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IMPLEMENTATION COMPLETION REPORT

MAURITIUS

SECOND HIGHWAY PROJECT  
(LOAN 3132-MAS)

MARCH 19, 1996

Infrastructure Division  
Central Africa and Indian Ocean Department  
Africa Region

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## **CURRENCY EQUIVALENTS**

Currency Unit = Mauritian Rupee (MuR)

(as of July 1995)

US\$1 = MuR 17.50

MuR1.00 = US\$0.057

(at the time of appraisal)

US\$1.00 = MuR 15.00

MuR1.00 = US\$0.066

## **WEIGHTS AND MEASURES**

1 meter (m)	=	3.28 feet (ft)
1 kilometer (km)	=	0.62 miles (mi)
1 Sq. kilometer (km <sup>2</sup> )	=	0.386 sq. miles (sq. mi)
1 hectare (ha)	=	2.47 acres (ac)
1 metric ton (m ton)	=	2,205 pounds (lbs)

## **ABBREVIATIONS & ACRONYMS**

AADT	-	Average Annual Daily Traffic
ERR	-	Economic Rate of Return
GOM	-	Government of Mauritius
FHP	-	First Highway Project
ICR	-	Implementation Completion Report
JICA	-	Japan International Cooperation Agency
MOF	-	Ministry of Finance
MOW	-	Ministry of Works
PSIP	-	Public Sector Investment Program
RSMP	-	Road Sector Master Plan
SAR	-	Staff Appraisal Report
SEMES	-	Singapore Environmental Management & Engineering Services
SHP	-	Second Highway Project
STC	-	State Trading Corporation
TA	-	Technical Assistance
TMU	-	Traffic Management Unit
VOC	-	Vehicle Operating Costs
VPD	-	Vehicles per Day

## **FISCAL YEAR**

July 1 - June 30

## IMPLEMENTATION COMPLETION REPORT

## MAURITIUS

SECOND HIGHWAY PROJECT  
(LOAN 3132-MAS)

## TABLE OF CONTENTS

PREFACE .....	i
EVALUATION SUMMARY .....	ii

**PART I: PERFORMANCE ASSESSMENT FROM IBRD PERSPECTIVE**

A. Statement/Evaluation of Project Objectives .....	1
B. Achievement of Project Objectives .....	4
C. Major Factors Affecting the Project .....	8
D. Project Sustainability .....	9
E. Bank Performance .....	10
F. Borrower Performance .....	11
G. Assessment of Outcome .....	11
H. Future Operation .....	12
I. Key Lessons Learned .....	12

**PART II: SUPPORTING ANNEX AND STATISTICAL TABLES**

Table 1. Summary of Assessments .....	14
Table 2. Related Bank Loans/Credits .....	15
Table 3. Project Timetable .....	15
Table 4. Loan Disbursements: Cumulative Estimated and Actual .....	16
Table 5. Key Indicators for Project Implementation .....	17
Table 6. Studies Included in Project .....	18
Table 7A. Project Costs .....	18
Table 7B. Project Financing .....	19
Table 8. Economic Costs and Benefits .....	19
Table 9. Status of Legal Covenants .....	20
Table 10. Bank Resources: Staff Inputs .....	22
Table 11. Bank Resources: Missions .....	23

**APPENDICES:**

Borrower Contribution to the ICR .....	24
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# **MAURITIUS**

## **SECOND HIGHWAY PROJECT (LOAN 3132-MAS)**

### **IMPLEMENTATION COMPLETION REPORT**

#### **Preface**

This is the Implementation Completion Report (ICR) for the Second Highway Project (SHP) in Mauritius, for which Loan 3132-MAS in the amount of US\$30.0 million equivalent was approved on November 7, 1989, and made effective on June 8, 1990.

The loan was closed on June 30, 1995, compared with the original closing date of June 30, 1994. Final disbursement took place on October 27, 1995, at which time a balance of US\$21,478.68 was canceled.

The ICR was prepared by Subhash Seth, Consultant, TWUTD, and Alain Labeau, Task Manager, AF3IN, and reviewed by Ms. M. Plessis-Fraissard, Division Chief, AF3IN and Mr. P. Hari Prasad, Operations Adviser, AF3DR.

Preparation of the ICR started during the Bank's final supervision mission in May 1995, and an implementation completion mission in July 1995. It is based on information in the project files and data provided by the Government of Mauritius. The Borrower contributed to the preparation of this ICR and contributed its own evaluation of the project's execution, which is included as appendix A to the ICR.



## EVALUATION SUMMARY

### Introduction

1. The Bank's involvement in the transport sector of Mauritius began in 1974, with the financing of the extension and modernization of the port at Port Louis. The Second Highway Project (SHP) was second in a series of projects aimed at assisting the Government of Mauritius (GOM) in integrating the development of the transport system into macroeconomic policies, and encouraging more efficient utilization of the existing transport infrastructure. The First Highway Project (FHP) focused on: protecting capital investment on selected main roads; strengthening institutional capacity of the Ministry of Works (MOW); and enforcing vehicle weight and traffic safety regulations. The SHP further consolidated the efforts initiated in FHP, and provided continued support in: (a) strengthening and upgrading of heavily circulated, weak road sections; (b) capacity-building of MOW in road maintenance; (c) traffic management, and (d) enforcing road safety and vehicle emission control regulations.

### Project Objectives and Description

2. The objectives of the SHP, as stated in the October 1989 Staff Appraisal Report (SAR), were to:

- (i) protect capital investment on roads by strengthening and improving the service life of important road sections with high traffic volume;
- (ii) strengthen MOW's capacity for road maintenance planning and operations, including traffic management; and
- (iii) establish effective vehicle safety and emission control procedures.

3. To achieve these objectives, the project supported the priority items of Highway Program FY1990-93 (para 4) and comprised the following components: (a) strengthening and improvement of about 46 km of main roads; (b) resurfacing (periodic maintenance) of about 130 km; (c) routine maintenance of about 840 km of main roads, and 27 km of motorways; (d) improvement of a circulation system and traffic management; (e) vehicle safety and emission control standards through the provision of testing equipment; and (f) consulting services and training.

4. All the objectives were important to the country and relevant to the transport sector. The project objectives were consistent with GOM policy and Bank strategy in assisting the country. In Mauritius, roads were originally constructed as agricultural tracks without proper engineering design and their weak structure and poor geometry was not compatible with the increasingly heavy and high volume of traffic. Given sustained traffic growth and a significant increase in the number of road accidents (4,447 in 1983 to 9,085 in 1989), the country needed to: (a) strengthen and upgrade weak sections of important roads; (b) improve the traffic circulation system; and (c) enforce standard procedures for emission control. The time frame provided by the project was too tight, and therefore over-optimistic.

## Implementation Experience and Results

5. The project was successful in achieving its principal objectives. The objective of protecting capital investment in main roads was substantially achieved on completion of all agreed civil works, which included 43 km of the strengthening and upgrading of heavily circulated road sections, 130 km of resurfacing (periodic maintenance) of main roads, 880 km of routine maintenance of paved roads. Also, the objectives of strengthening MOW's capacity in the planning and operation of road maintenance was substantially achieved. In order to achieve the objectives related to traffic management, or to review and revise GOM legislation for effective vehicle safety and emission control, the project's special objectives relating to traffic management, road safety, and vehicle emission control were only partially achieved. However, the project has provided a strong foundation in these areas, and has also gained the Borrower's commitment to their achievement in the near future.

6. The strengthening and improvement works carried out on selected main roads were extensive with respect to the structural and geometric design of road pavements. Considering the weakness of the existing road structure due to poor sub-grade, more emphasis was placed on designing the correct thickness of additional layers structurally sound and to improving road profile in accordance with acceptable geometric standards. Road upgrading works included, *inter alia*: (a) rehabilitation and improvement of cross drainage works; (b) major changes to improve horizontal and vertical alignments (about 35% length was realigned); (c) providing street lighting; (d) replacement of old water pipes laid previously under the pavement, with new pipes laid at appropriate locations; (e) improvement of junctions; (f) construction of new bus lay-bys; and (g) construction of crawler lanes for heavy traffic, which move slowly on steep slopes. All these upgrading works helped improve road safety, ease traffic congestion and good riding quality on improved road pavements.

7. Given that in mid-1989, at the time of project appraisal, GOM reorganized the maintenance section of MOW, a component was added to strengthen the maintenance section. Accordingly, the project provided 54 man-months of technical assistance (TA). During project implementation, GOM initiated various institutional reforms aimed at improving road maintenance (para 15), *inter alia*, creation of a Road Fund, increased budget allocation for road maintenance, and training of supervisory staff. As a result, the efficiency of maintenance operations was significantly improved: the Borrower decided, and the Bank agreed, not to use technical assistance (TA) funds earmarked for road maintenance experts. The savings thus created under the TA component was very helpful in the completion of an agreed surfacing program of 130 km, for which the scope of work was substantially changed because of major repairs needed before carrying out resurfacing works. As most of the roads were of weak structure, resurfacing was found to be impractical without strengthening the base course. Accordingly, MOW completed heavy patch work and improved profiles, before resurfacing roads. Furthermore, the project included training of supervisory staff, and on successful completion of the agreed training program (para 18), MOW benefited from an increased number of trained staff available in both units of Road Maintenance and Traffic Management.

8. The project's special objectives relating to traffic management and vehicle emission control were only partially achieved, as MOW did not have enough in-house expertise, and relied heavily on the external assistance. The project provided TA (6 person-months) for a traffic management expert to assist MOW in the preparation of the action plan, proposals for a traffic circulation system, and the upgrading of road intersections. The Borrower recruited an international consultant for 3 person-months: the consultant's report was useful in providing a general overview of all the key issues relating to urban transport, the traffic master plan, and road safety in Mauritius. However, it did not help much in achieving all the agreed targets of preparing an action program, a traffic circulation system, or in the improvement of road intersections. In fact, the consultant overestimated the capability of the Traffic Management Unit (TMU) and failed to provide any practical assistance in the planning and implementation of traffic management related works (para 7). However, in consultation with the Bank, MOW launched several remedial actions, including bus lay-bys, paid parking and crawler lanes, in order to ease traffic congestion on steep slopes, all of which were found very useful and feasible.

9. The project also provided 15 person-months of TA to assist in monitoring the pollutants and the setting up of standards for vehicle emission control. The Borrower recruited an environmental expert for one person-month to review existing Road and Traffic Regulations and who made recommendations for incorporation into the existing regulations, which are now awaiting GOM approval. Paragraph 21 of this ICR provides a synopsis of consultants' main findings and recommendations, which are, *inter alia*: (a) the amount of gasoline fuel has increased by about 51% over the last five years (1987-91), while diesel fuel increased by only 3.9%; (b) it would be unlawful to distribute any gasoline that has a sulfur content greater than 0.1%, lead content greater than 0.2 grams per liter, and a benzene content greater than 5%. The Borrower received regulations from other countries but these documents did not provide much information regarding practical enforcement. Therefore, the Bank suggested, and MOW agreed, to establish a twinning arrangement with the Ministry of Public Works of Singapore and it is expected that the ongoing study carried out by Singapore Environmental Management and Engineering Services (SEMES) is likely to prove helpful in establishing the standards and procedures for vehicle emission control.

10. The SHP was appraised in May 1989 and the loan was declared effective on June 8, 1990. Initially, progress was very slow: civil works began in April 1992, two years behind appraisal schedule. It appears that much time was spent on the procurement of civil works, which could have been easily avoided if the Bank and the Borrower had worked more closely together in finalizing procurement procedures. Although Bank guidelines were followed in general, Bank advice did not prove very helpful in expediting award of works contracts. In mid-1992, progress gained momentum and all civil works were completed in April 1994, only four months behind appraisal schedule. The scheduled loan closing date of June 30, 1994, was extended to June 30, 1995, as the Borrower needed more time to examine complex issues on traffic management and vehicle emission control. The final unit cost for strengthening and improvement works is US\$707,175/km, compared with US\$550,000/km (para. 26), 28% more than the appraisal estimate. As bid prices were already 25% higher than the appraisal

estimates, it indicates that the cost of works was underestimated at appraisal stage. It is worth mentioning that MOW did not have any system for monitoring unit rates based on the annual increase in labor, material and equipment costs. Despite cost changes in some components of the project, there was no overrun under Bank financing because: (a) there were savings in the component of TA; and (b) some works agreed under Bank financing were completed under local funding (para. 12 and 14).

11. Bank performance was satisfactory in the identification and preparation phases. However, during appraisal, more attention should have been paid to the evaluating resurfacing works in nature and volume, estimating costs, assessing institutional capacity of the Borrower in road maintenance, and clearly defining the role of TA. Sufficient skill mix was not included in the appraisal mission to prepare action plans for special components of traffic management, road safety and the transport-related air pollution. All loan covenants were appropriately enforced and the performance rating in the supervision reports were appropriate. Bank performance in supervision was professional and highly satisfactory, both in quantity and quality.

12. The Borrower's performance in reviewing of the Highway Program FY1990-93 (para. 33) and in the selection of project components, was satisfactory with respect to technical and economic aspects. Despite an initial delay of about two years, the Borrower managed to complete all civil works well ahead of the loan's extended closing date. The quality of all completed civil works is more than satisfactory. However, for the traffic management and vehicle emission control component, the Borrower took more time than expected in the preparation of the action plans.

13. The project outcome was satisfactory because its major objectives were substantially achieved. The benefits derived from the road upgrading and strengthening component will be more than expected; therefore, the project is likely to be sustainable. Based on final construction costs, the investment made on road improvement projects produces an ERR ranging from 21% to 46%, compared with 21% to 30% at appraisal.

### **Key Lessons Learned**

14. The key lessons learned from the project are as follows:

- (a) The next resurfacing program for periodic maintenance would benefit from the setting up of a Pavement Management System, which monitors and updates all relevant data on condition surveys, pavement strength, rainfall intensity and classified traffic counts.
- (b) To achieve all physical targets within allocated funding, and to ensure good financial control during the implementation of the project, unit rates used in the project cost estimates for various road activities play an important role. It is essential for a Road Agency to have a system for updating unit rates annually, based on the fluctuation of market prices for labor, equipment and materials.

- (c) Long-term, the Road Sector Master Plan (RSMP) should provide a sound basis for lending program of future investments and strategy of road development in the transport sector. Based on transportation studies, MOW's list of prioritized potential road project is useful for short-term planning.
- (d) For capacity building of the road institutions, the possibility of establishing a twinning arrangement with other countries should be explored in the special areas of traffic management, transport-related air pollution, and technology transfer to the Borrower's country.
- (e) The TA component needs careful assessment of the institutional capacity of the Borrower. For preparation of action plans in this special area, it is necessary to include a sufficient skill mix in a project's appraisal team.
- (f) For major civil works contracts, procurement procedures should be achieved as close as possible to contract award and before project effectiveness. As a general rule, the momentum of procurement procedures should override any other consideration within the Bank's guidelines. As far as possible, it is also recommended to adhere to decisions taken.
- (g) Objectives relating to sector policies, particularly involving legislation procedures, should not be too ambitious: their goals should be realistic and, above all, reasonable time should be allocated to their achievement.
- (h) In Mauritius town roads are under the administration of municipal committees, feeder roads under the administration of District Councils, and main roads under the administration of Technical Division of MOW. Although it is good to reach the objective of decentralization, it needs strong inter-agency coordination for harmonizing development and maintenance of the country's road network.



## **PART I: PERFORMANCE ASSESSMENT FROM IBRD PERSPECTIVE**

### **A. STATEMENT/EVALUATION OF PROJECT OBJECTIVES**

#### **Background**

1. Mauritius, an island nation of 2,400 sq. km, is located in the Indian Ocean. Over the past twenty years, Mauritius has undergone major structural changes from an agricultural mono-crop economy with fast population growth, high unemployment and low per capita income, to a situation characterized by a fairly stable population, quasi-full employment and a rapidly diversifying economy with the emergence of new sources of growth in export, manufacturing and tourism. The GDP more than tripled in real terms between 1970 and 1990, with an annual growth rate of about 6 percent on average over the last two decades. There are no railways, pipeline, coastal shipping or inland waterways in Mauritius, thus roads (about 1,881 km in 1993) are the only means of domestic transport. The country's foreign trade depends significantly on the availability of efficient roads and road transport system.

2. The Bank's involvement in the transport sector began in April 1974, with the financing of the extension and modernization of the port at Port Louis. Under the highway subsector, there were two loans, First Highway Project (FHP) and Second Highway Project (SHP) approved in 1983 and 1989 respectively. The FHP aimed to: (a) protect capital investment in selected main roads; (b) strengthen Ministry of Works (MOW) capacity for planning road investments; and (c) enforce vehicle weight and traffic safety regulations. The growth in number of motor vehicles from 73,218 in 1983, to 107,513 in 1989 (about 50%), revealed the inadequacies of many road sections where engineering standards were deficient with a heavy accident toll. The SHP further consolidated efforts initiated during the FHP and provided a continued support in: (a) strengthening and upgrading of roads with a high volume of traffic; (b) capacity-building of MOW in road maintenance; (c) traffic management; and (d) enforcement of vehicle safety and emission control regulations.

#### **Statement of Objectives**

3. The objectives of the SHP, as stated in the October 1989 Staff Appraisal Report (SAR), were to:

- (i) protect capital investment in roads by strengthening and improving the service life of important road sections with high traffic intensity;
- (ii) strengthen MOW's capacity for road maintenance planning and operations, including traffic management; and
- (iii) establish effective vehicle safety and emission control standards and procedures.

4. In order to achieve these objectives, MOW prepared a "Highway Program FY1990-1993", estimated at US\$107.1 million based on June 1989 prices. It comprised the following main components:

- (a) Strengthening and improvement of about 108 km of main roads;
- (b) A four-year cycle (FY1990-93) program of periodic maintenance of about 404 km of main roads;
- (c) A four-year cycle (FY1990-93) program of routine maintenance of 840 km of main roads and 27 km of motorways;
- (d) Traffic management, including: (a) improvement of intersections; (b) installation of new traffic lights; (c) provision of loop detectors at existing traffic lights; and (d) provision of street lighting;
- (e) Vehicle safety and emission control; and
- (f) Consultant services and training.

5. As part of the above program, the Government of France provided the financing for equipment and technical assistance (TA) for routine maintenance. The priority elements of the program (para 4) were financed under SHP in the amount of US\$30.0 million, and by GOM in the amount of US\$13.6 million equivalent. The SHP comprised the following components:

- (a) Strengthening and upgrading of about 46 km of the following main roads to acceptable engineering standards: (i) Black River Road (28 km); (ii) Saint Jean Road (2 km); (iii) B2 Palma Road (9 km); and (iv) Flic-en-Flac Road (7 km);
- (b) Carrying out a four-year (FY 1990-93) program of resurfacing (periodic maintenance) of about 130 km of main roads;
- (c) Carrying out a four-year (FY 1990-93) program of routine maintenance of about 840 km of main roads and 27 km of motorways;
- (d) Improvement of the circulation system and traffic management to control axle loads;
- (e) Establishment of vehicle safety and emission control standards and procurement of equipment for enforcement; and
- (f) TA, including consultant services and training.

## **Evaluation of Objectives**

6. All the objectives were important for the country and relevant for the transport sector. The project objectives were consistent with GOM's policy and the Bank's strategy to assist the country. They focused on: (a) integration of transport planning and investments with GOM's macro-economic policy; (b) easing critical traffic bottlenecks caused by the increased traffic volumes; (c) upgrading of low strength and limited capacity roads; and (d) strengthening MOW's institutional capacity for improving road maintenance. Furthermore, the project objectives were in accordance with the priorities enunciated in the Public Sector Investment Program (PSIP) and GOM's Development Plan FY89-92. All three objectives were stated in order of priority.

7. The first objective of improving the service life of important road infrastructure was clear and relevant. Since the roads in Mauritius were initially constructed as agriculture tracks without proper engineering design, their weak structure and poor geometric standards were not compatible with the high volume of traffic, ranging from 700 vpd to 3000 vpd at the time of project preparation. Therefore, the project included the strengthening and upgrading of highly circulated roads based on a maximum legal single axle load of 10 tons and for an economic life of 20 years. The second objective of institutional strengthening was very timely to the improvement of efficiency in the planning and operation of road maintenance. It also addressed the key issue of traffic management in order to reduce alarming traffic congestion and improve riding conditions. The project included: (a) improvement of road intersections; (b) provision of loop detectors; (c) additional traffic lights; and (e) street lighting.

8. The third objective of improving vehicle safety and establishing standard procedures for vehicle emission control formed an integral part in the development of the road transport system. This objective focused on assessing the scope of air pollution problems with adequate monitoring of the pollutants. This objective was very demanding, considering a more than 47% increase in the number of vehicles over a period of six years. However, the tasks needed to review existing road and traffic regulations, and to make recommendations in all aspects of vehicle registration, certification and fitness, setting standards and effective procedures, and were too optimistic for the implementing agencies to complete within the time-frame provided under the project.

9. With the exception of the objectives relating to traffic management and vehicle emission control, the project's concept and design were appropriate to meet its development objectives. The objectives relating to traffic management and vehicle emission control were too ambitious and put heavy demands on the Borrower in achieving the desired coordination among all the related institutions involved. MOW did not have enough in-house expertise and relied upon external assistance. In order to meet these objectives, the Bank sought and reached agreement with the Borrower at negotiations stage on the following two covenants: (a) MOW would prepare a date-bound, time-based action program for monitoring ambient air quality standards for vehicle emissions, not later than December 31, 1991; and (b) MOW would

prepare an action program to ensure effective traffic control, not later than December 31, 1991.

## **B. ACHIEVEMENT OF PROJECT OBJECTIVES**

10. The project was successful in achieving its principal objectives. The objective of protecting capital investment in roads and improving service life of important road sections was substantially achieved, although the strengthening of weak road sections require continual attention. Also, the objective of strengthening MOW's capacity was substantially achieved, and the technical standards, management of unit costs and performance efficiency of MOW have improved notably since the time of loan appraisal, judging by the standards that prevailed at the time of loan approval. Although the project's special objectives relating to traffic management, vehicle safety and emission control were only partially achieved, the project has provided a strong foundation in these areas, and the Borrower is taking steps towards achieving these objectives. An overview on the achievement of objectives is provided below, based on implementation experience, under five main headings: (i) physical objectives; (ii) institutional development; (iii) sector policies; (iv) macroeconomic policies; and (v) environmental concerns. Other objectives relating to poverty reduction, social welfare, financial performance, and private sector development were thought to be applicable under this project at the time of appraisal.

### **Physical Objectives**

11. **Strengthening and Improvement of Main Roads:** At loan closing, 43.2 km of road were strengthened, compared with 46 km agreed at appraisal. These were: (a) Road Riviere Noire-Port Louis (27.3 km); and (b) Saint Jean Roundabout-Flic en Flac (15.87 km). The remaining work on about 2.8 km could not be completed due to the very high cost of land acquisition. The reduced scope of work did not have any negative impact in achieving the project's objectives and the Borrower's decision to defer this construction was sound. The initial works description did not include street lighting under this component (para 5a). However, on recommendation of the Borrower, the Bank agreed to include street lighting at the time of approving bidding documents. As a result, the project's accomplishments exceeded those agreed at appraisal in terms of improvement of road safety and convenience to the road users. In general, the upgrading works included: (a) strengthening of existing pavements with additional layers containing bituminous materials and graded crushed stone; (b) widening of the carriageway; (c) improving horizontal and vertical profiles of existing alignments with new construction (about 15 km were realigned); (d) rehabilitation and improvement of the cross-drainage works; (e) constructing retaining walls, footpaths and hard shoulders; (f) providing road traffic signs, carriageway marking, guardrails, pedestrian handrails, bus lay-bys, milestones and ramps for disabled persons; (g) auxiliary civil engineering works for replacement of old water pipelines laid previously under the pavements, with new pipes laid at the appropriate locations; and (h) construction of crawler lanes for slow

moving traffic on steep slopes. All these upgrading works helped improve road safety, ease traffic congestion, and good riding quality on improved road pavements.

12. **Resurfacing Program:** At appraisal, it was agreed to complete resurfacing (periodic maintenance) of 130 km of main roads. However, at loan closing 46 km were completed under Bank financing and the remaining 84 km were completed under local funding. During implementation, detailed investigation showed that severely deteriorated and uneven pavement surfaces and a poor drainage system required prior reshaping of the pavement and improvement of side drains. Those unplanned activities were essential in providing good riding conditions and protecting the investment made. Therefore, with the available Bank financing, it was not possible to accomplish all the physical targets of resurfacing on account of additional costs. However, with local funds, MOW succeeded in: (a) reshaping the surface of pavement; (b) raising side drains wherever necessary; (c) cleaning and repairing drainage structures; and (d) providing pavement markings and traffic signs.

13. **Routine Maintenance:** All agreed equipment, material and supplies provided through the project for the carrying out of routine maintenance operations, were procured in time. Routine maintenance for 880 km of main roads and 27 km of motorways was completed, including, *inter alia*: (a) clearing of shoulders; (b) cleaning and repairing of ditches and culverts; (c) filling of potholes; (d) minor repairs and painting of bridges; (e) patching and resealing; (f) repainting of carriageway markings; and (g) repairing of road signs and traffic signals.

14. **Traffic Management:** Street lighting was completed for 3 km. Although funds for three traffic lights were covered under the Bank financing, MOW installed these under local funding. The project also included the improvement of intersections and provision of loop detectors, which were not completed by loan closing (para 16).

### **Institutional Development Objectives**

15. Given that at the time of appraisal in mid-1989, GOM reorganized the maintenance section of MOW and privatized implementation of resurfacing works, a component was added to strengthen the maintenance section. Accordingly, the project provided a total of 75 man-months of TA, which included: (a) 30 man-months for a periodic maintenance expert; (b) 24 man-months for a routine maintenance expert; (c) 6 man-months for a traffic management expert; and (d) 15 man-months for an environmental expert. During project execution, the Bank and the Borrower agreed to reduce the scope of TA earmarked for road maintenance as it was found that MOW had the capacity to carry out the services effectively without external expertise. Furthermore, the following institutional reforms were implemented: (a) creation of a Road Fund to finance road maintenance; (b) training of supervisory staff responsible for road maintenance; and (c) gradual increase of budget allocation for maintenance of roads from MuR40 million in 1989 to MuR110 million in 1995. As a result, TA of 54 man-months

earmarked for road maintenance were removed, but other TA were partially used (para. 16 and 17).

16. The project provided TA (6 person-months) for a traffic management expert to assist MOW in the preparation of the action program, proposals for a traffic circulation system, and the upgrading of road intersections. The Borrower hired a consultant for 3 person-months: the consultant's report was useful in providing a general overview of all the key issues relating to traffic master plan and road safety in Mauritius. However, the report did not contribute much to achieving all agreed targets of preparing an action program, proposal for traffic circulation system, and improvement of road intersections. In fact the consultant overestimated the capability of Traffic Management Unit (TMU), and failed to provide any practical assistance in the planning and implementation of traffic management related works (para 8). The consultant did not prepare any comprehensive action program based on short-term, medium-term and long-term needs to improve traffic management, as required in the loan covenant (para. 9). However, MOW launched several remedial actions, including bus lay-bys, paid parking and crawler lanes to ease traffic congestion on steep slopes, which were all found to be very useful.

17. The project also provided TA (15 person-months) for an environmental expert to assist in monitoring exhaust pollutants and setting up standards for vehicle emission control. The Borrower hired an environmental expert for two months and the consultant reviewed existing Road and Traffic Regulations making recommendations for incorporation into the existing regulations, which are now awaiting Government approval (Para. 21). Contrary to the loan covenants (para. 9), no action program was prepared by loan closing.

18. Development of human resources formed an integral part of the institutional development component under this project. It included technology transfer at management level, improved knowledge of the state of the art at the middle level, and on-the-job training at the technicians' level. One engineer attended a course in "Highway Construction and Maintenance", financed by the Japan International Cooperation Agency (JICA) during the period September/November 1993. Two Principal Engineers and two Engineers participated in courses on "Road Maintenance" in France during June 1994, and September 1994. The Chief Engineer, Traffic Engineer, and one Civil Engineer attended a course on "Traffic Management and Road Safety" in France during September 1994. The Chief Engineer and four Principal Engineers participated in a ten day seminar on "Contracts Law and Contract Management" in Mauritius in August 1993. Additionally, training courses were conducted for supervisory staff between July and November 1993 in Mauritius.

19. Because MOW retains its personnel and assures continuity in technical careers and responsibilities, and because experience acquired in management of unit costs (para. 26), the achievement of institutional objectives was substantial under the road maintenance and training, and only partial in the specialized areas of traffic management and vehicle emission control.

20. **Macroeconomic Policies.** No specific objectives relating to macroeconomic policies were agreed at appraisal. However, with regard to the completion of upgrading main roads (para 11) and resurfacing (para 12), the project contributed in meeting the following macroeconomic policy objectives: (i) more efficient utilization of the existing transport infrastructure, with emphasis on improving important routes carrying substantial volumes of goods and passengers; and (ii) maintaining all transport operations in a harmonized manner, in cooperation with the road users, and making them competitive, cost-effective and energy efficient.

21. **Sector Policies.** Although no specific objectives relating to sector policies were agreed upon at appraisal, the project largely supported the following policy objectives of the transport sector: (a) upgrading the road network to correct the structural weaknesses; (b) increasing support for road maintenance operations in the form of equipment, materials and supplies; (c) expanding the existing network to relieve congestion where roads have reached their traffic-bearing capacity; (d) supporting an additional center for vehicle examination facilities to ensure old vehicles are examined regularly; and (e) minimizing road accidents by improving riding quality, road alignments, street lighting, and the enforcement of speed limits.

22. **Environmental Concerns.** To achieve the objective of monitoring exhaust pollutants and setting up standards for emission control, a study was carried out by an environmental expert, who reviewed existing Road and Traffic Regulations, and made recommendations. The main findings were: (a) the amount of gasoline fuel used has increased by about 51% over the last five years (1987-91) while diesel fuel increased only 3.9%; (b) the gasoline used is of the leaded variety with a Research Octane Rating of 95. Before July 1992, the maximum amount of lead in gasoline was set at 0.84 grams per liter. Recently, the State Trading Corporation (STC) changed this specification and established a maximum lead limit of 0.4 gram per liter. The key recommendations were: (a) it would be unlawful to distribute any diesel fuel that has a sulfur content greater than 0.3%; (b) it would be unlawful to distribute any gasoline that has a sulfur content greater than 0.1%, lead content greater than 0.2 grams per liter, and a benzene content greater than 5%; and (c) after the three-point component check, vehicles shall be tested with a gas analyzer or opacity meter to determine the exhaust concentrations or opacity. Vehicles will pass inspections if exhaust gas concentration or opacity is less than the pass-fail criteria given in the report. MOW received regulations and legislation from other countries; however, these documents did not provide detailed and practical information about enforcement. Therefore the Bank suggested, and MOW agreed, to establish twinning arrangement with the Ministry of Environment, Singapore. This led to the signing of a contract for consultant services with SEMES, a firm working for the Ministry of Environment, Singapore. The study will start in mid-November 1995, and the report will be submitted by February 1996. This study is likely to prove helpful in establishing the standards and procedures for vehicle emission control. Although the environmental objectives relating to pollution control were partially achieved, a strong foundation has been provided and MOW is now committed to achieving these goals in the near future.

### C. MAJOR FACTORS AFFECTING THE PROJECT

23. *Factors not Generally Subject to Government Control:* (a) Several severe cyclone conditions, including cyclone Hollanda in 1994 that lasted for about four days, but their effect on the project was negligible because of MOW's organizational capacity and cyclone preparation procedures; (b) consultants' output partially affected the progress under the components of traffic management and environmental protection as no comprehensive action programs were prepared in these specialized areas (para 9); and (c) the Bank also overestimated MOW's institutional capacity in dealing with the issues of traffic control and transport related air pollution, and the time-frame provided for drafting regulations and establishing legal procedures was not adequate (para. 8).

24. *Factors Generally Subject to Government Control:* There were some difficulties in land acquisition (about 2.8 km in length), which was needed for road strengthening and its cost went very high. However, its effect on the project was negligible because the Government decided, and the Bank agreed, to defer road improvement for this small portion (para. 11).

25. *Factors Generally Subject to Implementing Agency Control:* (a) delays in procurement for civil works may have resulted in completion of upgrading works slightly behind schedule (para 25), although resurfacing and routine maintenance works were executed on schedule; (b) delays in procurement of consulting services resulted in late submission of the reports and consequently the action programs as covered under loan covenants could not be completed by loan closing (para. 9).

26. *Implementation Delays:* The loan was signed on May 7, 1990, and was declared effective on June 8, 1990. The civil works for strengthening and improvement were scheduled to begin in January 1990. The works for Lot 1 and Lot 2 began on November 18, 1991, and April 4, 1992, respectively, about two years behind schedule. Because of tedious review process, in particular by the Bank, it took longer than expected to finalize bidding documents, bid evaluation and award of contract. For Lot 1, bids were invited in December 1990, and contract was awarded on September 20, 1991, after a period of 9 months. For Lot 2, the bids were invited in December 1990, and the contract was awarded on January 6, 1992, after a period of more than one year. The contracts for both Lot 1 and Lot 2 were completed in April 1994, about 4 months behind the schedule set at appraisal. Progress gained momentum after April 1992, and despite unforeseen construction difficulties, the initial delay of two years reduced to only four months. The delay was caused by unforeseen difficulties met in the re-routing of existing electrical poles and drainage system, inclement weather and additional laying of water pipes. The Borrower requested extension of the scheduled loan closing date of June 30, 1994, to June 30, 1995, mainly to allow more time for complex issues of examining regulations and legislation to establish procedures for vehicle safety and emission control.

27. *Cost Changes:* At the final cost of US\$30.55 million, 43.2 km were strengthened and upgraded, compared with the target of 46 km at the estimated cost of US\$25.3 million (6%

less physical progress with 20% more cost). The final unit cost for strengthening and improvement works is US\$707,175/km, compared with US\$550,000/km (SAR, para 3.20), 28% more than the appraisal estimate. Since bid prices were already 25% higher than the appraisal estimates, it indicates that the cost of works was also underestimated at appraisal stage. The reason might be that MOW did not have any system for monitoring unit rates based on the annual increase in the price break-down of labor, material and equipment. Despite cost changes in some components of the project, there was no overrun under Bank financing because: (a) there were savings in the TA component; (b) some works agreed under Bank financing were completed under local funding (para. 12 and 14).

#### **D. PROJECT SUSTAINABILITY**

28. The benefits derived from road upgrading and resurfacing of main road sections will be greater than those expected at appraisal (para 36), and thus the project is likely to be sustainable. The main reasons are: (a) GOM's commitment to providing adequate funding for road maintenance in the coming years; (b) participation of road users in generating road funds; (c) increased technical capability of MOW, in the planning and operation of road maintenance, and (d) continued emphasis on training of supervisory staff. Based on the information provided by MOW, sufficient budget allocations have been made in the Ministry's recurrent estimates for all routine and periodic maintenance activities of the roads, which were recently strengthened, upgraded and resurfaced under the project. With the institutional reforms MOW introduced during the project implementation phase (para. 15), MOW is capable and has sufficient equipment, workshop facilities and supervisory personal to plan and implement all the required routine maintenance operations.

29. To ensure that the benefits from the upgrading and resurfacing of main road will continue as expected, adequate traffic management, including road safety on the project roads, needs to gradually increase in the following years. Over the last five years, vehicle fleet size has risen more than 50%, from 107,513 vehicles in 1989 to 168,158 in 1993, whereas the length of roads has hardly increased by 4% in the corresponding years, from 1,801 km in 1989 to 1,881 km in 1993. In the absence of remedial measures regarding emission control, the sustained growth in vehicle fleet is likely to create transport-related environmental problems (para. 21). However, the Government and MOW are committed to easing traffic congestion, improving road safety and mitigating environmental concerns by proposing new transportation projects, and setting up a pollutant control and monitoring system. The Ministry of Finance (MOF) also provided additional budget for traffic management and environmental protection in the coming years.

30. MOW executes road maintenance operations on an ad-hoc, but highly efficient, basis. This approach might further benefit from the introduction of a pavement management system based on traffic counts, existing pavement conditions, and climatic situations.

## E. BANK PERFORMANCE

31. **Identification and Preparation:** The project was identified in discussions between GOM and the Bank. It followed FHP and to fit in well with the Government's development plan and the Bank's strategy for the country (para. 6). The project, which formed the part of a highway program, was prepared with the support of consultants.

32. **Appraisal:** The Bank thoroughly reviewed the Highway Program of MOW (para. 4), and correctly selected the most economically viable sub-projects for upgrading and resurfacing. The need for preparing "Action Programs" for traffic management and vehicle emission control was correctly addressed during appraisal, and adequately highlighted as major covenant in the Loan Agreement (para. 9). However, the contents and methodology of preparation of these action programs were not clearly spelled out in the project documents. As a result, no action program could be completed by the loan's closing date. It looks as if the Appraisal Mission did not include a sufficient skill mix, and no detailed TORs or output of the consulting services were agreed before negotiations. In designing excessive TA for maintenance experts (54 man-months), the institutional capacity of the implementing agency was not adequately assessed. As a result, TA remained largely unused (para. 15). The resurfacing program (130 km) selected at appraisal was not found practicable, and the scope of work was substantially changed during implementation (para. 12). On balance, the Bank's performance in this area was mixed, satisfactory in the case of civil works, and marginally satisfactory in the case of other components.

33. **Supervision:** The Loan was declared effective on June 8, 1990. Progress was very slow at the beginning and no civil works were launched until early-1992, two years behind appraisal schedule. Both the Borrower and the Bank took a long time to finalize bidding documents. However, in May 1992, progress gained momentum and works were completed in April 1994, only 4 months behind appraisal schedule (para. 25). The quality of supervision was professional, objective and based on a solid understanding of the Borrower's institutional capabilities and the Bank's policies and procedures. During implementation, the Bank-Borrower relationship was beneficial and productive, as measured by the physical results achieved and the preparation of new Port Louis Ring Road Project. The Bank gave useful advice on remedial actions to ease traffic congestion (para. 16) and on revising roads and traffic regulations based on the Singapore experience (para. 21), which were all appreciated and implemented by the Borrower. All loan covenants were appropriately enforced and the performance rating given in the supervision forms 590 were fitting. On the whole, the Bank's performance in supervision was highly satisfactory, in both quality and quantity.

## F. BORROWER PERFORMANCE

34. **Preparation:** The project formed part of the Highway Program FY90-93, which was prepared by MOW. The Borrower's performance in reviewing the highway program and selection of the priority items for the SHP components was satisfactory. The main roads selected for upgrading were highly circulated and were designed in accordance with approved international standards. The economic criteria based on ERR adopted in selection of main road sections for strengthening and upgrading was acceptable. However, the resurfacing program of 130 km selected for the main roads was not based on a maintenance management system, although it was prepared on the basis of two successive studies conducted by consultants in 1985 and 1988. It was not found practicable, owing to the weakness of existing pavement, and substantial changes were made in the scope of work (para. 12).

35. **Implementation Performance:** The Borrower's performance in completing the civil works component was satisfactory. Despite an initial delay of about two years, the Borrower managed to complete civil works with an over-run of only 4 months, and well ahead of the extended loan closing date (para. 25). Outputs of the routine maintenance were highly satisfactory as compared to other countries in Africa. On resource mobilization, a Road Fund was established in 1990 to finance road maintenance with revenues derived from a levy on fuel sales. The quality of all completed civil works was more than satisfactory. However, specialized components relating to traffic management and vehicle emission suffered delays (para. 16 and 17).

## G. ASSESSMENT OF OUTCOME

36. The project's outcome was satisfactory in that its major objective of protecting capital investment not only by strengthening of road pavements, but also by placing greater emphasis on drainage, street lighting, and the realignment of critical sections was achieved. The outcome will prove beneficial to road users and other sectors of the economy. All civil works components were completed as planned, and their ERR were higher than the minimum rate of 12%. Additionally, with regard to institutional development, the project increased the availability of local trained staff in MOW (para. 18).

37. **Economic Re-Evaluation:** Table 8 summarizes the economic re-evaluation of all sub-projects. Based on actual construction costs and on the most probable estimates of maintenance costs, investment made on road improvement projects produces an ERR ranging from 21% to 46%, compared with 21% to 30% at appraisal. The computed ERRs underestimate the full benefits of the project as they do not include benefits due to increased traffic safety, quality of service, and convenience to travelers on the improved facilities which are a substantial outcome of the project and which have been upgraded during project implementation. The economic benefits included savings in vehicle operating costs (VOC), passenger travel times and road maintenance costs. The existing traffic levels were obtained

through traffic count surveys, and the previous growth rates have been taken into account for the computation of benefits. This is likely to lead to a conservative estimate for the ERR as VOC and passenger time values have increased significantly during the last years. Despite the carefully made calculations, the revised ERRs values are greater than the lower values considered in the sensitivity analysis at appraisal stage. Furthermore, all investments would now yield first year benefit ratio (FYR) in excess of 16%, as compared to a threshold value of 12% calculated at appraisal stage. The ultimate beneficiaries of the completed project would be road users who, due to the diversity of the traffic using the road network, come from a wide range of sectors and income groups.

## **H. FUTURE OPERATIONS**

38. Since most of the civil works included strengthening, upgrading and resurfacing of the existing main roads, no formal plan of operation was established. However, to ensure routine and periodic maintenance for the improved roads, MOW has made all the necessary arrangements, including technical planning, budgetary provisions, mechanical workshops and adequate staff for road maintenance. Basic performance indicators such as pavement conditions, traffic volumes, and the number of accidents would be monitored for the following purposes: (a) reporting on the effectiveness of maintenance management; (b) regular assessment of the project benefits; and (c) improvement in road safety, easing of congestion, axle loads and vehicle emission control. Based on MOW's improved institutional capacity and GOM's priority for maintenance of highly circulated road infrastructures, efficient execution of road maintenance is no longer a concern. However, the Bank's assistance would still be required for further upgrading works in order to allow the country to maintain pace with the ever-growing traffic volume. This would not preclude a follow-up in the field of traffic management and VEC.

## **I. KEY LESSONS LEARNED**

39. The key lessons learned from the project are as follows:
- (a) The next resurfacing program for periodic maintenance would benefit from the setting up of a Pavement Management System, which would monitor and update all relevant data on condition surveys, pavement strength, rainfall intensity and classified traffic counts.
  - (b) To achieve all physical targets within allocated funding and ensure good financial control during the implementation of a project, unit rates used in the project cost estimates for various road activities play an important role. It is essential for a Road Agency to have a system for updating unit rates annually, based on the fluctuation in market prices for labor, equipment and materials.

- (c) Long-term RSMP, based on a transportation study, should provide a sound basis for a lending program of future investments and strategy of road development in the transport sector. MOW's list of prioritized potential road projects is useful for planning.
- (d) For capacity building of the road institutions, the possibility of establishing a twinning arrangement with other countries should be explored in the special areas of traffic management, transport-related air pollution, and technology transfer to the Borrower's country.
- (e) The TA component needs careful assessment with regards to the institutional capacity of the Borrower. For the preparation of action plans in this special area, it is necessary to include a sufficient skill mix in the project's appraisal team.
- (f) For major civil works contracts, procurement procedures should be achieved as close as possible to contract award, before the project becomes effective. As a general rule, the momentum of procurement procedures should over ride any other consideration within the Bank's guidelines. As far as possible, it is also recommended to adhere to decisions taken.
- (g) Objectives relating to sector policies, particularly involving legislation procedures, should not be too ambitious: their goals should be realistic, and above all, a reasonable time-frame should be allowed for their achievement.
- (h) In Mauritius, town roads are under the administration of municipal committees, feeder roads under the administration of District Councils, and main roads under the administration of the Technical Division of MOW. Although achieving the objective of decentralization is positive, strong inter-agency coordination is needed for harmonizing development and maintenance of the country's road network.

## PART II: SUPPORTING ANNEX AND STATISTICAL TABLES

### Table 1: Summary of Assessments

<b>A. <u>Achievement of Objectives</u></b>	<b><u>Substantial</u></b>	<b><u>Partial</u></b>	<b><u>Negligible</u></b>	<b><u>Not applicable</u></b>
Macroeconomic policies	( )	(✓)	( )	( )
Sector policies	( )	(✓)	( )	( )
Financial objectives	( )	( )	( )	(✓)
Institutional development	( )	(✓)	( )	( )
Physical objectives	(✓)	( )	( )	( )
Poverty reduction	( )	( )	( )	(✓)
Gender concerns	( )	( )	( )	(✓)
Other social objectives	( )	( )	( )	(✓)
Environmental objectives	( )	(✓)	( )	( )
Public sector management	( )	( )	( )	(✓)
Private sector development	( )	( )	( )	(✓)
Other (specify)	( )	( )	( )	(✓)
<b>B. <u>Project Sustainability</u></b>	<b><u>Likely</u></b>		<b><u>Unlikely</u></b>	<b><u>Uncertain</u></b>
	(✓)		( )	( )
<b>C. <u>Bank Performance</u></b>	<b><u>Highly Satisfactory</u></b>		<b><u>Satisfactory</u></b>	<b><u>Deficient</u></b>
Identification	( )		(✓)	( )
Preparation Assistance	( )		(✓)	( )
Appraisal	( )		(✓)	( )
Supervision	(✓)		( )	( )
<b>D. <u>Borrower Performance</u></b>	<b><u>Highly Satisfactory</u></b>		<b><u>Satisfactory</u></b>	<b><u>Deficient</u></b>
Preparation	( )		(✓)	( )
Implementation	( )		(✓)	( )
Covenant Compliance	( )		(✓)	( )
Operation (if applicable)	( )		( )	( )
<b>E. <u>Assessment of outcome</u></b>	<b><u>Highly Satisfactory</u></b>	<b><u>Satisfactory</u></b>	<b><u>Unsatisfactory</u></b>	<b><u>Highly unsatisfactory</u></b>
	( )	(✓)	( )	( )

**Table 2: Related Bank Loans**

<b>Loan Title</b>	<b>Purpose</b>	<b>Year of Approval</b>	<b>Status</b>
<i>Preceding Operations</i>			
1. 0976	Port Development	1974	Completed
2. 2229	Water Supply I	1982	Completed
3. 2337	Highways I	1983	Completed
4. 2728	Sugar Industry	1986	Completed
5. 2791	Industrial Sector Adjustment	1987	Completed
6. 2927	Industrial Finance	1988	Completed

**Table 3: Project Timetable**

<b>Steps in Project Cycle</b>	<b>Date planned<sup>1</sup></b>	<b>Date Actual/ Latest Estimate</b>
Identification	June 1988	June 1988
Preparation	December 1988	December 1988
Appraisal	April 28, 1989	May 3, 1989
Negotiations	June, 1989	August 11 - 25, 1989
Board Presentation	November, 1989	November 7, 1989
Signing	May, 1990	May 7, 1990
Effectiveness	June, 1990	June 8, 1990
Project Completion	June 30, 1993	June 30, 1994
Loan Closing	June 30, 1994	June 30, 1995

1. As provided in the Staff Appraisal Report (SAR).

**Table 4: Loan/Credit Disbursements: Cumulative Estimated and Actual**  
*(US\$ thousands)*

	FY90	FY91	FY92	FY93	FY94	FY95	FY96
Appraisal estimate	1,900	8,500	17,300	25,100	30,000	30,000	30,000
Actual	0	0,290	4,050	13,910	27,000	29,274	29,912
Actual as % of estimate	0	4	23	55	90	97	99
Date of final disbursement	0						Oct. 31, 1995

**Table 5: Key Indicators for Project Implementation**

<b>I. Key Implementation Indicators in SAR</b>	<b>Estimated</b>	<b>Actual</b>
<b>(A) Physical Objectives (Page 20 of SAR)</b>		
1. Strengthening and Improvement	46 km	43.2 km
2. Resurfacing Program	130 km	46 km*
3. Routine Maintenance Program	840 km	881 km
<b>(B) Traffic Management (Page 41 of SAR)</b>		
1. Street Lighting	3 km	3 km
2. Traffic Signals	3 No.	3 No.
<b>(C) Institutional Development Objectives</b>		
<b>(a) Technical Assistance (Page 43 of SAR)</b>		
1. Resurfacing Expert	30 people-months	Not Applicable (In-house capacity increased with additional staff)
2. Routine Maint. Expert	24 people-months	Not Applicable (In-house capacity increased with additional staff)
3. Traffic Management Expert	6 people-months	3 people-months
4. Environmental Expert	15 people-months	2 people-months*

\* The remaining  $130 - 46 = 84$  km of resurfacing program was completed under local funding.

\*\* Although loan was closed on June 30, 1995, the TA for a remaining environmental expert continued under local funding. MOW signed a contract in October 1995 with a consulting firm from Singapore for three people-months effective from mid November 1995.

**Table 6: Studies Included in Project**

Study	Purpose as Defined at Appraisal/ Redefined	Status	Impact of Study
1. Vehicle Emissions Standards	Monitoring the pollutants and setting up standards	Completed	Recommendation were made, but not yet approved by the Government. (Refer to ICR para 21)
2. Traffic Management	A review of Urban Transport and Road Safety	Preliminary Studies Completed	Provided good base to undertake final study

**Table 7A: Project Costs**

Item	Appraisal Estimate (US\$M)			Actual/latest Estimate (US\$M)		
	Local costs	Foreign costs	Total	Local costs	Foreign costs	Total
1. Strengthening and	8.19	15.50	23.69	10.7	19.85	30.55
2. Resurfacing Program	2.48	4.70	7.18	1.72	3.19	4.91
3. Supply of Equipment	0.39	2.41	2.80	0.51	2.70	3.21
4. Consultants' Services	0.24	2.19	2.43	0.13	1.84	1.97
5. Contingencies (Physical)	1.09	2.48	3.57	-	-	-
6. Contingencies (Price)	1.21	2.72	3.93	0.95	2.10	3.05
7. PPF	-	-	-	-	0.50	0.50
<b>TOTAL</b>	<b>13.6</b>	<b>30.00</b>	<b>43.60</b>	<b>14.02</b>	<b>29.59</b>	<b>43.61</b>

**Table 7B: Project Financing**

Source	Appraisal Estimate (US\$M)			Actual/latest Estimate (US\$M)		
	Local Costs	Foreign Costs	Total	Local Costs	Foreign Costs	Total
IBRD			30.00	0.00	30.00	30.0
Co-financing institutions	0.00	0.00	0.00	0.00	0.00	0.00
Other external sources	0.00	0.00	0.00	0.00	0.00	0.00
Domestic contribution	13.60	0.00	13.60	13.61	0.00	13.6
<b>TOTAL</b>	<b>13.60</b>	<b>30.00</b>	<b>43.60</b>	<b>13.61</b>	<b>30.00</b>	<b>43.6</b>

**Table 8: Economic Costs and Benefits**

Road/ Link	Length (km)	Appraisal Estimates				Revised Estimates			
		Year	Unit Cost (US\$ m)	AADT	ERR %	Year	Unit Cost (US\$ m)	AADT	ERR %
Rivere - Noire	27.9	1989	12.95	2700	21	1995	17.82	3500	21
Saint Jean	2.1	1989	2.51	19500	30	1995	2.84	25700	46
Palma Road	8.7	1989	6.30	4100	22	1995	7.84	5200	25
Flic & Flac	6.5*	1989	1.95	2200	24	1995	3.05	2900	26

\* Final length completed 5.0 km.

Table 9: Status of Legal Covenants

Agreement	Sect.	Covenant Type	Present Status	Original Fulfillment Date	Revised Fulfillment Date	Description of Covenant	Comments
LA	3.03	9	CP	12/31/91		MOW to submit to the Bank by no later than 12/31/91 an action program for the monitoring of ambient air quality studies for vehicle emissions and proposed studies for vehicle emissions.	Consultant reviewed "Road and traffic Regulations" in 10/92 and made recommendations, which would be incorporated only if approved by GOM and the Parliament. MOW has established a national committee and will prepare an action program after approval of committee's recommendations by GOM.
	3.04	9	CP	12/31/93		MOW to submit to the Bank by no later than 12/31/91 an action program to ensure effective traffic control.	MOW submitted draft action program in 6/93. It was not complete in all aspects of traffic management, and now MOW would resubmit it after the consultant's report of 6/94 is finalized.
	3.05	9	C	12/31/90		MOW to submit to the Bank, no later than 12/31/90, a time bound training program covering its FY 91-93.	The program was submitted in mid-92 and the first training sessions began in 9/92. Program is underway for the inspectorate staff.
	3.06	9	C			MOW to submit to the Bank no later than 12/31 of each year, a road maintenance work program covering the period of twelve months, commencing on the following July 1.	
	4.01	1	C			MOW to maintain adequate record and account to reflect resources and expenditure in respect of the project	
	4.01	1	C			Submission of audit reports.	
	(a)						
	(b)						
	(ii)						

**Table 9: Status of Legal Covenants (continued)**

Agreement	Sect.	Covenant Type	Present Status	Original Fulfillment Date	Revised Fulfillment Date	Description of Covenant	Comments
	5.01 (a)	10	C			MOW to maintain road network in accordance with appropriate routine and periodic maintenance practices	
	5.01 (b)	5	C			MOW to maintain road network equipment and workshop in accordance with appropriate engineering, administrative and financial practices	

\*C = covenant complied with  
 CD = completed after delay  
 CP = complied with partially  
 NC = not complied with

**Table 10: Bank Resources - Staff Inputs<sup>10</sup>**

Stage of Project Cycle	Planned		Revised		Actual	
	Weeks	US\$	Weeks	US\$	Weeks	US\$ (000) (including Travel)
Through appraisal	n/a	n/a	n/a	n/a	27.7	64.50
Appraisal—Board	n/a	n/a	n/a	n/a	25.1	58.40
Board-Effectiveness	n/a	n/a	n/a	n/a	6.85	58.40
Supervision	n/a	n/a	n/a	n/a	56.95	168.39
Completion	14	-	14	-	5.4	10.1
<b>TOTAL</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>122</b>	<b>340.20*</b> (08/29/95)

\* Travel costs are partial only as cost-accounting system newly set up could captured only part of person years travel expenses

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10. Also includes Bank-financed and trust fund consultants.

**Table 11: Bank Resources - Missions**

Stage of project cycle	Month/year	Number of persons	Specialized staff skills represented	Performance Rating		Types of problems
				Implementation status	Development impact	
Through appraisal				—	—	—
Appraisal through Board approval				—	—	—
Spn. I	10/90	2	FA, HE	1	1	n/a*
Spn. II	8/91					
Spn. III	12/91	2	FA, HE	1	1	n/a
Spn. IV	9/92					
Spn. V	12/92	1	HE	1	1	n/a
Spn. VI	3/93	1	HE	1	1	n/a
Spn. VII	7/93	1	HE	1	1	n/a
Spn. VIII	4/94	2	HE, RA	1	1	n/a
Spn. IX	7/94	2	HE, RA	1	1	n/a
Spn. X	11/94	2	HE, RA	1	1	n/a
Completion	7/95	1	HE	—	—	—

Spn = Supervision

\* n/a = no specific problem identified

FA = Financial Analyst

HE = Highway Engineer

RA = Research Assistant

*Note:* A Financial Analyst and Traffic Management Expert from the Bank also participated during separate supervision missions for which Forms 590 were not recorded.

## **BORROWER'S EVALUATION**

### **1. INTRODUCTION**

The conception of the Second Highway Project and its objectives must be viewed against the economic background of the late nineties. The economy was undergoing a period of transition. The traditional rural and monocultural economic base was rapidly being diversified with the emergence of a predominant manufacturing sector and the growth of trade, tourism and services. The average rate of growth was about 6%. This resulted in considerable pressure on the existing road network which is the only means of transport in the country. This network though quite extensive and fairly distributed has mostly evolved from agricultural tracks and its structure and layout were inadequate to handle the heavy traffic volumes and loads which it was being subjected to.

Consequently the Government of Mauritius, through its Ministry of Works, had engaged in an important road rehabilitation and strengthening programme to ensure an efficient movement of goods and services and support the economic development.

Some of the physical and institutional objectives of this program had been achieved under the First Highway Project which was completed in 1989 with part financing from the Bank. The Second Highway project formed part of the 1990-93 Highway Program and aimed at consolidating the achievements of the First Highway Project.

### **2. OBJECTIVES.**

The prime objective of the Project was to safeguard the capital investment on roads estimated in 1989 at about two billion US Dollars and to strengthen the planning and operations capacity for road maintenance within the MOW. The Project also aimed at optimising the use of the existing network and improving the safety conditions as well as the institutional development for effective vehicle emission and traffic control.

### **3. PROJECT COMPONENTS AND COSTS**

The Project financed the priority items of the 1990-93 Program. Its main components and costs are shown in Table 1 hereunder:

**TABLE 1: COMPONENTS AND COSTS**

ITEM	COST (US \$ )
Strengthening / Improvement ( 45 Km )	23.69
Resurfacing (130 Km )	7.18
Procurement of road maintenance equipment	1.00
Traffic management	1.50
Vehicle emission and traffic control.	0.30
Consultancy services /Training.	2.43
Contingencies	7.50
<b>TOTAL</b>	<b>43.60</b>

The rehabilitation works consisted in the strengthening and improvement of 45 km of roads servicing the west and the south western coast of the island.

The region has been undergoing a sustained development over the past years, particularly in the tourism and manufacturing sectors with the construction of a number of resort facilities and the relocation of certain heavy industrial units ( stone crushers, precast yards, etc.). The works involved the reconstruction and strengthening of the existing road base/ sub-base improvement of the road geometrics through vertical and horizontal realignments, construction of drains and footpaths, etc.

The resurfacing operations concerned 130 km of heavily trafficked roads out of a total of about 400 km which had been identified as requiring an overlay in the short term to avoid their premature failure whereas the traffic management component aimed at improving the road safety conditions and optimal use of the existing road capacity.

The acquisition of the road equipment formed part of the modernisation of the maintenance unit of the MOW to ensure adequate capacity for the proper maintenance of the infrastructure constructed under the project as well as the road network as a whole.

#### **4. FINANCING**

The project was financed upto an amount of US\$30 million (69% ) by the Bank. The Government of Mauritius provided the balance of US\$13.6 million (31%). All items of equipment and the main materials for the construction of the permanent works as well as the consultancy services were exempted from the payment of taxes and duties. Further, Government financed the resurfacing of 84 km of roads for an amount of US\$5 million.

#### **5. DELAYS.**

##### **5.1 Schedule**

The initial schedule proposed during appraisal stage, a copy of which is attached at Annex 1, provided for the implementation of certain components of the project to start during the

last quarter of 1989. However this was subsequently found to be quite optimistic as the Loan Agreement was only signed in May 1990. This was mainly due to the delay in the finalisation of the tender documents for the rehabilitation works which constituted the main component of the Project. It is to be noted that a first version of the documents had been modified *strictly* according to the comments made by the appraisal mission from the Bank which visited the country in May 1989. A copy of the telex dated 3<sup>rd</sup> May 1989 giving the Bank's comments is enclosed at Annex 2. The amended documents were transmitted for the approval of the Bank in June 1989. However in a telex dated 21<sup>st</sup> September 1989 the Bank requested fresh amendments to the modified documents besides raising new issues.

Government amended the documents in line with the new comments with the exception of one item relating to the removal of subclause 12.2 of the Conditions of Particular Applications (awareness of site conditions). This resulted in an exchange of a series of correspondence with the Bank which finally accepted the Government's stand following discussions with a delegation which visited Washington in May 1990. The Loan became effective in August 1990.

## 5.2 Rehabilitation Works

These works were divided into two lots and involved the following contracts :

- a) Consultancy services for the supervision of the civil works
- b) Construction of Lot 1
- c) Construction of Lot 2
- d) Supply , installation and commissioning of street lighting to the rehabilitated roads.

### 5.2.2 Appointment of consultants

The appointment of consultants was carried out following the evaluation of technical and financial proposals from a short list of consulting engineering firms.

Consultancy proposals were received in August 1990. The evaluation report thereof was sent to the Bank in December 1990 as the analysis of the information given in the technical submissions and the clearance of the local authorities was an exhaustive and time consuming exercise. The final clearance from the Bank was received in April 1991 and the draft contract was only approved on 31<sup>st</sup> May 1991. The contract for the consultancy services was signed in June 1991, i.e almost ten months after the receipt of the proposals. This delay had a direct effect on the subsequent implementation of the rehabilitation works.

### 5.2.3 Contract Awards.

Tenders from prequalified contractors were received in December 1990. In February 1991 Government decided to carry out the bid evaluation using its own resources due to the delay in the appointment of the Consultants. The Evaluation Report was sent to the Bank in May 1991 and a reply was received in July 1991.

Following negotiations with the selected Contractors on the basis of the Bank's comments, clarifications and additional information were transmitted to the Bank in August/September 1991. Subsequently the Bank approved the award for Lot 1 in September 1991 and this Contract was signed on 3<sup>rd</sup> October 1991.

As regards Lot 2, the Bank asked for *additional information not requested in its reply dated July 1991*. The negotiations with the Contractor and Bank's clearance process turned out to be a very lengthy procedure particularly as the Bank proposed that the price adjustment for certain indices be subjected to a maximum limit. This was not in strict accordance with the Conditions of Contract proposed in the Tender.

Further this restriction had not been mentioned in the Letter of intent issued to the selected Contractor which had been based on the Bank's initial reply. The Contract for this Lot was finally signed in February 1992 .

The contracts for Lot 1 and Lot 2 were awarded respectively *nine* months and *fourteen* months after the date of receipt of bids whereas the initial validity of the tenders was six months.

It involved the exchange of six telexes in each case in addition to two office meetings with the Bank's officials in the case of Lot 2. Details of the correspondence exchanged with the Bank on this issue are attached at Annex 3.

### 5.2.4 Service Networks.

Coordination meetings had been held with the various authorities responsible for the service networks located along the project roads to allow them to carry out any proposed works well in advance.

Subsequently the rerouting of the water services were included in the main contracts whereas Mauritius Telecom carried out the improvement works on its network before the start of the rehabilitation works. As regards the electrical services a provisional sum was provided in the main contracts for any modifications required. No major problems were expected as similar arrangements had given satisfactory results in the case of the First Highway Project. However the provisions did not work out as expected in the case of Lot 1 and this resulted in a delay of about five months in the execution of the works for this contract. The reasons for the delay in displacing the electric poles were identified and appropriate measures were taken to avoid similar problems on Lot 2.

### 5.2.5 Overall Delay.

It should be pointed out that all the works were completed with an overall delay of only four months on the initial appraisal schedule. The professional approach of the supervision missions during which all issues relating to approval of tender documents, contract awards and other aspects were discussed and a close collaboration between Government and the Bank were instrumental to the reduction of the accumulated delay.

## 6. PROJECT IMPLEMENTATION.

### 6.1 Rehabilitation works.

The contract for Lot 1 was awarded for an amount of Rs 287 million (27.37km) to the joint venture A&J Maurel/Colas. The works started in November 1991 and were scheduled for completion in November 1993. However, the contractor was given an extension of time of five months, with costs, on account of the delay in the relocation of the electric poles and the works were completed in April 1994.

The final cost of the works was Rs 302 million. At the end of the Defects Liability Period the pavement was found to show signs of apparent bleeding at three locations covering a total length of about 2 km. Subsequent tests showed that the bleeding was only superficial and the defect was probably due to the excessive stresses induced in the pavement structure at two of these locations which were situated in a sharp bend and on a steep slope respectively. However, the defective surface at the third zone (500 metres) was found to be directly attributable to a very high bitumen content of the asphaltic concrete wearing course and the Contractor was instructed to take remedial measures.

The retention money relating to this section was withheld until the completion of the remedial works in September 1995. The Defects Liability Certificate was issued on 9<sup>th</sup> October 1995.

The contract for Lot 2 was awarded to Transinvest Engineering Co.Ltd for the sum of Rs 227 million (18 km). The works started in April 1992 and were completed within schedule in April 1994 at a total cost of Rs 233 million. The total length of road rehabilitated under this contract was reduced to 15.7 Km as a result of land acquisition problems encountered on the last 2 km of the project road. The savings were used for the construction of a crawler lane on a steep section of the project road on a length of one km. and to provide an asphaltic concrete wearing course in place of the proposed surface dressing on the last five kilometres of the project (Flic en Flac Rd). The contract for Lot 2 also included the execution of the works for Phase 1 of the Reconstruction of St. Jean Roundabout through an nominated subcontract. Following a tendering exercise the bid submitted by Transinvest Engineering was found to be the most competitive and the works were carried out as a variation to the main contract. The works did not show any major shortcomings at the end of the Defects Liability Period.

The average cost of the works per kilometre of road was about Rs 12.5 million (Rs11 million in the case of Lot 1 which was located mostly in rural areas and Rs 14.5 million for Lot 2 which included a heavily built up urban zone). This figure is about 30 % higher than the expected average of Rs 9.5 million during appraisal stage. It is to be noted that the variation of prices accounted for less than five percent of this increase and that the bid prices obtained at tender stage were almost 25 % higher than the appraisal estimates. This indicates that the cost of the works were probably underestimated at appraisal stage. It is also likely that the delay in the finalisation of the tender documents (refer Para 5.1) coupled with the high (two digit) inflation rate over the period from 1988 when the feasibility study was carried out to 1991 contributed to the increase in the base cost.

## 6.2 Resurfacing

Only 46 km of roads were resurfaced under the Project out of the scheduled 130 Km. Under the original program it had been proposed to restrict the operations to the provision of an overlay to the road surface. However subsequent detailed investigations showed that it was essential to carry out some improvements to the existing drainage system to protect the investment being made. Further the need for better driving conditions through minimal reshaping of the pavement was also found to be necessary to attract the targeted traffic and hence reduce the congestion on the other heavily trafficked roads

These measures , coupled with external factors such as inflation, doubled the cost of the resurfacing works from the appraisal estimate of Rs 0.9 million to almost Rs 1.8 million per kilometre and hence the reduction in the length resurfaced under the Project. The outstanding 84 km were resurfaced by Government from its own resources during the project implementation.

The works were procured through both local and international competitive bidding procedures in accordance with the Guidelines of the Bank.

### 6.2.2 LCB

15 km of roads were resurfaced through seven small contracts under local bidding procedures for a total amount of about Rs 18 million. The works were completed on schedule except in the case of St. Paul Rd where a delay was experienced due to the very poor condition of the existing drainage system.

### 6.2.3 ICB

The resurfacing of the Motorway ( M1 ) from Port Louis to Phoenix and the Mon Choisy-Cap Malheureux Road were carried out following a prequalification of contractors. However only the locally based contractors submitted bids for the works in each case despite the fact that foreign firms had been prequalified.

The tender for the resurfacing of the Motorway was awarded to the tenderer which had submitted the second lowest evaluated bid as the tenderer ranked first refused to accept the award on the terms and conditions stipulated in the Letter of intent and requested for a negotiation of the contract sum on the grounds that it had not been issued with a full set of drawings at tender stage and was unaware of the exact extent of the site of works.

Detailed investigations carried out by the Transport Research Laboratory (TRL) of UK which had been appointed by the Borrower to advise on the job mix formula showed that the pavement had undergone severe deterioration between the time of initial survey and the execution of the works. The consultants recommended that those sections that were severely damaged be reconstructed or repaired prior to the resurfacing to avoid damage to the resurfaced road through reflective cracking. This resulted in an increase of about Rs 5 million to the initial contract sum.

The resurfacing operations were carried out at night in order to cause minimum disruption to traffic on this very important link. The repairs were mostly executed during the day but restricted to off peak hours. The works were completed within the contractual completion period.

The contract for the resurfacing of Mon Choisy-Cap-Malheureux Road was awarded to Transinvest Engineering for the amount of Rs 26 million in October 1993 and completed in May 1994 without any major constraints.

### 6.3 Street lighting

The provision of street lighting along the Motorway (M1) from Caudan roundabout to Pailles and along the rehabilitated roads was included in the project to improve the safety conditions along these roads particularly after the completion of the improvement works. The street lighting of the rehabilitated roads had been initially included as a provisional sum in the contracts for Lot 1 and Lot 2. This item was subsequently removed from these contracts and the works procured through local competitive bidding with the agreement of the Bank.

The contracts for the rehabilitated roads and the Motorway were awarded to Messrs. Metamix and Design 2 limited for the respective amounts of Rs 7.1 million and Rs 7.0 million..

The works on both sites were completed at about the same time in September/October 1994.

### 6.4 Traffic Management.

This component of the project was not fully completed by the closing date. It included the implementation of a one way system in the city of Port Louis and the installation of traffic lights and loop detectors at important junctions as well as the acquisition of speed check

equipment. The initial schedule (Refer Annex 1) provided for the evaluation and award of the contracts for these works during the *first six months* of the implementation period in order to reap the maximum benefits from these traffic management measures. On the other hand the Loan agreement included a covenant for the submission of an action program for effective traffic control within the *first 24 months* of the implementation period. The traffic management measures detailed in the Loan agreement were a continuation of the traffic control scheme already initiated under the First Highway Project and had been discussed and agreed with the appraisal mission.

The preparation of the action plan, from the Borrower's point of view, was to provide Government with the essential tools for policy making and effective planning for traffic management and the adoption of a global approach and strategy and was complementary to the execution of the works already identified as mentioned above. However the Bank insisted that the action plan be submitted before the financing of any traffic management works under the project. This had serious effects on the component since the Action Plan could not be submitted by December 1991 as it had to be prepared by a consultant. Subsequently the Transport Research Laboratory(UK) was appointed as consultant to carry out a study and prepare the Action Plan. The study started in April 1993 and was completed in June 1993.

The plan submitted in the consultant's Report recommended the implementation of a series of measures such as controlled parking, additional traffic signal equipment, pedestrian facilities, etc. The following measures were implemented later in consultation with the Bank:

- Installation of 3 sets of traffic lights
- acquisition of speed check equipment
- Paid parking in Port Louis and the main urban areas.

As it was expected that there would be a shortage of credit under the Loan funds the works were financed from local funds.

Government has also restructured the Traffic Management Unit of the MOW and doubled the number of qualified staff (Engineers, Technicians) attached to the section.

#### 6.5 Vehicle Safety and Emission Control.

An environmental expert was appointed for the preparation of an action plan to monitor ambient air quality and to establish vehicle emission standards. The consultant's report revealed that there was an absence of practical measures applicable to the country. Following consultations with the Bank, Government has engaged the consulting engineering firm, SEMES, of Singapore to study the vehicle emissions and related legislation in the country and to develop guidelines and prepare draft legislation for

effective implementation of the control measures identified under the study. The study is expected to start in November 1995 and will involve about four man-months.

#### 6.6 Routine Maintenance

The maintenance section of the MOW has been reorganised into three sections of three administrative districts each headed by an engineer and under the overall responsibility of a principal engineer. Qualified technicians with experience in maintenance and rehabilitation works are attached to each of these sections.

The system of administrative units wherein the engineer in charge was responsible for both the roads and the buildings within a given geographical area has been discontinued to encourage specialisation on the part of the staff concerned. Government has also made a major change in its maintenance policy in that the direct labour is mostly involved in the routine maintenance aspects whereas periodic maintenance is carried out through force account. Additional road equipment were acquired under the project to modernize the maintenance fleet and enhance the capacity of these newly created units.

#### 6.7 Consultancy Services

The project provided for the procurement of consultancy services for the supervision of the rehabilitation works and for routine maintenance (54 man-months) as well as for traffic management and emission control.(21 man-months).Consultants were appointed for the supervision of the works as already pointed out at Para.5.2 above. However, the provisions for the routine maintenance and resurfacing works were not used as the reorganisation of the maintenance units and the recruitment of additional qualified staff increased the capacity of the Implementation Agency in these fields. The tender documents for the resurfacing works were prepared and evaluated and the field operations supervised by the borrower's staff with the agreement of the Bank.

Further the services of the traffic management and environmental experts were reduced to 3 and 2 man-months respectively. It must, however, be noted that an additional four man-months will be used for the emission control study as explained at Para. 6.5.

#### 6.8 Training.

A time bound training program was submitted to the Bank as per the covenants of the Loan Agreement. However, the Loan funds were not directly used for this component. The training of the middle and higher management was mostly carried out through bilateral aid programs with the Governments of France and Japan. Special training courses for the supervisory staff in the field were designed and implemented by the engineering cadre with the assistance of other relevant Departments (Finance, State Law Office, etc).

It must also be noted that the Government has committed itself to provide adequate training opportunities at all levels of the Public Sector, including the Highways sector, in an

effort to improve its services. The Mauritius Institute of Productivity and Management (MIPAM) which will cater for these training needs will be operational early next year.

## **7. KEY LESSONS**

The key lessons learnt during the project preparation and implementation are as follows:

- (i) The implementation schedule proposed during appraisal should be more realistic. This schedule should be reviewed prior to the signature of the Loan Agreement in case it is adversely affected by unforeseen events.
- (ii) The procedures for approval of tender documents should be clearly defined at appraisal stage.
- (iii) Technical assistance should be properly assessed and have clear objectives
- (iv) Those components of the project involving legislation and input from other Ministries should be more precisely detailed at the start of the project.
- (v) The procedure for contract awards by the Bank should be clearly established in order to minimize delays. Any queries should be sorted out through direct discussion rather than protracted correspondence.





IMAGING

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