cost of Component 2: 862,036 Counterpart: 0 IDB: 862,036 IDB Disbursement: 100% <u>Classification:</u> U | | |
| Key Output Indicators: | | |
| <u>Planned Outputs</u> | <u>Outputs Achieved</u> | |
| 2.1. Description: Six permanent scales installed by Q2, 2006. Unit: Number <u>Baseline</u> <u>Annual/Intermediate</u> <u>End of Project</u> 2.1 0 (15 Jan, 2002) 2.1 0 (date) 2.1 6 (30 Sep, 2008) | 2.1. 4 (30 May, 2009) Four permanent vehicle weigh scales were installed in the road network and twenty-four portable scales were procured for random checks in the network. | |
| 2.2. Description: Database in weight control is established by Q4, 2005. Unit: Database <u>Baseline</u> <u>Annual/Intermediate</u> <u>End of Project</u> 2.2 0 (15 Jan, 2002) 2.2 0 (date) 2.2 1 (30 Sep, 2008) | 2.2. 0 (30 Sept, 2009) The database was not established. | |
| Briefly explain differences between planned and actual outputs (if applicable). The cost of six permanent vehicle weigh scales far exceeded the original budget in the loan contract. Although the Weight Control budget category was supplemented form other categories in the loan; only four permanent scales and twenty-four portable ones could be afforded. Several attempts were made to procure a consultant to provide technical assistance for the set-up of the database and review the current law and regulations governing weight limits on the country’s road. These attempts failed due to delays in the process from objections raised by participations of the procurement process and objections raised by Cabinet with regards to the cost of the contract. Finally, Government decided that the database and review would be undertaken by WSG, however, this did not materialize due to the lack of human resources in the unit to undertake the task. | | |

| | | | | | | | | | |
|---|----------------------------|--------------------------------|------------------------------|-----------------------|--------------------------------|----------|--------------------------------|--|--|
| Restructuring. Indicate if this component was restructured (date of approval by Manager). Briefly discuss the consequences of these changes. N/A | | | | | | | | | |
| 3. Component 1: Rehabilitation of the Mahaica-Rosignol Road Segment Total cost of Component 3: 25,760,101 Counterpart: 63,215 IDB: 25,696,886 IDB Disbursement: 100% <u>Classification:</u> S | | | | | | | | | |
| Key Output Indicators: | | | | | | | | | |
| <u>Planned Outputs</u> | | <u>Outputs Achieved</u> | | | | | | | |
| 3.1 Description: Construction cost within 10% of contract amount Unit: US\$ <table border="0" style="width: 100%;"> <tr> <td style="text-align: center;"><u>Baseline</u></td> <td style="text-align: center;"><u>Annual/Intermediate</u></td> <td style="text-align: center;"><u>End of Project</u></td> </tr> <tr> <td style="text-align: center;">22,094,217.84 (05 Mar 2003)</td> <td style="text-align: center;">0 (date)</td> <td style="text-align: center;">24,303,639.62 (30 Sep 2008)</td> </tr> </table> | | <u>Baseline</u> | <u>Annual/Intermediate</u> | <u>End of Project</u> | 22,094,217.84 (05 Mar 2003) | 0 (date) | 24,303,639.62 (30 Sep 2008) | 3.1. 23,073,909 (30 Sept, 2008) The construction contract was completed with an overrun of 4.4% which was within the 10% limit in the indicator. 3.2 100% (15 Dec, 2005) The construction on the main works substantially completed on 15 July 2005, while, the Drill - Mahaicony realignment was completed on 15 December, 2005. | |
| <u>Baseline</u> | <u>Annual/Intermediate</u> | <u>End of Project</u> | | | | | | | |
| 22,094,217.84 (05 Mar 2003) | 0 (date) | 24,303,639.62 (30 Sep 2008) | | | | | | | |
| 3.2 Description: Construction completed by first half of 2005 Unit: % <table border="0" style="width: 100%;"> <tr> <td style="text-align: center;"><u>Baseline</u></td> <td style="text-align: center;"><u>Annual/Intermediate</u></td> <td style="text-align: center;"><u>End of Project</u></td> </tr> <tr> <td style="text-align: center;">0 (05 Mar 2003)</td> <td></td> <td style="text-align: center;">100 (05 June, 2005)</td> </tr> </table> | | <u>Baseline</u> | <u>Annual/Intermediate</u> | <u>End of Project</u> | 0 (05 Mar 2003) | | 100 (05 June, 2005) | | |
| <u>Baseline</u> | <u>Annual/Intermediate</u> | <u>End of Project</u> | | | | | | | |
| 0 (05 Mar 2003) | | 100 (05 June, 2005) | | | | | | | |
| Briefly explain differences between planned and actual outputs (if applicable). The completion of the works within 6 months of the original completion date was not achieved because the Drill - Mahaicony realignment commenced late since the GOG had requested that the Contractor not do the works and then reconsidered. | | | | | | | | | |
| Restructuring. Indicate if this component was restructured (date of approval by Manager). Briefly discuss the consequences of these changes. N/A | | | | | | | | | |
| 4. Component 4: Feasibility and Design Studies Total cost of Component 1: 3,353,818 Counterpart: 0 IDB: 3,353,818 IDB Disbursement: 100% <u>Classification:</u> S | | | | | | | | | |
| Key Output Indicators: | | | | | | | | | |
| <u>Planned Outputs</u> | | <u>Outputs Achieved</u> | | | | | | | |
| 4.1. Description: Final reports on the New Amsterdam to Moleson Creek Road, and Rural Feeder Roads and Southern Approach studies submitted and accepted by April 2004 Unit: Final Reports <table border="0" style="width: 100%;"> <tr> <td style="text-align: center;"><u>Baseline</u></td> <td style="text-align: center;"><u>Annual/Intermediate</u></td> <td style="text-align: center;"><u>End of Project</u></td> </tr> <tr> <td style="text-align: center;">0 (15 Jan, 2002)</td> <td style="text-align: center;">0 (date)</td> <td style="text-align: center;">2 (30 Sep, 2008)</td> </tr> </table> | | <u>Baseline</u> | <u>Annual/Intermediate</u> | <u>End of Project</u> | 0 (15 Jan, 2002) | 0 (date) | 2 (30 Sep, 2008) | 4.1. 2 (09 Feb, 2006) Several addendums were made to the contracts for the studies delaying the submission dates. | |
| <u>Baseline</u> | <u>Annual/Intermediate</u> | <u>End of Project</u> | | | | | | | |
| 0 (15 Jan, 2002) | 0 (date) | 2 (30 Sep, 2008) | | | | | | | |
| Briefly explain differences between planned and actual outputs The Final Reports were not completed in the planned timeline because several addendums to the contracts were issued for the consultants to consider comments from the Bank and to undertake additional scope. | | | | | | | | | |
| Restructuring. Indicate if this component was restructured (date of approval by Manager). Briefly discuss the consequences of these changes. N/A | | | | | | | | | |
| Summary Implementation Progress Classification | | | | | | | | | |
| [] Highly Satisfactory (HS) | [X] Satisfactory (S) | [] Unsatisfactory(U) | [] Very Unsatisfactory (VU) | | | | | | |

D. Project Costs

| Total Project Cost – Planned (US\$) | | Total Project Cost - Actual (US\$) | % Difference |
|--|-------------------|---------------------------------------|--------------|
| Category | Bank | Bank | Bank |
| Institutional Strengthening | 1,100,000 | 423,750 | (61.5) |
| Weight Control Program | 350,000 | 862,036 | 146.0 |
| Mahaica-Rosignol Road | 23,800,000 | 25,696,886 | 8.0 |
| • Civil Works | 21,800,000 | 23,073,909 | 5.8 |
| • Supervision | 2,000,000 | 2,622,977 | 31.2 |
| Feasibility Study | 3,050,000 | 3,353,818 | 10.0 |
| Contingencies | 4,000,000 | 0 | (100.0) |
| Financial Cost | 700,000 | 700,000 | 0 |
| TOTAL | 33,000,000 | 31,036,490 | 94.0 |
| Explanation of difference: \$1,796,000 cancelled as part of the debt relief initiative, \$167,510 was unspent at the end of the project. | | | |

IV. PROJECT IMPLEMENTATION

A. Analysis of Critical Factors

The factors that affected project implementation were:

- 4.1 The implementation of this project benefited from the formation of the Works Service Group which is an executing unit with competitive salaries formed within the MPW&C. The mandate of the WSG is to plan, design and implement all contracts for investment and maintenance of roads and bridges.
- 4.2 The implementation of the works suffered from delays in the procurement of the construction supervision firm. The delays were the result of corruption allegations against one of the bidders and protest lodged by another bidder. The allegations of corruption in the form of fraudulent resumes being tendered by one bidder was investigated by the Bank and found to have no merit, as such; the bidder's continued participation in the process was allowed. In the case of the protest, the protesting party was disqualified because it submitted its bid without the associated firm with which it had pre-qualified. The Bank's Procurement Committee reviewed the case and resolved to disallow the protest.
- 4.3 It took 10 months for the achievement of conditions prior to first disbursement because of delays in the procurement of the RMMS consultant under the Bridges Rehabilitation Program (Loan 999/SF-GY) which was a prior condition of this loan. This led to delays in project start up.
- 4.4 Seven firms were prequalified to bid for the works while five submitted bids; this was a sufficient number to induce competition in the process. The competition created saw the lowest evaluated bid being 10% below the engineer's estimate. The winning bidder opined, that the requirement in the bid for Contractors to review and endorse the employers in a 60 day bidding period was costly and onerous.

- 4.5 The designs for the works were completed in May 2001 while construction works did not commence until May 2003. The condition of the road deteriorated significantly during that period since no maintenance activity was being carried out. This deterioration coupled with the construction contract being a lump sum one, posed difficulties in the management of the contract. Contingencies and provisions for extra works were used to address areas of severe deterioration. For the most part the contract was managed as a unit price contract since payment were made according to measured quantities, however, the final payment was made according with the principles of the lump sum contract.
- 4.6 Difficulties in obtain Governmental approval for staff of WSG to attend training courses overseas affected implementation of that aspect of the Institutional Strengthening component.
- 4.7 Poor management and frequent equipment breakdown affected timeliness of civil works Contractor's completion of the works. This issue was the source of many management meetings between the Employer, Supervisor and Contractor during the execution of the works.
- 4.8 The failure to hire a consultant to assist with the WCP resulted in the weight control database not being established and the law not being reviewed. This will negatively impact the enforcement of weight control on the countries roads.
- 4.9 The design of the leveling course for the road rehabilitation works was flawed since thickness were specified that were less than nominal size of the aggregate used in the leveling course. This led to slow progress while a technical solution was sought which would not affect the cost of the works.
- 4.10 The civil works contract was designed without a fluctuation clause for material prices; this resulted in cash flow problems for the Contractor when there was an unprecedented upward movement in the price of petroleum products and construction materials caused by disturbances in Venezuela and construction boom in China in preparation for the 2008 Olympic Games.
- 4.11 The WSG was designed and staffed with personnel to execute projects and is not geared to undertake studies. While the unit has the expertise to undertake studies related to contract management and administration, the staff is preoccupied with the daily tasks of projection execution for multiple operations which leaves little time to participate in studies. WSG is not staffed or equipped to undertake studies in specialized areas such as vehicle weights and measurements and legislation review.

B. Borrower/Executing Agency Performance

Executing Agency performance in key areas. The Executing Agency Performance in the following areas is as follows:

- | | |
|--|-------------------------------------|
| 1. Participation and quality of its contributions during project design | Low ← 1 2 3 4 → High ○ ○ N/A |
| 2. Organization for project execution (Executing / Coordinating Unit's staff, infrastructure, coordination, communication, etc.) | Low ← 1 2 3 4 → High ○ N/A |

| | | |
|--|-----------------------------|---------------------------|
| 3. Coordination and integration of the project executing/Coordinating Unit with the Executing Agency | Low ← 1 2 3 4 → High | <input type="radio"/> N/A |
| 4. Establishing a monitoring and results framework (baseline data, systems, procedures, data analysis and reporting, etc.) | Low ← 1 2 3 4 → High | <input type="radio"/> N/A |
| 5. Executing/Coordinating Unit's management and decision-making capacity | Low ← 1 2 3 4 → High | <input type="radio"/> N/A |
| 6. Timeliness in the fulfillment of the Bank's policies, procedures and contractual clauses | Low ← 1 2 3 4 → High | <input type="radio"/> N/A |
| 7. Financial management (securing counterpart resources, disbursements, quality and timeliness of AFS, etc.) | Low ← 1 2 3 4 → High | <input type="radio"/> N/A |
| 8. Timeliness and efficiency for procurement of goods, works and consulting services | Low ← 1 2 3 4 → High | <input type="radio"/> N/A |
| 9. Executing Agency top-level management's leadership, ownership and support to project execution | Low ← 1 2 3 4 → High | <input type="radio"/> N/A |
| 10. Concrete actions to secure project sustainability | Low ← 1 2 3 4 → High | <input type="radio"/> N/A |

The two areas with low ratings were because (i) the Guyana Police Force does not have a comprehensive traffic accident data system in place to effectively monitor traffic accident indicators and (ii) the efficiency of the country's procurement system could be improved.

| Borrower/Executing Agency | | | |
|---|--|---|---|
| <input type="checkbox"/> Highly Satisfactory (HS) | <input checked="" type="checkbox"/> Satisfactory (S) | <input type="checkbox"/> Unsatisfactory (U) | <input type="checkbox"/> Very Unsatisfactory (VU) |

C. Bank Performance

Bank Performance in critical areas. Evaluate the Bank's performance in the following areas:

| | | |
|--|-----------------------------|---------------------------|
| 1. Extent to which the Bank facilitated the project design in a participatory manner with the Borrower and Executing Agency | Low ← 1 2 3 4 → High | <input type="radio"/> N/A |
| 2. Technical assistance and training as well as consistent follow-up provided so that the Executing Agency follow the Bank's policies and procedures | Low ← 1 2 3 4 → High | <input type="radio"/> N/A |
| 3. Technical assistance and training provided to the Executing Agency to improve project management | Low ← 1 2 3 4 → High | <input type="radio"/> N/A |
| 4. Benefits of the Bank's supervision and assistance to improve project management | Low ← 1 2 3 4 → High | <input type="radio"/> N/A |
| 5. Timeliness in the Bank's response to the needs of the Executing Agency during project implementation | Low ← 1 2 3 4 → High | <input type="radio"/> N/A |
| 6. Bank flexibility to respond to emergencies during project implementation | Low ← 1 2 3 4 → High | <input type="radio"/> N/A |

The two areas with low ratings were because:

(i) This Loan introduced the concept of the Lump Sum Works Contract for the first time into Guyana. The PEU was unfamiliar with the implementation and administration of the contract and expected the Bank's team to provide more training/guidance on the implementation and administration of these contracts than was received. The Bank also provided resources in the Institutional Strengthening components for Advisory Services and Contract Administration Training to aid the PEU but these resources were not utilized.

(ii) In 2005 Guyana experienced a flood with waters being more than one meter high and lasted for as much as four weeks in the some areas. The aftermath of the flood saw damage to many tertiary roads in the country. The GOG requested to uses uncommitted funds in the Loan to rehabilitate these roads as a matter of emergency. The Loan operation was for a specific project and to accommodate the GOG request Board approval would have been required and this did not fit into the timeframe of the GOG for the rehabilitation of the damaged roads. More than US\$1.8 million was eventually cancelled from this program.

| Bank Performance | | | |
|---|--|---|---|
| <input type="checkbox"/> Highly Satisfactory (HS) | <input checked="" type="checkbox"/> Satisfactory (S) | <input type="checkbox"/> Unsatisfactory (U) | <input type="checkbox"/> Very Unsatisfactory (VU) |

V. SUSTAINABILITY

A. Analysis of Critical Factors

- 5.1 The Routine Maintenance Management System which was design and implemented under LO 999/SF-GY provides for multi-year routine maintenance contract for the entire main road network. The sustainability of the Mahaica – Rosignol Road was addressed through the inclusion of a requirement in the works contract for three years of routine maintenance which adheres to the RMMS. The three year routine was carried out on the road as per contract and upon its conclusion the road was fully integrated into the RMMS and is now benefiting from a second multi-year routine maintenance contract. Thus far the funding for the RMMS has been from counterpart funds in the loan contracts and is sustainable if this arrangement continues.
- 5.2 The installation of four (4) permanent weigh stations in the road network and purchase twenty-four (24) portable vehicle weigh scales would contribute positively to curbing the occurrence of overweight vehicles in the road network. However, the effect of these scales would be severely limited if the current law and regulations governing weight limits and dimensions on the country's road are not updated.
- 5.3 The creation of the WSG is a commendable initiative by the MPW&C. During the implementation life of this project, the WSG has experienced high staff turnover which saw the change of personnel for many of key staff positions. These positions included the Highway Engineer, Bridge Engineer, Maintenance Engineer, Road Safety Engineer, Materials Engineer, Environmental Engineer, Head of CTPU, CTPU Economist and Engineer, Finance Controller and Administrative Officer. While most of the positions were filled as they became vacant, the Finance Controller and CTPU Economist and Engineer positions are vacant. WSG staff are on short term contracts (two years) and salary scales have not been increased since its formation, these issues need urgent attention with the aim of retaining staff.

- 5.4 In the area of road safety, comprehensive data collection and analysis is needed to differentiate whether lack of road safety features on the road or road user error is the primary cause for accidents. The Guyana Police Force is responsible for collecting and storing the data and this done manually. The manually process makes it difficult to assemble and analyze the data. Apart from data collection, the Guyana Police Force is responsible for the enforcement of traffic law and regulations; this is an important contributor to reducing accidents on a new road since motorists have the tendency to take advantage of the smooth road surface and increase their vehicle speeds.

B. Potential Risks

- 5.5 In the current world financial situation, countries such as Guyana could face cash flow difficulties which could be a treat to local funding for maintenance activities. To ensure that road maintenance is adequately funded, the Bank should continue to include the RMMS in all future transport infrastructure projects and provide funding for this activity if that becomes necessary.
- 5.6 The country's truck fleet is being populated with a growing number of heavier vehicles with high carrying capacities. The update and enforcement of weight limits in the road network is necessary for the preservation of the road network.
- 5.7 Should high staff turnover be a continuous trend, WSG would face problems in implementation progress of Bank funded programs since the new staff members would take some time to learn the procedures of the Bank.

C. Institutional Capacity

- 5.8 The Institutional Capacity of the MPW&C has improved significantly with the formation of the WSG. The capacity of WSG itself could be improved with the introduction of a strategic training program to improve the technical and management ability of the current staff which comprises of a number of young professionals. Such a program would also contribute to the retention of staff.

Sustainability Classification SU:

| | | | |
|---|--|---|---|
| <input type="checkbox"/> Highly Probable (HP) | <input checked="" type="checkbox"/> Probable (P) | <input type="checkbox"/> Low Probability (LP) | <input type="checkbox"/> Improbable (I) |
|---|--|---|---|

VI. MONITORING AND EVALUATION

A. Information on Results

- 6.1 There is no system in place to collate the data required to assess the impact of the road safety program. The responsibility for data collection lies with the Guyana Police Force (GPF), which is an institutionally weak entity. Attempts to institute a data collection system for the GPC failed when the contract award was rejected because it was considered too costly. To assemble the data required for the evaluation of this program, the staff of WSG visited the different divisions of the GPF and made copies for the accident report sheets which were then tabulated in an Excel spreadsheet for storage and analysis. This process of collecting traffic data is laborious and time consuming.

B. Future Monitoring and Ex-Post Evaluation

- 6.2 The analysis of the accident data showed an increase in accidents and fatalities in the Abary to Rosignol section of the road, which happened to be the section with a higher concentration of population. MPW&C should investigate the cause of this increase and make interventions where necessary.

VII. LESSONS LEARNED

The lessons learnt from the project are as follows:

Project Design

- 7.1 The designs for the works produced by consultants at the project design stage should be reviewed thoroughly by the Execution Agency to ensure the solution is practical for the existing construction environment in order to avoid changes, delays and increases in cost during project execution.

Project Execution

- 7.2 The Works Services Groups was established to execute all donor funded programs in the road sector. This model work well since it rationalized the number of personnel needed to execute the programs and offered attractive packages to retain staff. WSG has now taken on the role as the technical arm of the Ministry of Transport and Hydraulics thus increasing that ministry's capacity to implement programs of its own as well. The WSG model is useful in agencies which implement a number of donor and local funded program annually.
- 7.3 WSG is currently not staffed or equipped to undertake studies prescribed in the transport programs. The staffing levels and technical training are key areas to be improved in order to equip WSG with the requisite skill to undertake studies.
- 7.4 The bidding and contracting processes could be more efficient by:
- Bidders should not be required technically review and endorse service life of the Employers design since its is unduly burdensome and costly to bidders and they may not be equipped to adequately undertake such an exercise.
 - Works contracts with intermediate bonuses should also have intermediate penalties to be balanced achieve the objective of sectional completion of the road.
 - Long duration lump sum works contracts should allow for price fluctuation in materials since the Contractors cash flow and profitability could be seriously affected by sharp increases in material prices.
- 7.5 The use of lump sum contract is not appropriate for rehabilitation of roads which are in an advance state of deterioration since changes in the existing road condition is dynamic and it introduces high risk to the Contractor. Such situations results in many disputes between the Employer and the Contractor during the execution of the

contract and could result in technical considerations being superseded by economic ones.

Institutional Strengthening

- 7.6 Institutional Strengthening and staff training in one area in transport programs which is executed at a slow pace and has to be taken up by the Bank at the country level to improve the effectiveness of these components in Bank operations.
- 7.7 The Guyana Police Force needs to have a computerized system to store and analyze traffic accident data. Accident data is important to plan and prioritize road safety initiatives and measure the effectiveness of the programs that are implemented.

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GY0056 – 1094/SF-GY

Minutes from the Exit Workshop

1. Participative project assessment

The exit workshop took place on July 3, 2009 with participants representing the Works Services Group, Civil Works Contractor and the Sectoral Specialist of the Bank. The Draft PCR was shared ahead of time with the Ministry Of Finance, Ministry of Public Works and Communication and the Works Services Groups in order to facilitate the exercise and attain the objectives of the Exit Workshop. The Draft PCR included information on the indicators including the planned and achieved outputs and outcomes organized by components.

The participants were engaged in an active discussion group analysis where outputs and outcomes of the possible future impacts initiated by the project and their benefits were discussed. Based on that information gathered during these discussion groups, the necessary actions and measures were recommended. A summary of the main points identified by the participants is as follows.

2. Assessment of Project Results by Component

Institutional Strengthening of the MPW&C

The component was successful in most of the intended areas with the notable exceptions being the areas of training and the ex-post review of the use of lump sum contracts. WSG indicated that attempts were made during project execution to have staff trained but these proposals were not approved by the GOG which has taken a policy decision that Consultants should not be trained (WSG staff are considered as Consultants). Training for local Contractors and Consultants was not done under the program, however, GOG through the Ministries of Finance and Public Works and Communication held two workshops for Contractors and Consultants on engineering technology and procurement. An individual Consultant was procured for the ex-post review of the use of lump sum contracts, however, GOG considered cost of the contract excessive. The WSG was delegated to undertake the review and work has commenced but is progressing at a slow pace because of other priority commitments.

Weight Control Program

The goods and works aspect of this component was successfully implemented; however, the institutional aspect was not completed. Four permanent scales and twenty-four portable scales were procured. The GOG did not approve the contract for the Individual Consultant to review of the existing weight limits because of the high cost; WSG was instructed to do the study.

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MAHAICA-ROSIGNOL ROAD REHABILITATION PROJECT
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Thus far the portable scales were used in one instance to regulate trucks transporting boulders for Sea Defense construction. The aim of the exercise was to restrict the axle loading to an allowable amount (based on the tire width) which was computed to be 10 tons. The trucks were being loaded in an uneven manner for ease of loading and off loading, resulting in axle loads being as much as 20 tons. The objective was achieved by having an even distribution of the load in the trucks.

Rehabilitation of the Mahaica-Rosignol Road Segment

The component was successfully completed but took more time than was anticipated to be completed. There were a number of challenges that were encountered during the execution of the component, they are as follows.

- (i) A protest from one of the firms bidding for the works supervision contract resulted in the delay in the tendering and award of the works contract.
- (ii) The lapse in time between the completion of the civil works designs and the start of the construction saw further deterioration in the road condition. This was the source of many disputes between the Contractor and Employer since the contract was a lump sum one. It also resulted in additional works being required in the areas of crack sealing and leveling course.
- (iii) The works contract was designed without a fluctuation clause for material prices; this posed cash flow problems for the Contractor due to unprecedented upward movement in the price of petroleum products and construction materials because of disturbances in Venezuela and the construction boom in China ahead of the 2008 Olympic Games.
- (vi) The use of different specifications for surfacing materials for the carriageway and shoulders was not the best approach from an implementation point of view, since, it was a time consuming exercise to construct the different surfaces.
- (v) The works Contractor poor site management and work methodology contributed to delays in the implementation of the works.
- (vi) GOG's decision to remove the Drill-Mahaicony Realignment from contract and subsequent decision to reincorporate it at a later time, contributed to the project being completed at a later date than was anticipated.
- (vii) The works supervisor provided good support to the Employer and Contractor during the execution of the works and ensured that a quality product was delivered by the Contractor.

Feasibility and Design Studies

The feasibility and design studies were satisfactorily completed. The only challenge was inter ministry coordination with the Ministry Of Housing during the

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execution of the Southern Approach to Georgetown. The lack of cooperation of the Housing Ministry resulted in a house lots being allocated on a land reserve within the alignment of the Southern Approach.

3. Sustainability

The inclusion of the Mahaica Rosignol Road in the RMMS is one initiative that would ensure that the road is maintained during its life. The vehicle weigh scales would contribute to a reduction in the number of overloaded trucks on the roads.

The WSG staff are all on short term contracts (two years) and salary scales have not been increased since its formation. These two factors are the main contributors to the high staff turnover in the unit.

In the area of road safety, comprehensive data collection and analysis is needed to differentiate whether lack of road safety features on the road or road user error is the primary cause for accidents. The Guyana Police Force is responsible for collecting and storing the data and this done manually. The manually process makes it difficult to assemble and analyse the data. Apart from data collection, the Guyana Police Force is responsible for the enforcement of traffic law and regulations; this is an important contributor to reducing accidents on a new road since motorists have the tendency to take advantage of the smooth road surface and increase their vehicle speeds.

4. Lesson Learnt

- (i) The bidding period of 60 days for the works was considered short especially so with the requirement for the Contractor to verify and accept the Employer's design.
- (ii) The requirement for the Contractor to verify the Employers design is a difficult task for contractors during bidding regardless of the allotted time, since, they may not have the appropriate staff and equipment to undertake the exercise and it is too costly to hire the services of a firm.
- (iii) The Guyana Police Force needs to have a computerized system to store and analyze traffic accident data.

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Borrower Evaluation



Inter-American Development Bank
Project Completion Report –2006 PCR
Borrower Evaluation

| | |
|---|---|
| Project Name: Mahaica – Rosignol Road Rehabilitation Program - GY0056 - Loan 1094/SF-GY | |
| Executing Agency: Ministry of Public Works & Communication | |
| Borrower: Cooperative Republic of Guyana | |
| Date of Project Approval: November 07, 2001 | Date of Contract Effectiveness: March 18,1998 |
| Date of Borrower Evaluation: May 6,2009 | Expected Date of Exit Workshop: |

Borrower Project Performance Ratings

Probability on Achieving its Development Objective(s):

[x] Highly Probable (HP) [] Probable (P) [] Low Probability (LP) [] Improbable (I)

Project Implementation:

[x] Highly Satisfactory (HS) [] Satisfactory (S) [] Unsatisfactory (US) [] Very Unsatisfactory (VU)

Sustainability of Project Results:

[x] Highly Probable (HP) [] Probable(P) [] Low Probability (LP) [] Improbable (I)

Comments:

- Travel time and vehicle operating costs reduced
- Fatal accidents reduced by 19% one year after completion

Borrower Performance During Project Execution

Please rate your own performance during Project Execution:

[x] Highly Satisfactory (HS) [] Satisfactory(S) [] Unsatisfactory (US) [] Very Unsatisfactory (VU)

Comments:

Project was completed within budget and minimal extensions to contract to facilitate increased scope of works.

GUYANA
MAHAICA-ROSIGNOL ROAD REHABILITATION PROJECT
GY0056 – 1094/SF-GY

Borrower Performance During Project Preparation

Please rate your own performance during Project Preparation:

☒ Highly Satisfactory (HS) ☐ Satisfactory (S) ☐ Unsatisfactory (US) ☐ Very Unsatisfactory (VU)

Comments:

The project was well designed and included studies for the New Amsterdam to Moleson Creek Road which materialized into a program currently under execution and a rural feeder roads program which will likely soon be included under new transport projects being considered by the bank and GOG

Bank Performance During Project Preparation

Please rate the Bank's performance during project preparation. Factors to be considered include the extent to which the Bank facilitated a participatory project design, proposed adequate technical solutions to the problems identified, and responded to the needs of the Borrower (timeliness, selection of instrument type).

☐ Highly Satisfactory (HS) ☒ Satisfactory (S) ☐ Unsatisfactory (US) ☐ Very Unsatisfactory (VU)

Comments:

There was excellent collaboration and consensus between the bank and GOG during the design of the projects.

Bank Performance During Project Supervision

Please rate the Bank's overall performance during project supervision. Factors to be considered include technical assistance (including informal and formal training) to Executing Agency, timeliness of Bank response and the Bank's flexibility to respond to emergency situations during project implementation.

☐ Highly Satisfactory (HS) ☒ Satisfactory (S) ☐ Unsatisfactory (US) ☐ Very Unsatisfactory (VU)

Comments:

A very good spirit of partnership existed between the Bank and GOG during the execution, with one exception. The project was executed as a Lump Sum contract and the bank's position with regards to claims for cost escalation was not clearly defined. The situation has lead to claims from the contractor which is presently before the courts.

Additional Suggestions for Improving Bank Performance

Additional comments/suggestions for improving Bank performance in the future.

Decisions taken by senior bank officials should be upheld when these officials are transferred to other assignments. A reversal of position by new incumbents can lead to serious consequences.

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Fatal Accident Analysis

Baseline Data (2001 to 2003)

| Location | Length (km) | Fatal Accidents | | | | | | | | ADT | Kilometer Traveled Annually (Million) | Fatal Accidents Per Million Km Traveled | Fatalities per Million Km Traveled |
|-------------------------------------|----------------|-----------------|------------|-----------|------------|-----------|------------|--------------------|------------|-------|---|--|--|
| | | 2001 | | 2002 | | 2003 | | Average 2001 -2003 | | | | | |
| | | Accidents | Fatalities | Accidents | Fatalities | Accidents | Fatalities | Accidents | Fatalities | | | | |
| Mahaica Bridge to Abary Bridge | 28 | 6 | 6 | 3 | 3 | 6 | 6 | 5.00 | 5.00 | 2,380 | 24.32 | 0.206 | 0.206 |
| Abary Bridge to Rosignol | 37 | 4 | 4 | 3 | 3 | 6 | 7 | 4.33 | 4.67 | 3,186 | 43.03 | 0.101 | 0.108 |
| Total: Mahaica- Rosignol (Baseline) | 65 | 10 | 10 | 6 | 6 | 12 | 13 | 9.33 | 9.67 | 5,566 | 132.05 | 0.071 | 0.073 |

Result Data (2005 to 2007)

| Location | Length (km) | Fatal Accidents | | | | | | | | ADT | Kilometer Traveled Annually (Million) | Fatal Accidents Per Million Km | Fatalities per Million Km Traveled |
|------------------------------------|----------------|-----------------|------------|-----------|------------|-----------|------------|--------------------|------------|-------|---|--------------------------------------|--|
| | | 2005 | | 2006 | | 2007 | | Average 2005 -2007 | | | | | |
| | | Accidents | Fatalities | Accidents | Fatalities | Accidents | Fatalities | Accidents | Fatalities | | | | |
| Mahaica Bridge to Abary Bridge | 28 | 1 | 1 | 2 | 2 | 2 | 2 | 1.67 | 1.67 | 2,703 | 27.62 | 0.060 | 0.060 |
| Abary Bridge to Rosignol | 37 | 8 | 9 | 7 | 14 | 7 | 13 | 7.33 | 12.00 | 3,907 | 52.76 | 0.139 | 0.227 |
| Total: Mahaica- Rosignol (Results) | 65 | 9 | 10 | 9 | 16 | 9 | 15 | 9.00 | 13.67 | 6,610 | 156.82 | 0.057 | 0.087 |

Outcomes

| Location | Length (km) | Percentage Reduction (Results /Baseline) | |
|--------------------------------|-------------|--|------------|
| | | Fatal Accidents | Fatalities |
| Mahaica Bridge to Abary Bridge | 28 | 71 | 71 |
| Abary Bridge to Rosignol | 37 | -38 | -110 |
| Total: Mahaica- Rosignol | 65 | 19 | -19 |

* Negative values indicate an increase over the baseline.

GUYANA
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Financial History

| | Categories | Original Bank | % of Total | Budget Transfers | | | | | Cancellations | | Modified Bank | % of Total | Original GOG |
|-----|--------------------------------------|-------------------|-------------|------------------|-------------|-----------|-----------|----------|---------------|-----------|-------------------|-------------|------------------|
| | | | | First | Second | Third | Fourth | Fifth | First | Second | | | |
| 1 | Institutional Strengthening | 1,100,000 | 3% | | | | (200,000) | (66,000) | (282,000) | (128,250) | 423,750 | 1% | 6,250,000 |
| 2 | Weight Control Program | 350,000 | 1% | | | 331,600 | 200,000 | | | (19,564) | 862,036 | 3% | 50,000 |
| 3 | Mahaica-Rosignol Road Rehabilitation | 23,800,000 | 72% | | | | | | | | 25,696,886 | 83% | 200,000 |
| 3.1 | Civil Works (1) | 21,800,000 | | 300,000 | 1,568,953 | | | 66,000 | (660,312) | (732) | 25,696,886 | | |
| 3.2 | Supervision | 2,000,000 | | | 748,965 | | | | (125,988) | | 23,073,909 | | 200,000 |
| 4 | Feasibility Studies | 3,050,000 | 9% | | 1,382,082 | (331,600) | | | (727,700) | (18,964) | 3,353,818 | 11% | 200,000 |
| 5 | Contingencies | 4,000,000 | 12% | (300,000) | (3,700,000) | | | | | | 0 | 0% | |
| 6 | Financial Costs | 700,000 | 2% | | | | | | | | 700,000 | 2% | |
| 6.1 | Interest | 370,000 | | | | | | | | | 370,000 | | |
| 6.2 | FIV | 330,000 | | | | | | | | | 330,000 | | |
| 6.3 | Credit Fee | | | | | | | | | | | | 300,000 |
| | TOTAL | 33,000,000 | 100% | 0 | 0 | 0 | 0 | 0 | (1,796,000) | (167,510) | 31,036,490 | 100% | 7,000,000 |
| | % | | | | | | | | | | 81.6% | | 18.4% |

Notes:

(1) Includes 3 year maintenance contract

Original Credit Fee was estimated in USD300,000. Final amount paid: USD338,389

Disbursements:

| | |
|--------------|-------------------|
| 2002 | 26,000 |
| 2003 | 8,871,763 |
| 2004 | 10,189,478 |
| 2005 | 9,557,981 |
| 2006 | 1,832,398 |
| 2007 | 636,018 |
| 2008 | (77,148) |
| Total | 31,036,490 |

Guyana: Mahaica-Rosignol Road Rehabilitation Project—An Ex-Post Economic Evaluation



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1.0 Introduction¹

The objective of this analysis is to carry out an ex-post economic evaluation of the Mahaica – Rosignol Road Rehabilitation project (LO 1094/SF-GY). This report is designed to complement the Project Completion Report for the project.

The road is a 66 km section of the East Coast road that extends from the east abutment of the Mahaica river bridge to the Rosignol steeling, on the banks of the Berbice River, across from the City of New Amsterdam, the second largest city in the country. It provides the only access to New Amsterdam and to the Berbice Region, the most important agricultural area in Guyana. The entire Mahaica-Rosignol road is situated in the coastal belt and traverses an almost continuous ribbon of houses and businesses on both sides, with short intermittent breaks. The opening of the Berbice Bridge in December of 2008 further highlights the importance of the Mahaica-Rosignol road.

The road traverses one of the most populated regions of Guyana. The main economic activities are rice cultivation (100,000 hectares) and coconut groves (10,000 hectares). About 48,000 people live along the road and about 299,000 people live immediately west of the road. About 143,000 people live east of the road (across from the Berbice River) and use it as their main connection to commute to Georgetown. In total the Mahaica Rosignol road serves, directly or indirectly, about 490,000 people or more than fifty percent of the population of Guyana.

Construction began in March of 2003 and was completed in January, 2005 at a cost of \$23,073,909 million. According to the PCR, the project was completed with an overrun of 4.4% which was within the 10% limit in the indicator.

It should also be noted that this project benefited significantly from the Bridges Rehabilitation Program (Loan 999/SF-GY), that was approved on November 25, 1997 for an amount of US\$41 million. This loan replaced, rebuilt or rehabilitated existing bridges and culverts along the main road system, including this Mahaica-Rosignol segment.

This report would not have been possible without the cooperation and assistance of the Guyana IDB Representation. In particular, Chris Persaud was invaluable in developing much of the input data that are used in the analysis.

This consultant visited Guyana from September 10 to the 18th.

2.0 Economic Analysis

2.1 Methodology

The primary benefit for transportation road projects is to lower vehicle operating costs (VOC). These benefits accrue to the operators and/or owners of the vehicles and the users of the vehicles. These users may be passengers and/or producers that transport their product on the improved

¹ Much of the material contained in this Introduction and other areas in the report derives from the Version 1.1 of the PCR prepared by Christopher Persaud, July 25, 2006. Additionally it draws on the original loan proposal document GY 0056 of 16 October, 2001. The cover photo as well as other material in this report benefited from the Post Construction Report by SNC Lavalin International.

road. For roads with relatively high volume traffic, the methodology generally applied is to compute the VOC and estimate the number of vehicles using the road and estimating the benefits over a time span of at least twenty years.

In particular, in this analysis, the HDM model, version 4 was used to develop the VOC. The model computes the VOC based on inputs collected in country, and depending on the vehicle type computes costs of various categories, including fuel, lubricants, tires, maintenance parts, wear and tear on the vehicle (depreciation), and passenger and crew time. The model is dated and it is reasonable to question the results. What can be said about it, however, is that it does provide a consistent model to estimate the VOC, and does reign in analysts to some extent. Because of its limitations, however, it is important to carry out extensive sensitivity analyses to demonstrate the robustness of the results.

As is always the case in the economic analysis, the inputs are exclusive of taxes, tariffs and other transfers. The reason for this is that the objective is to measure benefits to the country, and taxes do not represent a cost to the country. They are a transfer from the individual or firm to the government.

2.2 Traffic

Traffic counts along the Mahaica-Rosignol road are available for the years 2000 and 2008. The locations at which the counts were taken were different; however, so that the most closely aligned stations were compared in order to establish a growth rate over the eight year period.

| Mahaica-Rosignol 2000 and 2008 Traffic | | | | | | | |
|---|--------------|--------------|------------------|-------------------|---------------|-------------|--------------|
| Unified Counts | Total | Total | Cars/Jeep | Pickup/Van | Minib. | Med. | Heavy |
| 2000 | Raw | Adj. | | | | | |
| De Hoop Branch Rd. (Station 3 eqv.) | 1022 | 2398 | 352 | 154 | 364 | 106 | 23 |
| Onverwagt (Station 4 eqv.) | 851 | 2204 | 251 | 117 | 379 | 72 | 16 |
| Rosignol (Station 5 eqv.) | 1493 | 3839 | 571 | 177 | 560 | 107 | 39 |
| 2008 | | | | | | | 0 |
| Mahaica (Station 3) | 2643 | 3381 | 1326 | 364 | 540 | 265 | 74 |
| Belladrum (Station 4) | 2128 | 2729 | 780 | 275 | 699 | 266 | 54 |
| Rosignol (Station 5) | 3016 | 3907 | 1166 | 327 | 1227 | 202 | 47 |
| 2008 Average Traffic | 2596 | 3339 | 1091 | 322 | 822 | 244 | 58 |

In addition neither year's traffic counts were for 24 hours so that the raw results were adjusted to estimate the total daily traffic. The adjustment applied to the 2000 count was 2.4 and that to the 2008 was 1.16. The tables with the raw and adjusted counts are shown above.

In order to estimate the average growth rate, the counts were compared at the stations that were most similar, and the following growth rates were calculated. Because of the difficulty in

calculating the benefits over stretches of the road, an overall growth rate was estimated. The growth rates shown below are slightly below 3% for the Belladrum station and 4.4% for the Mahaica station. The Rosignol station was only 0.2%, but it was considered unreliable because of the mix of urban and Mahaica-Rosignol traffic. Based roughly on the results below and consistent with the original analysis, a 3% growth rate was conservatively chosen, and the 2008 average traffic for each vehicle category was used to establish the benefit flows.

| Growth Rates for Stations on the Mahaica-Rosignol Road | |
|---|--------------------|
| Station | Growth Rate |
| Mahaica (Station 3) | 4.4% |
| Belladrum (Station 4) | 2.7% |
| Rosignol (Station 5) | 0.2% |

2.2 Vehicle Operating Costs

The vehicle operating costs (VOC) were developed using the HDM model, version 4. For different vehicle types and based upon inputs determined locally and where it is appropriate, internationally, the model estimates the costs per kilometer along the road trajectory. Because of data and other limitations, the road was considered homogenous over the 66 km stretch. The inputs for the model are described below, and do not include taxes or transfers. For all gasoline powered vehicles, the price of fuel after transfers was \$0.54/liter. For diesel fuel, the price applied was \$0.50/liter, and lubricants were \$2.05/liter.² Based upon information from the PCR, without the project the international Roughness Index (IRI) was 6.5m/km and with the project 2.25m/km. The average horizontal curvature was taken as 50 degrees/km and the altitude 20 meters. In an attempt to provide more consistent results, the average speed was set at 70km/hr and 85km/hr without and with the project, respectively. Details on each vehicle are contained in Annex 1.

The input values for the HDM model as well as how model treats these values in estimating the VOC can certainly be open to debate. In particular, the assignment of the price of the vehicles was widely discussed. In Guyana for various reasons mostly having to do with tariffs and excise taxes, the vehicles are virtually never imported new. The assignment of the new car price, however; followed the instructions that guided the HDM inputs. For this reason, sensitivity analysis of the results was applied on this parameter as well as on other variables, including the resulting VOC savings.

The table below shows the VOC savings for each vehicle type .

| Vehicle Operating Cost Savings by Vehicle Type | |
|---|--------------------|
| Vehicle Type | VOC Savings |
| Car/Jeep | \$0.058/km |
| Pickup, Van | \$0.119/km |
| Minibus | \$0.153/km |
| Medium Truck | \$0.167/km |
| Heavy Truck | \$0.246/km |

² The medium and heavy truck use diesel, all others use gasoline.

2.3 Results of the Economic Analysis

The economic analysis consists of applying the results of the above traffic and VOC exercises to annual costs and benefit streams. The streams are shown for the base case in Annex II. The streams for the sensitivity analyses are similar with only the appropriate variable being varied.

2.31 Investment and Maintenance Costs

The investment costs are based on information from the IDB files and appears most reliable available. As this was given as a lump sum, in order to provide a calendar over time, the costs were distributed based on the project annual reports. The results of this were then escalated to put them in US\$2009. The basis for the escalation was the US CPI index. The maintenance costs are based on the actual cost that form part of a three year maintenance contract.

In year ten after completion of the road, it is expected that it will be necessary to put down a 40mm overlay on the entire road as estimated by the Representation, this would cost US\$ 9.153 millions.

| Summary of Project Costs | |
|---------------------------------|--------------------------|
| Item | Cost in 2009 US\$ |
| Investment Year 2003 | 5,355,000 |
| Investment Year 2004 | 12,878,000 |
| Investment Year 2005 | 7,467,000 |
| Total Investment | 25,700,000 |
| Annual Maintenance | 163,784 |
| Ten Year 40 mm Overlay. | 9,153,000 |

2.32 Benefits

The benefits for the project are derived from the VOC for each type vehicle multiplied by the 66.0 km road and the annual traffic estimated above. In the first year of operation after completion of the project, the benefits were about US\$6.5millions. The Net Present Value (NPV) of the benefit and cost flows from 2006 to 2025 were then discounted at a 12% rate. The project yielded a NPV of US\$18,191,608 and the Economic Internal Rate of Return (IRR) was 22%. As mentioned earlier an analysis of this type uses a number of inputs that may be uncertain. For this reason, the real test of the project needs to be examined through the sensitivity analysis shown in the following section.

2.32 Sensitivity Analyses and Conclusion

Six different and believed relevant analyses were carried out in order to test the robustness of the base solution described above. The table below summarizes the result of these exercises:

| Sensitivity Test | NPV (\$US)³ | IRR |
|---|-------------------------------|------------|
| Base Case | 18,191,608 | 22% |
| Annual Rate of Traffic Growth Reduced to 1% | 11,142,316 | 19% |
| New Vehicle Price Reduced 50% | 5,752,737 | 15% |
| Gas Price Increased 50% | 18,730,058 | 22% |
| Passenger and Crew Rates Reduced 50% | 12,845,188 | 19% |
| VOC reduced 50% | -2,400,742 | 10% |

The above results demonstrate the robustness of the base case results in the face of many uncertainties surrounding the inputs. The project is most sensitive to the new vehicle price, but does sustain a good return even with a 50% reduction. The most drastic test performed above—an across the board 50% reduction in VOC, does yield a return below what the Bank seeks, but even in this unlikely scenario the project remains only slightly marginal.

The analysis did not take into consideration the apparent increase in safety along the corridor. The PCR for the project points out that fatal accidents per kilometer of travel have been reduced by 19 percent three years after the project's completion. Despite this, the number of fatalities has risen by a similar percentage, so that it is a mixed result. It is also mentioned that there has been a reduction in night time accidents probably due to the installation of safety works such as traffic signs road markings, reflectors and street lights. It might be in order for the government to take a closer look at the locations of the accidents to see if more safety improvements are in order.

It would have been desirable to determine the impact on the various income groups, but the available information did not permit any conclusions in this regard. Conversations with the bus drivers did not yield much insight to this. Their recollections on fares before and after the project were consistent with the increase in inflation. It was not possible in any case to draw any conclusions in this regard. There was unanimous agreement among the drivers that the road was a major improvement and that the driving times had been significantly reduced. This reduction in driving time was not reflected in the HDM results, so that the benefits due to the time savings of passengers and crew are probably underestimated.

In conclusion, the project has benefited Guyana to date and should confidently yield significant benefit as long as the maintenance continues to be adequate.

³ Discount rate equals 12%

Annex I: Vehicle Inputs to HDM Model

| | |
|-------------------------|--------------|
| Car/Jeep | |
| New vehicle price | \$18,000 |
| New tire cost | \$70/tire |
| Crew time cost | \$0.00/hour |
| Passenger delay cost | \$2.00/hour |
| Maintenance labor cost. | \$15.00/hour |
| Number of passengers | 1 |
| VOC savings | \$0.058/km |

| | |
|-------------------------|---------------|
| Pickup, Van | |
| New vehicle price | \$29,500 |
| New tire cost | \$137.00/tire |
| Crew time cost | \$2.50/hour |
| Passenger delay cost | \$2.00/hour |
| Maintenance labor cost. | \$15.00/hour |
| Number of passengers | 0 |
| VOC savings | \$0.119/km |

| | |
|-------------------------|----------------|
| Minibus | |
| New vehicle price | \$ 25,650.00 |
| New tire cost | \$ 91.00 /tire |
| Crew time cost | \$4.50/hour |
| Passenger delay cost | \$2.00/hour |
| Maintenance labor cost. | \$15.00/hour |
| Number of passengers | 13 |
| VOC savings | \$0.153/km |

| | |
|-------------------------|----------------|
| Medium Truck | |
| New vehicle price | \$ 50,000 |
| New tire cost | \$ 183.00/tire |
| Crew time cost | \$4.50/hour |
| Passenger delay cost | \$2.00/hour |
| Maintenance labor cost. | \$15.00/hour |
| Number of passengers | 0 |
| VOC savings | \$0.167/km |

| | |
|-------------------------|----------------|
| Heavy Truck | |
| New vehicle price | \$ 100,000 |
| New tire cost | \$ 183.00/tire |
| Crew time cost | \$4.50/hour |
| Passenger delay cost | \$2.00/hour |
| Maintenance labor cost. | \$20.00/hour |
| Number of passengers | 0 |
| VOC savings | \$0.246/km |

| ANNEX II: Cost and Benefit Flows for Base Case (all values in 2009 thousands \$US) | | | | | | | | | | | | | |
|---|----------------|--------------|-----------------|--------------|--------------------------|--------------|--------------|---------------|--------------|--------------|-------------|--------------|--------------------|
| Year | Invest. Costs | Maint. Costs | Cars\Jeeps\ 4WD | | Pickup/Vans Light Trucks | | Minibus, Bus | | Medium Truck | | Heavy Truck | | Total Net Benefits |
| | | | ADT | VOC Savings | ADT | VOC Savings | ADT | VOC Savings | ADT | VOC Savings | ADT | VOC Savings | |
| | | | | | | | | | | | | | |
| 2002 | | | | | | | | | | | | | |
| 2003 | 5355 | 0 | 941 | 0 | 278 | 0 | 709 | 0 | 210 | 0 | 50 | 0 | -5,355 |
| 2004 | 12878 | 0 | 969 | 0 | 286 | 0 | 730 | 0 | 217 | 0 | 52 | 0 | -12,878 |
| 2005 | 7467 | 0 | 998 | 0 | 295 | 0 | 752 | 0 | 223 | 0 | 53 | 0 | -7,467 |
| 2006 | 0 | 164 | 1028 | 1,434 | 304 | 871 | 775 | 2,850 | 230 | 928 | 55 | 324 | 6,243 |
| 2007 | 0 | 164 | 1059 | 1,477 | 313 | 897 | 798 | 2,935 | 237 | 956 | 56 | 334 | 6,436 |
| 2008 | 0 | 164 | 1091 | 1,522 | 322 | 924 | 822 | 3,024 | 244 | 984 | 58 | 344 | 6,634 |
| 2009 | 0 | 164 | 1124 | 1,567 | 332 | 952 | 847 | 3,114 | 251 | 1,014 | 60 | 354 | 6,838 |
| 2010 | 0 | 164 | 1157 | 1,614 | 342 | 980 | 872 | 3,208 | 259 | 1,044 | 62 | 365 | 7,048 |
| 2011 | 0 | 164 | 1192 | 1,663 | 352 | 1,010 | 898 | 3,304 | 267 | 1,076 | 63 | 376 | 7,264 |
| 2012 | 0 | 164 | 1228 | 1,713 | 362 | 1,040 | 925 | 3,403 | 275 | 1,108 | 65 | 387 | 7,487 |
| 2013 | 0 | 164 | 1265 | 1,764 | 373 | 1,071 | 953 | 3,505 | 283 | 1,141 | 67 | 398 | 7,716 |
| 2014 | 0 | 164 | 1303 | 1,817 | 384 | 1,103 | 982 | 3,610 | 291 | 1,176 | 69 | 410 | 7,953 |
| 2015 | 9153 | 164 | 1342 | 1,872 | 396 | 1,136 | 1011 | 3,719 | 300 | 1,211 | 71 | 423 | -957 |
| 2016 | 0 | 164 | 1382 | 1,928 | 408 | 1,170 | 1041 | 3,830 | 309 | 1,247 | 73 | 435 | 8,447 |
| 2017 | 0 | 164 | 1424 | 1,986 | 420 | 1,205 | 1073 | 3,945 | 318 | 1,285 | 76 | 448 | 8,705 |
| 2018 | 0 | 164 | 1466 | 2,045 | 433 | 1,242 | 1105 | 4,063 | 328 | 1,323 | 78 | 462 | 8,971 |
| 2019 | 0 | 164 | 1510 | 2,106 | 446 | 1,279 | 1138 | 4,185 | 338 | 1,363 | 80 | 476 | 9,245 |
| 2020 | 0 | 164 | 1556 | 2,170 | 459 | 1,317 | 1172 | 4,311 | 348 | 1,404 | 83 | 490 | 9,528 |
| 2021 | 0 | 164 | 1602 | 2,235 | 473 | 1,357 | 1207 | 4,440 | 358 | 1,446 | 85 | 505 | 9,818 |
| 2022 | 0 | 164 | 1650 | 2,302 | 487 | 1,397 | 1243 | 4,573 | 369 | 1,489 | 88 | 520 | 10,118 |
| 2023 | 0 | 164 | 1700 | 2,371 | 502 | 1,439 | 1281 | 4,711 | 380 | 1,534 | 90 | 535 | 10,426 |
| 2024 | 0 | 164 | 1751 | 2,442 | 517 | 1,483 | 1319 | 4,852 | 392 | 1,580 | 93 | 552 | 10,744 |
| 2025 | -4576.5 | 164 | 1803 | 2,515 | 532 | 1,527 | 1359 | 4,997 | 403 | 1,627 | 96 | 568 | 15,648 |
| NPV | -22,122 | -871 | | 9,220 | | 5,598 | | 18,320 | | 5,965 | | 2,083 | 18,192 |