República de Moçambique
Ministério das Obras Públicas e Habitação

Road Sector Strategy 2007 - 2011

Final Report

August 2006



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Preface

The Road Sector Strategy 2007 – 2011 (RSS) was prepared for the Government of Mozambique by the Administração Nacional de Estradas (ANE), with the assistance of the Road Fund and Ministry of Public Works and Housing.

The RSS is based upon the Draft Final Report of the Review of Road Sector Strategy and Phase 2 Planning, prepared for ANE by Stewart Scott International (SSI) in Association with Sociedade de Engenharia e Desenvolvimento (SEED). The RSS also draws from drafts of the Paved Road Works Program and Unpaved Road Works Program, both of which were also prepared by SSI and SEED.

The present volume (and Map Supplement) summarizes and revises Volume I of the Draft Final Report, The Revised Road Sector Strategy, containing the essential features of the Strategy. Volume II: Strategic Analysis, is intended for readers who want to delve further into the analysis behind the Strategy. In addition to an analytical review of the original Integrated Road Sector Strategy and detailed explanation of the proposed changes, it contains the full versions of the Strategic Maintenance Plan and the Preliminary Investment Plan and Project Prioritization. Volume III: Stakeholder Consultation includes much of the basic input that went into the revision of the Strategy, in addition to a report on the seminar that was held to discuss the initial findings of the Review. Volume IV: Candidate Projects is a compendium of the candidate projects and the details on their technical aspects and justifications. Volume V: Maps, contains all of the maps used in the report and is a useful companion to all of the Volumes.

Summary Table of Contents of the Review of Road Sector Strategy and Phase 2 Planning

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Abbreviations

AADT ..... Average Annual Daily Traffic
ADB ..... African Development Bank
ANE ..... National Roads Administration
DEP ..... Provincial Department of Roads and Bridges
EIRR ..... Economic Internal Rate of Return
EOI ..... Expression of Interest
ETB ..... Emulsion Treated Base
EU ..... European Union
GIS ..... Geographical Information System
GOM ..... Government of Mozambique
HDM ..... Highway Design and Maintenance Standards Model
HNMS ..... Highway Network Management System
IDA ..... International Development Association
IDB ..... Islamic Development Bank
INAV ..... National Institute of Road Traffic
IRMS ..... Integrated Road Management System
IRSS ..... Integrated Road Sector Strategy
JBIC ..... Japan Bank for International Cooperation
LEM ..... Engineering Laboratory of Mozambique
MCA ..... Multi-Criteria Analysis
MER ..... Monitoring, Evaluation and Reporting
MOPH ..... Ministry of Public Works and Housing
NGO ..... Non-Governmental Organization
N/C ..... Unclassified Roads
PAF ..... Planning and Assessment Framework
PARPA ..... Programme for Poverty Reduction (PRSP)
PIP ..... Project Implementation Plan
PPP ..... Public Private Partnerships
PRMC ..... Provincial Road Management Consultants
PRMP ..... Paved Road Management Program
PRMU ..... Paved Road Management Unit
PRWP ..... Paved Road Works Program
RBMMP ..... Roads and Bridges Management and Maintenance Programme (Roads 3)
RRIP ..... Regional Roads Investment Program
RRIF ..... Regional Roads Investment Fund
RSS ..... Road Sector Strategy 2007 2011
SADC ..... Southern Africa Development Community
SATCC ..... Southern Africa Transport and Communication Commission
SFP ..... Strategic Financial Plan
SIP ..... Strategic Investment Plan
SMP ..... Strategic Maintenance Plan
SWAP ..... Sector Wide Approach
TI ..... Targeted Intervention
TM ..... Transitability Maintenance
TOR ..... Terms of Reference
VAT ..... Value Added Tax

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1 INTRODUCTION

1.1 General

The Road Sector Strategy 2007 - 2011 (RSS) presents the main elements of the Government of Mozambique's (GOM's) strategy for developing and managing the country's classified roads. The RSS is based upon the GOM's Road Sector Policy which establishes the broad goals and priorities for the sector in the context of national policy.

RSS has been formulated following a consultative process that included a review of the Integrated Road Sector Strategy (IRRS, 2001), stakeholder consultations, formulation of strategic plans for investment, maintenance and finance, and presentation to a broad audience of GOM officials, road sector professionals, the donor community, and other stakeholders. The analytical background and further detail for RSS can be found in the 5-volume "Revised Road Sector Strategy".

The RSS takes a medium- long-term perspective of the development and management of the classified road network of Mozambique.[1] RSS adds a level of detail to the GOM's Road Sector Policy to establish the main principles, approaches, and activities that will be undertaken through the end of Roads-3, GOM's 10-year road's program. The strategic plans for investment, maintenance and finance included in RSS are prepared for a 5-year horizon, 2007 – 2011. Both RSS and the 5-year strategic plans should be reviewed and revised in 3 year's time in preparation for Phase 3 of Roads-3. The figures, projects descriptions and plans presented in this report are current through May 2006; subsequent developments will be reported in the Project Implementation Plan.

A detailed set of plans for the period 2007 – 2009 are being prepared for inclusion in a separate document, the Roads-3 Phase 2 Project Implementation Plan (PIP 2007 - 2009). PIP 2007 - 2009 includes detailed programs of works (paved and unpaved, investment and maintenance, national and provincial) and sector support activities (road sector planning and management, capacity building, road safety, and axle load control). Procurement, implementation and disbursement schedules are also included in PIP 2007 - 2009, as are the performance indicators that will be used to measure accomplishments and performance.

PIP 2007 - 2009 will be reviewed and adjusted annually to take into account changes in needs and resource availability. Toward the end of Roads-3 Phase 2, the program for Phase 3 (PIP 3) will be prepared based upon a revised Strategy and rolling 5-year plan.

The purpose of this Volume is to present a clear and concise description of RSS which will guide road sector planning, programs, and implementation during the Phase 2 of Roads-3. Most of the major principles and elements of the original IRSS remain valid. Those aspects of RSS that have been modified or added are explained in more detail.

[1] Although the urban and unclassified road networks are not addressed in detail, RSS recognizes the need for strategic and detailed planning for these sub-sectors. An important part of the Road Sector Strategy is to undertake urgent and immediate data collection, needs assessments, and planning for these networks.

1.2 Thematic Overview

RSS is a guide to road sector planning, programs, and implementation during Phase 2 of Roads-3. The overall theme relates to ***Consolidation and Strengthening*** of the improvements that have been achieved to date.

The main new themes of RSS are *asset preservation*, *enhanced transitability*, and *maintainability*. These complement the main principles elaborated in the original IRSS: *sustainability*, *connectivity*, *and accessibility*. These objectives will be achieved through sound sector planning, management and implementation. The key elements of RSS include:

Sustainability: by prioritizing maintenance and ensuring that adequate funds are allocated and effectively used to provide quality and appropriate maintenance on both paved and unpaved roads. A key principle guiding all investment and resource allocation in RSS is to ensure that what is upgraded and rehabilitated is then maintained. Resources will be allocated to maintenance activities so as to ensure the preservation of road sector assets, even at the expense of deferring desirable and worthy investments. Donors will participate in financing some of the maintenance requirements, predominantly in supporting timely periodic maintenance on the paved road network.

Asset preservation: to ensure that what has been rehabilitated and can be sustained through standard maintenance, actually receives that maintenance as a matter of highest priority. This principle applies most especially to the paved road network, and RSS includes a *Paved Road Management Program* with the stated goal of preserving this valuable investment while ensuring a good level of service on the country's paved road network.

Transitability: to provide at least minimal access to those communities and districts to which existing access roads have deteriorated to the extent that they are cut off from the main trunk network, through investments (*targeted interventions* and *spot improvements*) and through the implementation of *transitability maintenance which ensures that roads are passable almost all year*. Annual targets will be established to increase the share of the network that is transitable with the goal of 95% transitability by the end of 2011.

Selective rehabilitation and upgrade: Selected rehabilitation and upgrade of priority segments of the main road network are also components of RSS. Priority is given to upgrading the entire *primary road* network to paved standard by the end of Roads-3. Rehabilitation and construction of bridges is a key element of RSS, especially in light of their importance for ensuring transitability.

Balanced investment: by explicitly providing resources for the rehabilitation and opening of vital rural links in the regional roads network. Selected upgrade and rehabilitation of the secondary network and regional roads networks (tertiary and vicinal roads) will be prioritized, planned and programmed on a provincial basis so as to ensure balanced and sustainable development of the network. To this end RSS includes the creation of a *Regional Roads Investment Program and Fund*.

Rational allocation of investment resources: proposed projects will be systematically evaluated and prioritized using the fundamental principles of connectivity and accessibility, justified on social-economic grounds, designed to provide the minimum level of service required consistent with minimum life-cycle costs, and capable of being maintained properly. Project designs will take into account the limitations of financial and implementation capacity, applying minimum maintenance-friendly standards with the objective of achieving the optimal network performance.

Improving road-sector management: good sector management and timely decision-making in terms of planning, procurement, and contract management is the simplest and cheapest way to make scarce sector resources go farther. The role of planning will be enhanced, and monitoring and evaluation will be incorporated into road sector management, including bi-annual reviews of performance and achievement of targets.

Develop true capacity: the desired development of local capacities in the public sector as well as in the private sector will only come about with experience gained from performing the required tasks. This will require a complete rethinking of the approaches to human resources management, training, and technical assistance, with accountability and on-the-job training as the essential elements.

Rationalizing sector finance: moving to a Sector Wide Approach to planning, finance and assessment will enhance efficient resource allocation and control. A sector budget approach to financing maintenance and investments (the so-called *single channel* or *sector budget support*) will facilitate a cohesive implementation of RSS, avoid fragmentation and duplication of efforts, and promote harmonization of procedures among the various funding partners.

Innovate, experiment, but most importantly, implement change: RSS contains numerous initiatives to improve sector performance. These range from promoting technical solutions such as emulsion treated bases (ETB) designs to planning rolling works plans and programs to alternative contracting methods such as multi-year level-of-service maintenance contracts. Road sector management will evaluate the impact of the various initiatives and strive to expand the implementation of those approaches which prove most successful.

Table 1: Summary Road Conditions

Condition	Paved Roads [a]	Unpaved Road Network [b]			
		Unpaved Total	of which		
			Fully Transitable [c]	Semi-Transitable [d]	Intransitable [e]
Kilometers					
Good	3,698	4,221	3,648	507	66
Fair	1,302	8,501	6,801	1,432	268
Poor	649	11,596	3,311	5,371	2,914
Total	**5,649**	**24,318**	**13,760**	**7,310**	**3,248**
Percent [f]					
Good	65%	17%	15%	2%	0%
Fair	23%	35%	28%	6%	1%
Poor	11%	48%	14%	22%	12%
Total	**100%**	**100%**	**57%**	**30%**	**13%**

a. Data from paved road visual assessment, March – April 2006. Conditions are projected for roads currently under works and therefore overstate share of roads in good condition.
b. Data from interviews with provincial roads personnel, April 2006.
c. Fully transitable: road is open to "normal" traffic all year without closure.
d. Semi-transitable: road is closed to "normal" traffic intermittently during rainy season.
e. Intransitable: road is closed to "normal" traffic during most of the year.
f. Percentages shown separately for paved and unpaved roads.

Current Road Conditions Usage: Mozambique's classified road network consists of almost 30,000 kilometers of roads, of which less than 20% (5,649 kilometers) are paved. In general, the condition of the paved road network is better than the unpaved network (see Table 1). Almost half of the unpaved roads are in poor condition, and only 57% are fully transitable by normal (non four-wheel drive) traffic.

In terms of road usage it can be seen that the paved road network carries the largest share of traffic in terms of estimated vehicle-kilometers, almost 85% (see Table 2). The analysis of road usage indicates that while the unpaved road network is important for accessibility goals, the greatest economic impact of poor road condition is concentrated on the more heavily trafficked paved roads.

Table 2: Summary Road Usage by Condition

Condition	Paved Network		Unpaved Network		Total
	Vehicle kilometers [a]	%	Vehicle kilometers [a]	%	
Good	1,354	58%	89	4%	1,443
Fair	335	14%	181	8%	516
Poor	266	11%	112	5%	378
Total	**1,955**	**84%**	**381**	**16%**	**2,336**

a. Based on databases for paved and unpaved roads described above.
b. Million vehicle kilometers estimated from ANE traffic count and survey data.

1.3 Structure of the Report

The main elements of RSS are presented in five chapters following this Introduction:

Chapter 2: Principles of the Road Sector Strategy 2007 - 2011 is a summary of the main principles and plans of RSS. It begins with an overview of the vision of road sector management and a brief description of the role of the road sector in promoting national and PARPA objectives. It then presents the six fundamental principles guiding RSS and concludes with sections on long-term network vision and planning and description of the Paved Road Management and Regional Roads Investment Programs.

Chapter 3: Strategic Plan presents the framework for the three plans that make up PIP 2007 - 2009: the Strategic Maintenance Plan, the Strategic Investment Plan; and the Strategic Financial Plan

Chapter 4: Strengthening Sector Management addresses those actions which will be taken to improve overall management of the road sector, and the institutional and management changes that are planned in RSS.

Chapter 5: Fine-Tuning Road Sector Finance deals with the measures required to ensure adequate financial performance of the road sector. These include a statement of the principles of road sector financing under RSS and specific actions which are planned in order to enhance revenues and improve road services.

Chapter 6: Value for Money Through Better Engineering addresses the crucial technical matters that lie at the heart of providing road users with good roads. These include the maintenance approaches to be utilized in RSS, maintenance management issues, development and application of appropriate standards, and road safety and axle-load controls.

2 PRINCIPLES OF THE ROAD SECTOR STRATEGY 2007 - 2011

2.1 Reinforcing the Strategic Principles and Vision

The Road Sector Strategy 2007 – 2011 is premised on the view that the harmonious development of the country's economy depends upon the compatibility of national and road-sector development plans and policies. The ultimate goal of RSS is to substantially contribute to the GOM's objectives for economic growth and poverty alleviation, especially in rural areas. The commercial orientation of RSS is in keeping with the Government's sectoral policies of maximizing the economic profitability of investments made in the road network while minimizing total road-sector transport costs.

The overall thrust of RSS is to create an *efficient, dynamic, independent,* and *responsive* system of roads management that is capable of implementing national and provincial policies and effectively delivering road services desired by road users.

RSS is formulated to achieve these objectives in a sustainable manner by prioritizing maintenance and by ensuring the required funding for maintenance of rehabilitated roads through road-user charges. Priority is given to asset preservation by maintaining roads that are already in transitable condition and by expanding transitability to the entire classified network. Revenues are to be collected from road users in a manner that ensures a sufficient flow of funds to cover all maintenance needs.

This vision presented in RSS reflects a Sector Wide Approach, encompassing a unified, coherent and coordinated program of investment, maintenance, management, finance, institutional development and capacity building. All stakeholders and partners shall act in coordinated fashion, with RSS as the guiding instrument for planning and implementing sector activities, under the leadership of the Ministry of Public Works and Housing (MOPH) and its main implementing agencies, ANE and the Road Fund. To the extent possible, all plans and procedures shall be harmonized so as to ensure consistency and compatibility.

2.2 The Road Sector and National Objectives

Sector policy and RSS recognize the dual roles of the road network: (a) ensuring the social and economic mobility necessary for promoting growth; and (b) fostering regional development by providing secure links to all areas of the country. The specific rationales for improving the road network are:

- *National Integration*: Better roads contribute to the reduction of regional differences and to the building of national unity through integration resulting from enhanced transportation services.
- *Economic Growth*: Better roads stimulate economic growth by reducing transportation costs and providing access to markets. They facilitate marketing of agricultural commodities by ensuring reliable delivery of inputs and timely marketing of production at reasonable cost.
- *Strategic Asset*: Better roads bolster Mozambique's strategic geographical position as an essential transit corridor for its landlocked neighbors, facilitating their access to international markets.
- *Poverty Reduction and Social Development*: Roads provide access to District capitals, employment opportunities, schools, health-care facilities, and other social services.

2.3 Road Sector Strategy and the PARPA

The Goals and objectives of RSS are consistent with the *Programa do Governo para a Redução da Pobreza Absoluta,* or PARPA, the Government's program for poverty reduction. The PARPA establishes five major goals for the road sector:

- *Supporting Markets*: To contribute to the expansion of markets, in particular in the agricultural sector;
- *District Access*: To ensure access to districts with the greatest economic potential, focusing on provinces with high population densities and high concentrations of poverty;
- *Connectivity*: To establish connectivity between the major regions of the country and to develop the main corridors;
- *Decentralization*: To improve the capacity at the provincial and local level for the management and prioritization of roads civil works; and
- *Quality of Works*: To improve the quality of the roads civil works, including construction, rehabilitation and maintenance.

The specific targets established in the PARPA are incorporated in the PIP 2007 - 2009 performance indicators. RSS includes *systematic monitoring of progress toward achievement of the PARPA goals*.

- All planning activities and resulting documents shall explain how the proposed actions contribute to the PARPA goals.
- ANE and the Road Fund shall hold an annual review of the PARPA's transportation objectives in light of institutional priorities.
- The Planning and Assessment Framework for the road sector shall include an annual report on achievement of the PARPA goals for the road sector.

2.4 Fundamental Principles

Six fundamental principles underlie the Revised Road Sector Strategy and are incorporated in the Plan for Phase 2. These include *Sustainability*, *Connectivity*, *Accessibility*, *Transitability*, *Asset Preservation,* and *Maintainability*. While interrelated, each of these principles identifies a separate aspect of the management of roads that when combined with the others, serves to achieve the Government's overall sectoral objectives. The first, sustainability, addresses an overall approach to sector management. Connectivity and accessibility focus on priorities for the development of the Mozambican road network. The last three, transitability, asset preservation, and maintainability underlie the approach towards maintenance interventions.

Sustainability

The most fundamental principle of RSS is to assure the *sustainability* of the road network and to ensure that resources invested in the sector yield long-term benefits to the economy. This requires three separate conditions:

Sustainability of maintenance: Ensuring that civil works are planned and implemented so as to preserve the investments and reduce total life-cycle costs of rehabilitation, maintenance and operation of the infrastructure. Under RSS:

- Maintenance is prioritized ahead of new investment activities;
- the highest priority is given to effective routine maintenance;
- periodic maintenance will be programmed, budgeted and implemented so that roads don't fail before their design life;

- rehabilitation of roads that are not maintainable using standard methods will be undertaken only when maintenance can be assured.

Financial sustainability: Ensuring that financial resources are sufficiently and timeously available to finance programmed civil works. Delayed maintenance leads to accelerated degradation of roads conditions and disproportionately higher costs for restoring roads to acceptable conditions. Under RSS:

- flows of maintenance funding will be sufficient and stable;
- maintenance budgets will be timely and funding will flow without delays;
- road user charges will increasingly finance maintenance needs;
- maintenance funding gaps will be given priority over new investment.

Sustainability of capacity: Ensuring that the capacity exists to implement the programmed civil works, including capabilities on both the road management side and on the works execution side. Under RSS:

- data collection, information management and network maintenance planning systems and tools to program required maintenance will be implemented;
- procurement of consulting services and civil works will be responsive and rapid so that interventions are executed on time;
- effective contract management will ensure that quality services are delivered as specified and within budget;
- programs will be implemented to develop local consultant and contractor capabilities and capacities (technical, financial, and access to equipment) to satisfactorily execute the quantity and quality of maintenance services.

Connectivity

Connectivity is directly related to the goal of national integration and mainly refers to the role of the primary, and to a lesser extent, the secondary road networks in connecting the nation's provinces, provincial capitals, and main international corridors. It also contributes to national economic development by connecting national and international markets to zones of production and consumption.

The principle of connectivity mainly applies to the prioritized approach to the rehabilitation and upgrading of the main trunk network of roads. The main principles under RSS include:

- achieving and sustaining a good level of service on the N1 from Maputo to Pemba, including the Zambezi River Bridge;
- ensuring secure and continuous connectivity to the network for all provincial capitals;
- giving priority to the main *international corridors* that provide access to Mozambican ports and to international border crossings;
- achieving regional balance in development of *national corridors* to connect major regional social, political and commercial centers.

Accessibility

The concept of accessibility refers to the role of *secondary roads* to provide access to high-priority economic poles and to the role of *tertiary and vicinal roads* to improve and expand rural accessibility, especially in densely populated and economically productive regions. Accessibility is closely related to the concept of transitability.

The main goal for the secondary network is to serve priority economic areas that contribute to economic growth—agricultural areas, tourist sites, areas of industrial or natural-resource development, and access to ports, rail lines, and border crossings. Both secondary and tertiary roads are also important for connecting cities, district capitals and other important towns to the national road network.

Improving the tertiary and vicinal road network is intended to extend access and economic opportunities to rural populations, especially those populations effectively cut off from the transportation network and thereby without access to markets and basic social services. These tend to be very low-volume roads, requiring the use of low-cost labor-intensive construction and maintenance methods. Under RSS accessibility will be extended to a greater portion of the road network by focusing on transitability interventions rather than more expensive standard rehabilitation and maintenance approaches which at this point are not sustainable.

Transitability

Closely related to the network development goal of accessibility is the principle of *transitability*. The goal of transitability is to keep roads open almost all year, in almost all weather, especially for those roads that are the only source of accessibility for otherwise isolated rural populations and districts.

The principle of transitability will significantly extend accessibility to a larger share of users of the road network. A road is deemed to be transitable if it is open to *normal* vehicular traffic during the entire year, with few exceptions.[2] This concept allows for situations where different sections of a road deliver varying levels of service, and even accepts that certain sections may be poor (high roughness, low travel speeds) if they are at least passable.

When applied to maintenance planning and investment prioritization, transitability requires flexibility in addressing designs. Interventions may not be uniform over the length of the road. Interventions should be first targeted to address those parts of the road that are prone to becoming impassable, especially during the rainy season. This approach to road maintenance and investment is termed *transitability maintenance* and *targeted intervention*.[3] Transitability maintenance interventions may call for localized repairs and *spot improvements* such as the construction of culverts or other drainage structures. In the case of targeted intervention, limited sections of road may be upgraded to paved standards while the balance of the road remains unpaved.

Asset Preservation

The asset preservation principle is to minimize the long-term life-cycle costs of maintaining the road network. In particular, it strives to prevent the high costs of neglected maintenance, especially on those roads which represent the largest investment in the sector, paved roads.

Insufficient maintenance on all roads, but especially on paved roads, results in disproportionately high costs of future maintenance, shortens pavement life and maintenance return periods for periodic maintenance and rehabilitation, and results in rapidly escalating

[2] Normal vehicular traffic may vary from road to road, but should generally include passage by taxis (mini buses or modified pickups) and light trucks.
[3] The concepts of *transitability maintenance*, *spot improvement*, and *targeted intervention* address the goals of providing transitability by improving or upgrading of problem sections of a road. Transitability maintenance applies to interventions on an unimproved track to provide year-round transitability. Targeted intervention is more generally applied to problem sections of already improved roads.

user costs. The asset preservation approach attempts to save on long-term maintenance costs by ensuring that technically required maintenance is carried out in a timely fashion.

RSS applies the asset preservation principle, prioritizing maintenance of all types especially for those roads where the costs of not doing maintenance are deemed to be high. RSS views maintenance as a *preventative* action, not a response to already observed problems. Maintenance will be planned proactively. Roads will be inspected carefully and regularly and required interventions will be executed promptly.

The principle of asset preservation underlies the Paved Road Management Program described later. But asset preservation also applies to unpaved roads where the benefits of rehabilitation are quickly eroded if appropriate maintenance practices are not followed.

Maintainability

The final fundamental principle of road network management under RSS is *maintainability*. Maintainability entails the design and construction of roads keeping in mind the limited capacities for maintenance. It does not mean using expensive low-maintenance options, but rather focusing on realistic life-cycle costs of keeping roads in good or at least transitable condition. It also means considering and employing, where suitable, maintenance-friendly solutions. This could be, for example, the use of emulsion treated bases (ETB) and sand seal surfacing where they are suitable.

One particular technical aspect of maintainability addressed in RSS is drainage. Both with respect to road design and maintenance interventions, attention to proper drainage, both in terms of structures and appropriate road cross sections is particularly important.

2.5 Network Vision and Planning

The intermediate term network vision is guided by the network principles of connectivity and accessibility. In the long term, RSS calls for a far-sighted vision of the Mozambican road network, using a Master Planning approach. Both of these will be supported by the road classification system which will be revised to more accurately reflect the function and administrative attributes of the roads.

Long-Term Network Vision and Master Planning

ANE and provincial roads authorities have naturally tended to focus on managing the road network in terms of maintenance and on individual projects, having little time and resources to devote to long-term network vision. One way to address this is to separate network planning from maintenance planning.

Under RSS, long-term network planning will be separated from maintenance planning. A national Highway Master Plan will be prepared by consultants to guide the long-term investment plan for roads. The Master Plan will formalize the long-term goals for the road network and provide a guide to future investments. The Master Plan will determine the need for roads as a function of development plans for the various sectors, both public and private. It will be based on forecasts of population, land uses and economic activity, generating forecasts of traffic demand for the various modes of transportation.

The Master Plan will be implemented through a consultancy to the MOPH and will include the establishment of a National Highway Master Plan office, to solicit, manage, evaluate and

coordinate feasibility studies and proposals for the development of the road network. This will include developing methods for generating and evaluating public private partnerships (PPPs) and concession schemes for the development of roads that fit into the long-term network vision as expressed in the Master Plan.

The Master Plan consultancy will also be tasked with assisting in the formulation of Provincial Master Plans that set out priorities for road upgrading, rehabilitation and opening, including indications of internal and external funding needs necessary for the development of provincial road networks. A Strategy for urban roads and individual Urban Road Master Plans for the main municipalities (most especially for the Maputo-Matola metropolitan area) will be prepared early in Phase 2. Finally, a National Transport Master Plan should be discussed with the other transport subsectors; this will be useful to ensure consistency between investments in the various transport modes.

Classification and Mapping of the Mozambican Road Network

Under RSS, the classification of the classified road network will be reviewed and revised to better reflect the function of the roads. This process will involve detailed input from provincial roads professionals. The revised classification will be put into practice and road classification will become an integral part of road network management. In addition, clear, detailed and accurate maps of the road network will produced and made available to road sector professionals and to road users. To this end, the following steps will be undertaken:

- Conduct an additional round of provincial consultations regarding the final classification, aimed at correcting errors, proposing limited amendments, and winning public support for the reclassification;
- Addition of select key alignments to the classified network, including the alignment to the Unity Bridge, the road from Cuamba to Gurué, and the proposed Maputo Bypass road;
- Addition of a select number of key urban roads that logically comprise part of the national classified network in order to create a more unified and continuous network and shift management responsibility to ANE;
- A GIS/mapping facility will be established within ANE (initially to be contracted out) with responsibility for producing accurate maps and databases of roads and road characteristics;
- Detailed maps will be made available to provincial authorities and all road sector professionals, both in printed and in electronic versions;
- A program to update and replace roads signs to reflect the new classification system will be budgeted and implemented. All signs will be replaced or corrected within one year;
- Desirable geometric design and maintenance standards for each class of road in the network will be established.

Medium-Term Priorities and Main Corridors

The main elements of the national grid that is currently envisioned for the national road network follow from the main principles of connectivity and accessibility noted above. These give rise to the *main* corridors and trunk roads shown in Table 3 and in Map 1. For each, a very brief description is provided of the intermediate term goals (i.e., to be completed under Roads-3), the current status of the road and the anticipated interventions. This list helped to guide the prioritization of projects for Phase 2 described later.[4]

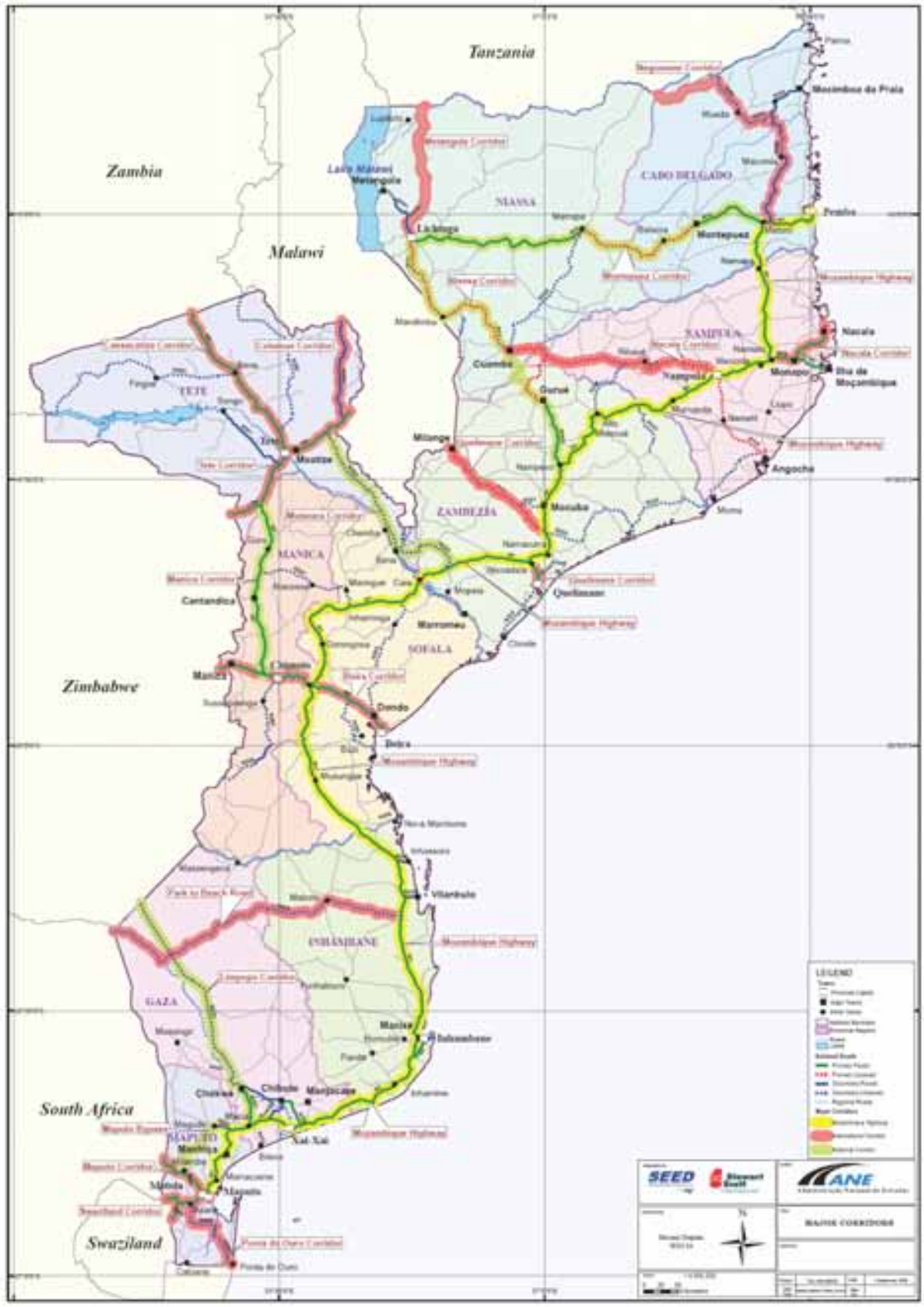
[4] In general the names given to the major corridors and roads in the table follow the conventions adopted in earlier documents.

Table 3: Main Corridors and Trunk Roads

Corridor / Road Name	Main Nodes	Road Numbers	Intermediate Term Goals	Current Status	Required Interventions
Mozambique Highway	Maputo – Pemba	N1	High level of service, well maintained paved road	By end of Phase 1, road will be fully paved, condition poor to excellent	Complete rehabilitation in south, urgent need for periodic maintenance on northern sections.
International Corridors					
Maputo Corridor (South Africa)	Ressano Garcia – Matola – Maputo	N4	High level of service, well maintained paved road	Under concession	None
Beira Corridor (Zimbabwe)	Machipanda – Chimoio – Beira	N6	High level of service, well maintained paved road	Serious degradation	Urgent need for rehabilitation and periodic maintenance
Nacala Corridor (Malawi)	Nacala – Nampula – Cuamba	N12, N13, N1	Good condition all-weather road	Good paved road from Nacala to Nampula; poor condition gravel road to Cuamba	Targeted Intervention (staged rehabilitation and upgrade) of Nampula – Cuamba for all-weather transitability
Tete Corridor (Zimbabwe, Malawi)	Cuchamano– Zobué	N7, N8	Well maintained paved road	Fully paved in fair condition	Will require periodic maintenance soon
Manica Corridor (Zimbabwe, Malawi)	Vanduzi – Changara	N7	Well maintained paved road	Small section poor gravel, remainder paved from very poor to very good	Complete paved rehabilitation originally programmed under Phase 1.
Quelimane Corridor (Malawi)	Milange – Mocuba – Quelimane	N11, N1, N10	Development of a new international corridor, well maintained, paved,	Gravel road from Milange to Mocuba in fair condition	Good maintenance, upgrade Milange – Mocuba to paved.
Swaziland Corridor	Matola – Namacha/Goba	N2/N3	Well maintained paved road	Good condition	Normal maintenance
Columué Corridor (Malawi)	Mussacama – Columué	N304	Well maintained paved road	Recently constructed	Normal maintenance
Cassacatiza Corridor (Zambia)	Cassacatiza – Tete	N9	Well maintained paved road	Good condition	Normal maintenance

Corridor / Road Name	Main Nodes	Road Numbers	Intermediate Term Goals	Current Status	Required Interventions
Ponta do Ouro Corridor (South Africa)	Boane – Ponta do Ouro	N200	Well maintained gravel road; consider alternative alignment and concession as BOM.	Fair gravel road to Bela Vista, fair paved road to Salamanga, poor sand road to Ponta do Ouro	Targeted Intervention, staged upgrade, for all-weather transitability
Park to Beach Road (South Africa)	Parfuri – Mapinhane (N1)	N222	Create all-weather transitable gravel road	Poor condition unsurfaced road, seasonally intransitable	Targeted Intervention for all-weather transitability
Negomane Corridor (Tanzania)	Sunate – Oasse – Mueda – Negomane (Unity Bridge)	N380, N381, to be designated	Good condition all-weather road	Mostly surfaced from Sunate to Mueda; poor sand road to Negomane	Surface Macomia – Oasse; Targeted Intervention for Mueda – Negomane for all-weather transitability.
Metangula Corridor (Tanzania)	Lichinga – Metangula and Lichinga – Macaloje – Matchedje	N361, R733, R1215	Well maintained paved road to Metangula, good condition all-weather road to Matchedje	Paved road to Maniamba; poor unsurfaced road to Matchedje	Upgrade road to Metangula; Targeted Intervention for all-weather transitability to Matchedje
National Corridors					
Montepuez Corridor	Lichinga – Marrupa – Montepuez – Pemba	N14	Well maintained paved road	Unpaved from Marrupa to Montepuez, narrow width Lichinga to Litunde	Improve Marrupa to Montepuez, widen, Lichinga to Litunde, bridge works
Niassa Corridor	Lichinga – Cuamba – Gurué – Nampevo	N13, N103	Good condition all-weather road	Poor condition gravel to Gurué, paved to Nampevo	Rehabilitate or upgrade gravel, bridge over Rio Lurio
Limpopo Corridor	Macia – Chokwé / Guijá – Macarretane – Chicualacuala	N101, N221,	Well maintained paved road to Macarretane, good condition all-weather road to Chicualacuala	Poor condition pavement from Macia to Chokwé, poor condition unsurfaced road to Chicualacuala	Urgent need for maintenance on Macia – Chokwé; Targeted Intervention for all-weather transitability to Chicualacuala
Mutarara Corridor	Kambulatsisi (Tete) – Morrumbala (Zambezia)	N322	Well maintained gravel road	Poor gravel, seasonally intransitable	Targeted Intervention for all-weather transitability, rehabilitate
Maputo Bypass	Moamba – Magude – Xinavane	R 811 or R402 (to be redesignated)	Provide all-weather road for northbound traffic to relieve congestion in Maputo	Poor condition unsurfaced road	Targeted Intervention, staged upgrade, for all-weather transitability

Figure 1: Map of Main Corridors



Priority Corridors for Phase 2 Interventions: The following is a brief summary of the highest corridor priorities for Phase 2:

- **Mozambique Highway (N1)**: rehabilitation of several sections south of the Zambezi are included in the Investment Plan; rehabilitation and periodic maintenance of four northern sections are included in the Paved Road Works Program (PRWP)
- **Beira Corridor (N6)**: Substantial rehabilitation and periodic maintenance of this strategic corridor is required and planned in Phase 2.
- **Nacala Corridor (N13)**: upgrade of the Cuamba – Nampula to a paved standard is planned to begin in Phase 2, with intensive maintenance of unpaved sections applied to ensure a reasonable level of service.
- **Tete Corridor (N7):** periodic and backlog maintenance is scheduled under the PRWP.
- **Manica Corridor (N7):** completion of the Vanduzi – Changara road rehabilitation is included in the Phase 2 investment plan.
- **Quelimane Corridor (N11)**: Upgrade of the Mocuba – Milange road will begin in Phase 2; periodic and backlog maintenance on the Namacurra – Quelimane road is scheduled under the PRWP.
- **Negomane Corridor**: improvement of the road linking Mueda with the Unity Bridge will coincide with the opening of the bridge; periodic maintenance and completion of the upgrade of the remainder of the road to Sunate (N381, N380) is planned under the PRWP.
- **Montepuez Corridor (N14):** completion of the upgrade of the road from Montepuez to Ruaça, Marrupa to Ruaça, and Lichinga to Litunde, as well as the construction of bridgeworks is scheduled for Phase 2.
- **Niassa Corridor (N13, N103):** Extension of the paved portion of the N103 from Gurué to Magige is planned during Phase 2; Upgrade of the Lichinga – Cuamba road should begin in Phase 2 but is not funded; final alignment of the N103 to Cuamba must be determined and funding found for construction.
- **Mutarara Corridor (N322)**: the priority is to bring this road to full serviceability as an all-year all-weather road through the construction of bridges targeted intervention.

2.6 Paved Road Management Program

A key new element of RSS and of the Strategic Maintenance Plan (SMP) is the introduction of the Paved Road Management Program (PRMP). Following the principle of asset preservation, the program is designed to ensure the appropriate safeguarding of the capital asset represented by the paved road network. The objective of the PRMP is *to manage and finance the paved road network such that roads entering the program will be maintained according to principles of optimal maintenance interventions based upon sound engineering and economic principles.*

The PRMP for Phase 2 is fully described in the Paved Road Works Program, is included in PIP 2007 - 2009 and is shown separately in the Strategic Financial Plan (SFP). The PRMP consists of two components:

Paved Roads Management: Paved road management will be concentrated in a Paved Road Management Unit (PRMU), separate from management of the rest of the network. The program will be led by an experienced and highly competent paved roads maintenance specialist, assisted by a team of engineers with experience in maintenance. The PRMP team will be responsible for the overall management of the program with the following tasks:

- Selection of paved roads that qualify for the program;
- Review of designs for paved road construction and upgrades to ensure the appropriateness and sustainability of the works;[5]
- Regular and careful inspection of the paved road network;
- Development of local expertise in paved road maintenance management;
- Utilization of the IRMS (Integrated Road Management System, the successor computerized management system to HNMS) for paved roads (i.e., the Pavement Management System function of the system);
- Preparation of annual and multi-annual works programs and budgets;
- Establishing the standards and practices for paved road maintenance;
- Use of innovative forms of maintenance contracts including concessions.

Paved Roads Maintenance Finance: Funding for paved road maintenance will be channeled entirely through the Road Fund. Multi-annual budget planning (connected to the SMP) will provide the indicated levels of funding necessary. Financial principles include:

- Funding of all paved road routine maintenance by the Road Fund;
- Periodic maintenance funding is shared by the Road Fund and donors, with a target of increasing the Road Fund share over time;
- Until such time as full sector budget support is implemented, donors will initially contribute to a ring-fenced revolving fund to be used for paved road periodic maintenance. Donors will not fund individual projects;
- Harmonized procurement and contracting procedures for all projects;
- Promotion of alternative financing for paved road maintenance such as tolls.

2.7 Regional Roads Investment Program

Investment in regional roads (tertiary and vicinal roads) features prominently in RSS. Regional roads serving rural areas are a vehicle for social development as they provide accessibility to large segments of the less advantaged population. They provide important connections between agricultural production zones and markets and are very often the only links between Districts and from Districts to provincial capitals and the trunk road network.

Despite these principles, regional roads have been at a disadvantage in terms of claims on available resources. Because funding for regional roads investment has generally been weak and not uniformly distributed, rehabilitation and upgrade of priority regional roads tends to be deferred. Provincial roads authorities contend with this by applying routine maintenance funds to inadequately scoped rehabilitation projects on roads that would otherwise be considered unmaintainable. The interventions rarely solve the critical problems on the road, with the works often being “washed away” during the next rainy season.

The negative repercussions also extend to the rest of the network, as the diversion of maintenance funds results in more rapid deterioration and subsequent greater needs for more intensive interventions. Further, the situation creates a serious issue of inequity and imbalance between those provinces fortunate enough to benefit from targeted support from donors and those without such external funding.

[5] The PRMP will not necessarily manage upgrade projects themselves, which initially will continue to be funded through donor project funding.

To address these problems, RSS calls for the implementation of a Regional Roads Investment Program (RRIP) and creation of a Regional Roads Investment Fund (RRIF). The fund will be operated by the Road Fund, using donor funds specifically earmarked for this purpose. Since the objective is rehabilitation, the GOM will make available counterpart funds from the Ministry of Finance equal to approximately 10% of the cost of the RRIF.

Wherever possible, labor-based intervention methods will be utilized. Further, the program will promote the use of output- and performance-based contracts that include both a rehabilitation and a maintenance component. Such contracts (sometimes called multi-year level of service) are actually a form of concessioning. The program will promote this promising approach by implementing pilot programs under the guidance of a specialist with experience in these forms of contracting.

The RRIP address the objective of transitability for regional roads. Rehabilitation and construction of bridges and major drainage structures, and use of the Targeted Intervention approach will help to maximize accessibility while minimizing investment costs and future maintenance burdens. Upgrade proposals will be considered in those cases where it can be demonstrated that life-cycle maintenance costs will be dramatically reduced.

The RRIP will be a participatory bottom-up program. Proposals for project funding will originate in the Provinces and District involvement in planning and prioritization will be encouraged. The allocation of budgets will include provincial balance criteria and the requirement for systematic prioritization based on network, economic, and other criteria.

The financial aspects of the program include the following:

- All funding for regional roads investments will be channeled through the RRIP.
- RRIP will be financed through a revolving managed by the Road Fund. Donors will not fund specific projects, but rather a fixed portion of the program.
- Harmonized procurement and contracting procedures for all projects;

3 STRATEGIC PLAN

The RSS includes strategic plans for maintenance, investment and finance. These plans are all guided by the principles set forth above and are formulated for a 5-year period. The strategic plans establish the framework for the preparation of the detailed Work Plans that are included in PIP 2007 - 2009. This chapter also includes descriptions of two specialized programs, the Paved Road Management Program and the Regional Roads Investment Program.

3.1 Strategic Maintenance Plan

The SMP is a multi-annual rolling plan conceived at the strategic level that indicates the level and types of maintenance activities necessary to achieve sustainability of the road network over the medium term. The SMP prepared as part of RSS provides a general guide for maintenance resource allocation and for the Strategic Financial Plan; a more detailed set of work plans for maintenance are included as part of PIP 2007 - 2009. The SMP will be updated annually in parallel with the detailed work plans to be formulated annually.

Maintenance Approaches and Definitions [6]

Under RSS and the SMP, maintenance is divided into standard maintenance and transitability maintenance. The term "standard maintenance" is used to mean maintenance activities applied on roads which are normally transitable and which can be maintained to a level of service with regular interventions: annual routine maintenance, regular and timely periodic maintenance, and return-period rehabilitation at the end of a road's design life.[7] The categories used here do not define the interventions narrowly. The specific interventions for each road and road section will differ and must be programmed locally. However, the average interventions required are predictable.

In contrast, "transitability maintenance" refers to the interventions required on roads that are not currently "maintainable" and for which the objective is simply to keep the road transitable, even if in poor condition. Transitability maintenance is no substitute for investments that are required to construct bridges (the most common reason for intransitability) or to rehabilitate or upgrade a road that is currently intransitable. Rather, it will be used as a maintenance approach, combined with targeted interventions (investment), that strives to maximize the extent of the network that is transitable most of the year with the limited maintenance resources available.

The SMP also includes two additional categories of works. Backlog periodic maintenance is defined for paved roads where the level of repairs required to bring the road back to its design standard exceeds the definition of periodic maintenance, i.e., resealing and minimal repairs to the structure. The requirements for backlog maintenance were derived from the project prioritization analysis and are included in the Paved Road Works Program that comprises part of PIP 2007 - 2009.

Emergency works are also an essential part of a maintenance program. They are defined as any repair or reinstatement of a section or sections of an existing route (including structures)

[6] Full maintenance definitions for paved and unpaved roads are found in the Draft Final Report, Volume II, Chapter 4, and included in the *Paved Road Works Program* and *Unpaved Road Works Program* Reports.
[7] Although return-period rehabilitation is included in the SMP for illustrative purposes, road rehabilitation for Phase 2 is included in the Investment Plan.

where the circulation of traffic has been interrupted due to unforeseen circumstances, usually due to a natural event. The goal of the emergency works is to restore the integrity of the link so that the reinstated sections or structures will be structurally and functionally adequate and will be maintainable by normal recurrent maintenance until the next major intervention.

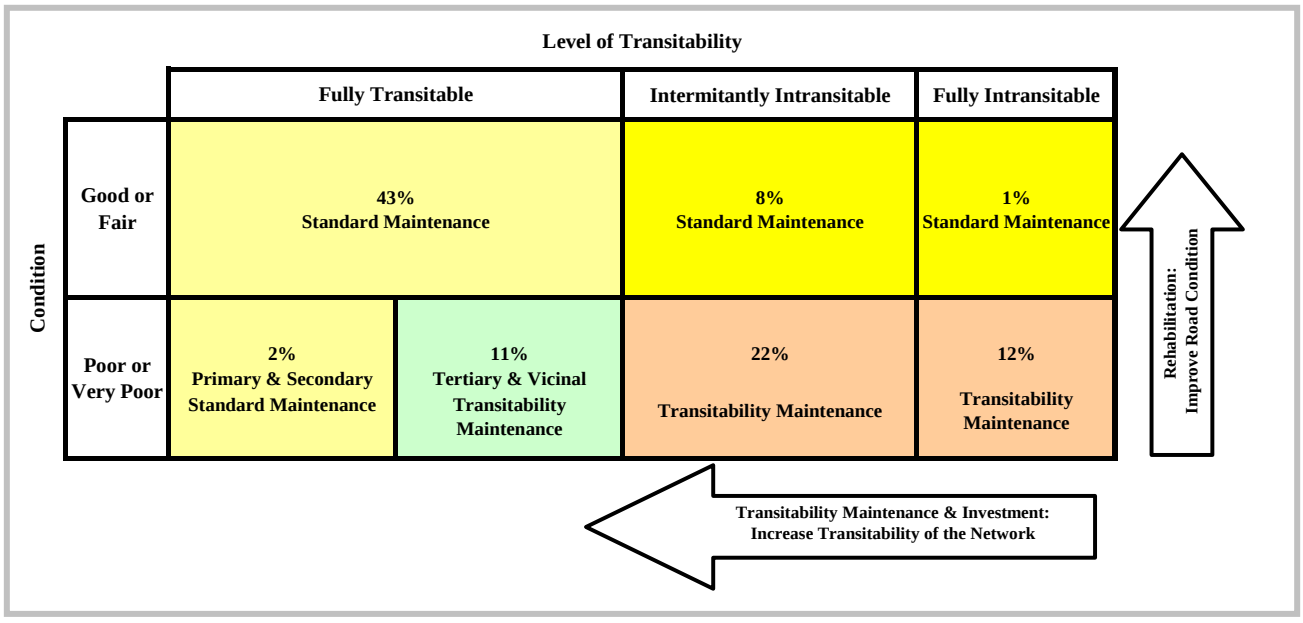
Maintenance Strategy

In principle, standard maintenance will be applied so as to preserve as much of the network in good and fair condition as possible, while transitability maintenance funds will be allocated so as to maximize the transitability of the network, or alternatively, to minimize the number of days that roads are closed.

The distinction between maintenance interventions and investments is important, both for standard maintenance and transitability maintenance. Investments intended to improve the condition of roads in the form of rehabilitation, reconstruction, and upgrade, and investments intended to increase transitability in the form of bridge construction and targeted interventions, are one-off interventions, are considerably more costly than maintenance, and will be included in the Investment Plan (Section 3.2).[8]

The unpaved road maintenance strategy is shown visually in Figure 2. The figure depicts the current state of the network in terms of condition and transitability (as percent of the unpaved road network), and the prescribed maintenance to be applied. The two arrows indicate dual objectives of improving both condition (through investment/rehabilitation) and transitability (through transitability maintenance and through investment).[9]

Figure 2: Maintenance Strategy



[8] The distinction between intensive standard maintenance and rehabilitation, or between spot improvements as part of transitability maintenance and targeted intervention as a partial upgrade to a road, may, at times, be matters of judgment, which local engineers must carefully consider.
[9] A fully description of the unpaved road maintenance strategy is contained in the Unpaved Road Works Program.

Unit Costs

The projected average maintenance costs by class of road and type of intervention are shown in Table 4. These costs are projected averages which have been used to project annual maintenance budgets; the costs of each intervention will vary by the specific requirements of the road, local costs, and other factors. Unit costs will be monitored and average costs in updates of the Strategic Maintenance Plan will be modified as required.

Table 4: Unit Maintenance Costs Rates and Return Periods
(US$ per km, per year for Transitability and Routine)

Type of Maintenance	**Transitability**	**Routine**		**Periodic**		**Rehabilitation**	
Road Class	**Unpaved**	**Unpaved**	**Paved**	**Unpaved**	**Paved**	**Unpaved**	**Paved**
Primary	N/A	1,500	1,100	35,000	55,000	80,000	300,000
Secondary	N/A	1,200	880	28,000	44,000	50,000	240,000
Tertiary	300	750	660	10,000	44,000	25,000	200,000
Vicinal	200	350	660	2,500	44,000	17,500	175,000
Return periods (years)	Annual	Continuous	Continuous	5	8	15	20

Road Network

The SMP is formulated for the classified and urban road networks. The base network is shown in Table 5. The total classified network included in the SMP is just under 30,000 kilometers with an additional 3,000 kilometers of urban roads.

Table 5: Base Classified and Urban Road Networks (kilometers)

Class	Unpaved	Paved	Total
Primary	1,407	4,459	5,866
Secondary	3,983	809	4,792
Tertiary	11,645	516	12,161
Vicinal	6,500	30	6,530
Subtotal Classified	23,535	5,814	29,348
Urban	2,500	500	3,000
Grand total	26,035	6,314	32,348

This network has been divided into roads that are forecast to be maintainable by standard maintenance interventions and the balance of the network which will be maintained by transitability maintenance. The shares of the network in each maintenance category by class and surface are shown in Table 6. These shares will be refined as more detailed maintenance needs are defined. The working assumption of the SMP is that 100% of classified paved roads and approximately 50% of classified unpaved roads receive standard maintenance. For urban roads, given the current degraded conditions, only 20% of unpaved roads and 25% of paved roads are assumed to receive standard maintenance interventions.

Table 6: Maintenance Category by Class and Surface

Class	Percent of network maintained under:		
	Unpaved Transitability Maintenance	Unpaved Standard Maintenance	Paved Standard Maintenance
Primary	0%	100%	100%
Secondary	20%	80%	100%
Tertiary	50%	50%	100%
Vicinal	76%	24%	100%
Weighted Average	49%	51%	100%
Urban	80%	20%	25%

The extent of the network then maintained under each category is shown in Table 7. The SMP divides the classified road network into a "target" network of 17,800 kilometers on which standard maintenance can be applied, and a "transitability" network of about 12,800 kilometers on which transitability maintenance will be applied. Note that not all urban roads are assumed to receive maintenance. Specific maintenance interventions will be determined for each road as part of the annual planning exercise.

Table 7: Road Network by Maintenance Category, Class and Surface

Class	Kilometers maintained under:			
	Unpaved Transitability Maintenance	Unpaved Standard Maintenance	Paved Standard Maintenance	Total
Primary	0	1,407	4,459	5,866
Secondary	797	3,187	809	4,792
Tertiary	5,822	5,822	516	12,161
Vicinal	4,929	1,570	30	6,530
Subtotal	11,548	11,986	5,814	29,348
Urban	2,000	500	125	2,625
Grand total	13,548	12,486	5,939	31,973

Projected Annual Maintenance

Based on the assignment of maintenance categories, unit rates, and return periods, summary total annual maintenance by kilometers and costs are shown in Table 8. These projections do not take into account "return-rehabilitation", i.e., rehabilitation that would be projected based on normal pavement design life. The projections shown here were used to establish the Strategic Financial Plan framework. Detailed annual planning of maintenance can be found in PIP 2007 - 2009.

In addition to standard and transitability maintenance, US$ 48 million in backlog maintenance for paved roads has been projected for Phase 2. This backlog maintenance is the minimum amount estimated to prevent critical roads from deteriorating to the point of requiring more expensive rehabilitation in the near term. The specific program of backlog maintenance is included in the Paved Road Works Program included in PIP 2007 - 2009.

Urban road maintenance is limited to US$ 6 million annually in the Strategic Maintenance Plan, an amount approximately equal to the statutory contribution required of the Road Fund. This is far below the amount of maintenance required to bring urban road networks up to

reasonable standards. The amount of necessary rehabilitation works cannot be estimated without additional detailed data. These data will be collected and evaluated urgently in Phase 2 and a plan for the rehabilitation and maintenance of urban roads will be prepared and implemented.

Finally, an allowance of US$ 3 million annually has been included for emergency works. The needs for properly defined emergency works will be monitored and the budget adjusted accordingly.

Table 8: Projected Annual Maintenance

	Standard Routine	Standard Periodic	Transitability	Total
Kilometers				
Classified Unpaved	8,950	2,237	11,548	22,736
Classified Paved	4,833	690	0	5,523
Total	13,782	2,928	11,548	28,259
Urban (all)	477	108	2,375	2,960
Cost (million USD)				
Unpaved	$8.1	$37.5	$5.8	$51.3
Paved	$4.5	$36.2	$0.0	$40.7
Paved backlog maint. [10]				$16.0
Emergency works				$3.0
Total	$12.6	$73.7	$5.8	$111.0
Urban (all)	$0.7	$4.2	$1.2	$6.0

3.2 Strategic Investment Plan and Project Prioritization

The full Investment Plan for Phase 2 is presented in PIP 2007 - 2009, and detailed analysis of Project Prioritization is found in Volume II of the full RSS report. The principle of sustainability dictates that new investments (rehabilitation, upgrading, and new construction) will only be undertaken where there is a demonstrated capacity to maintain those investments. At the same time, RSS establishes a priority for upgrading, rehabilitating, and maintaining the entire core primary road network to good paved condition. Further, the goal of accessibility points to the importance of allocating investment resources toward regional roads. These three factors point to the importance of a balanced approach to investment decision.

The investment plan followed a process of identification and evaluation of candidate projects. For the purposes of the prioritization exercise, projects were divided into three categories:[11]

- **National roads projects** (primary and secondary roads), including upgrade, rehabilitation and periodic maintenance of paved roads.[12] The full list of National Roads candidate projects was discussed with stakeholders and following revisions, a total of 59 were included in the prioritization exercise. These projects were prioritized using

[10] Backlog maintenance for paved roads is estimated for only three years.
[11] As noted above, investment (rehabilitation) in urban roads has not been included in RSS. Programs for urban roads and the unclassified rural network will be prepared separately.
[12] Paved road periodic maintenance projects were then directed toward the Paved Road Management Program.

economic analysis using HDM and then applying multi-criteria analysis (MCA) to incorporate less easily quantified network, social and economic factors.

- **Regional roads projects** (tertiary and vicinal roads): A total of 69 provincial roads were initially identified. These projects were not prioritized as regional roads rehabilitation priorities will be established in cooperation with the Provinces. An expanded list of regional roads candidate projects and preliminary evaluations and prioritizations are included in PIP 2007 - 2009.
- **Bridge projects:** A total of 32 Bridge candidate projects were identified. The GOM has established a priority program of 13 bridges for rehabilitation and construction in Phase 2.

National Roads Investment Projects

Forty national roads candidate projects were prioritized for rehabilitation and upgrade. These projects represent 5,591 kilometers of roads at an estimated cost of US$ 786 million. Thirteen projects were finally selected for inclusion in the Phase 2 Investment Plan, comprising 1,565 kilometers and with a total estimated cost of US$ 429 million (Table 9). Some of the projects will extend beyond Phase 2 (2007 – 2009) with the estimated Phase 2 investment cost being US$ 300 million. All selected roads are primary roads with the exception of the Macarretane – Massingir and Macomia – Oasse roads. The estimated costs for each project are based on the engineering estimate for projects for which there are designs prepared and on pre-design estimates in other cases. In all cases, designs will be reviewed to ensure that projects are in accordance with RSS design and network optimization principles. Each project is described briefly.

Rehabilitation Projects

- **Southern N1 Sections**: three projects are sections of the N1 south of the Zambezi River, all of them deferred from Phase 1 due to costs. All are due to be financed by IDA and already have detailed designs (which must be reviewed). They include:
  - Maputo: Jardim – Benfica
  - Xai - Xai – Zandamela – Chissibuca
  - Massinga - Nhachengue
- **N7: Vanduzi – Changara**: originally consisting of two lots, this project was originally supposed to have been completed under Phase 1 under ADB financing. The project is highly ranked and important, especially given the degradation of the pavement on the northern part of the road. Financing arrangements to complement the ADB commitment remains to be finalized.
- **R445: Macarretane – Massingir:** although not a national road, this project was included originally as a periodic maintenance/capital repair project. Timed to follow the completion of the Massingir dam construction works, this project will be funded by the OPEC Fund.

Upgrade Projects

- **N14: Montepuez Corridor Projects:** Three sections of the Montepuez Corridor remain to be upgraded: Ruaça – Montepuez in Cabo-Delgado, and Marrupa – Ruaça and Lichinga – Litunde in Niassa Province. All three are part of a joint financing agreement for the N14 including participation of ADB, ASDI, JBIC and the GOM. These projects will likely commence in 2008 and largely be completed during Phase 2. When completed, these projects will provide for an all-weather paved trunk road from Lichinga to Pemba, serving the economic development of the two provinces.

Table 9: National Roads Investment Projects

Ref. #	Road	Province	Length (km)	Projected Works [a]	Est. EIRR (%)	Estimated Cost (USD m)	
						Total [b]	Phase 2 [b]
Rehabilitation							
42	N1: Maputo (Jardim - Benefica)	Maputo	7	Rehabilitation & upgrade	414.0	$4.5	$4.5
39	N1: Xai - Xai – Zandamela – Chissibuca	Gaza, Inhambane	96	Rehabilitation	80.1	$22.0	$22.0
40	N1: Massinga - Nhachengue	Inhambane	57	Rehabilitation	34.4	$15.0	$15.0
109	N7: Vanduzi – Changara (km 60-106, 161-270)	Manica	154	Rehabilitation	65.8	$46.0	$46.0
155	R445: Macarretane – Massingir	Gaza	106	Rehabilitation	na	$8.5	$8.5
	Subtotal		**420**			**$96.0**	**$96.0**
Upgrade							
4	N14: Montepuez - Ruaça	Cabo Delgado	136	Upgrade to Paved	5.2	$42.8	$33.2
100	N14: Marrupa - Ruaça	Niassa	87	Upgrade to Paved	6.0	$19.9	$19.9
55.1	N380: Macomia – Oasse	Cabo-Delgado	28	Upgrade to Paved	na	$8.5	$8.5
59	N13: Lichinga - Litunde	Niassa	67	Widen and Reseal	20.5	$15.7	$15.1
	N13: Bridges and Structures	Cabo Delgado, Niassa		Repair and Construct	na	$4.8	$4.5
46	N13: Cuamba - Lichinga	Niassa	286	Upgrade to Paved	12.3	$72.9	$24.3
5	N13: Cuamba - Nampula	Nampula	335	Upgrade to Paved	71.1	$120.5	$60.3
45	N103: Gurué – Magige	Zambezia	35	Upgrade to Paved	na	$11.5	$11.5
44	N11: Mocuba – Milange	Zambezia	171	Upgrade to Paved	na	$36.1	$27.1
	Subtotal		**1,145**			**$332.7**	**$204.2**
	Total		**1,565**			**$428.7**	**$300.2**

a. Exact project definitions may vary from those specified in Draft Final Report.
b. Estimated financial costs in million US$.

The design of these roads has been the subject of considerable discussion and the costs of the works is quite high. *It is important that the scope of works be reviewed prior to finalization of the tenders to ensure that the designs provide the minimal level of service required subject to minimizing life-cycle costs.*

- **N13: Cuamba – Lichinga:** the western portion of the Nampula – Lichinga road, also providing connectivity from Niassa province to the south via Gurué. This road is an important part of the core primary network and very expensive to maintain an unsurfaced road. Funding for the upgrade of this road to paved standard is not yet committed, thus

anticipated commencement is tentatively scheduled for 2009 with most of the works being completed during Phase 3.

- **N13: Cuamba – Nampula**: this project was one of the highest ranking projects whatever weighting system was used. The particular importance of this primary road and of bringing it to all-weather transitable condition is well established. The project scores very highly as an upgrade-to-paved project, and its economic viability is quite high, with an EIRR of over 70%. It appears now that the project will be included under Japanese funding, probably beginning in 2008 and extending over four years (half during Phase 3).
- **N103: Gurué – Magige:** part of the Niassa Corridor including the Nampevo – Gurué – Cuamba axis and continuing on to Lichinga. The southern section of this road is already paved. Construction of this section is to be funded by the Islamic Development Bank (IDB) and would leave the portion from Magige to Cuamba, including the construction of a new bridge over the Lurio River, to be completed in Phase 3.
- **N11: Mocuba – Milange:** this road is part of the regional (SADC) international Corridors as well as being part of the core primary network. There is a funding commitment by the EU, with works expected to commence in 2008 and continue into Phase 3.

Other Projects

Of the remaining candidate national roads projects, several deserve note and could be considered for inclusion in the Investment Plan for Phase 3 or for Phase 2 should funding become available (Table 10).

Table 10: Additional National Road Candidate Projects

Ref #	MCA Rank	Project Name	Road No.	Class	Km	Surface	CW [a]	HDM Cost [b]	HDM EIRR (%)
64	9	Boane - Ponta do Ouro	N200	S	131	U	Upgrade	$39.3	39.1
19	14	Nampula – Nametil	N104	P	72	U	TI	$5.8	11.5
63	10	Moamba – Magude	R811	V	92	U	Upgrade	$27.6	41.8
25.2	17	Sussendenga - Chimoio	N260	S	48	P/U	Rehab	$3.0	11.6
27	20	Matema – Mualadze	N302	S	279	U	TI	$12.5	12.7
65	21	Moma – Angoche	N324	S	109	U	TI	$5.5	15.9
54	32	Oasse - Unity Bridge	R298 [c]	S, T	229	P/U	TI	$16.4	2.2
Total					960			$110.1	

a. Exact intervention definitions vary by project.
b. Financial Costs in million US$.
c. Multiple roads; see project list, Volume II.

- **Boane - Ponta do Ouro (N200)**: this secondary road to Mozambique's southern border and coast scored well in the MCA, 9th out of 40 rehabilitation projects, and has a good estimated rate of return as a paved upgrade project (39%). Consideration should be given to various forms of concessioning of this road, as well as to alternative alignments.
- **Nampula – Nametil (N104):** this primary road serves an important provincial Corridor in Nampula province. Interestingly, the southern half of the Corridor, from Nametil to Angoche is being implemented in Phase 1 under the program of rural roads funded by the World Bank. Given the importance of this Corridor, relatively high ranking for this

project (14th among all rehabilitation projects and 6th among unfunded projects), and the relatively low cost of the project (about US$ 6 million as a Targeted Intervention project), it would make sense to incorporate this project into Phase 2 if funding permits.

- **Moamba – Magude**: also in Maputo province, this so-called "Maputo Bypass" road scored highly on the MCA (10th out of 40 rehabilitation projects) and in the economic analysis (42% rate of return) largely due to high levels of projected traffic. The potential benefits of this road in terms of reducing congestion in Maputo and Matola by diverting traffic to the north are probably over estimated by many, but nonetheless exist.
- **Sussendenga - Chimoio and Espungabera – Sussendenga**: the northern half of this road is heavily trafficked and earned a rate of return of just under 12%. Further investigation might help to justify this investment.
- **Matema – Mualadze**: this Tete province Corridor to Malawi and Zambia earned a rate of return above 12% as a Targeted Intervention project.
- **Moma – Angoche**: this Nampula province road has significant potential as Nampula's southern coast is opened to mineral exploitation, fishing, and tourism, and complements the Nampula – Nametil – Angoche projects. The project earns a rate of return of 16% as an unpaved rehabilitation.
- **Oasse - Unity Bridge**: this road would provide access to the new crossing to Tanzania over the Rovuma River at the conjunction of Cabo-Delgado and Niassa provinces at Negomane. Eventually, this alignment should be reclassified as a secondary road, but its rehabilitation/construction should be phased to coincide with the completion of the bridge.

National Roads Capital Repair and Periodic Maintenance Projects

Table 11 shows the following projects that have been identified for capital repair and periodic maintenance under the Paved Road Works Program, as described in Section 3.1 above. Several of these projects were evaluated in the original list of national roads investment projects (see Draft Final Report, Volume II, Chapter 6). The remainder were evaluated as part of the paved road visual inspections carried out as part of the Paved Road Works Program. The exact timing and definition of interventions will be determined based upon funding availability and reviewed annually as part of the Paved Road Management Program.

Regional Roads Investment Program

As noted above, regional roads were not individually prioritized for the RSS, but will be prioritized for the PIP 2007 - 2009. A total of US$ 17 million annually is included in the Investment Plan for the RRIP.

The estimated cost of the proposed 69 regional roads projects is just over US$ 160 million, comprising 6,176 kilometers of road. Clearly such an amount is far in excess of historical funding for these roads, and beyond the realistic scope of Phase 2 financing. However, it must be noted that at an average cost of just over US$ 25,000 per kilometer, the potential benefits of these investments at achieving the national priorities of accessibility and poverty alleviation are great.

It should also be noted that secondary roads seem to fall between the cracks of project prioritization and the Investment Plan. The secondary roads included as candidate projects tended to score poorly, largely due to the importance of economic feasibility in the MCA and the generally low volumes of traffic carried by most of these roads. For this reason, secondary

roads will be included in the RRIP, especially in light of the new Road Sector Organization which makes ANE responsible for all classified roads.

Table 11: National Roads Capital Repair and Periodic Maintenance Projects

Ref. #	Road	Province	Class	Length (km)	Projected Works [a]	Est. Cost (USD m) [b]
41	N1: Pambara - Rio Save	Inhambane	Primary	122	Light Rehab & reseal	$14.4
43.1	N6: Beira - Inchope	Sofala	Primary	90	Heavy & Light Rehab	$16.2
43.2	N6: Machipanda - Chimoio - Inchope	Manica	Primary	158	Reseal	$12.0
35	N1: Rio Ligonha - Nampula	Nampula	Primary	98	Light & Heavy Rehab	$13.6
36	N1: Namialo - Namapa	Nampula	Primary	150	Heavy & Light Rehab, Reseal	$16.0
104	N5: Lindela (N1) - Inhambane, Tofo	Inhambane	Primary	56	Heavy Rehab, Reseal	$12.1
55.2	N380: Macomia - Oasse	Cabo Delgado	Secondary	74	Reseal	$5.9
154	N1: Gorongosa-Caia	Sofala	Primary	244	Reseal & Light Rehab	$20.5
51	N7: Tete - Zobué	Tete	Primary	116	Light & Heavy Rehab	$25.7
37	N1: Rio Lurio - Metóro	Cabo Delgado	Primary	75	Light Rehab	$9.0
38	N1: 3 de Fevereiro - Incoluane	Maputo	Primary	18	Reseal	$1.4
110	N7: Vanduzi - Changara (km 106 - 134)	Manica	Primary	28	Reseal	$2.2
108	N101: Macia - Chokwé - Macarretane (R445)	Gaza	Primary, Tertiary	71	Reseal, Light Rehab	$6.1
34	N1: Chimuara (Rio Zambezi) - Nicoadala	Zambezia	Primary	167	Light Rehab	$20.0
58	N105: Monapo - Ilha de Mozambique	Nampula	Primary	47	Reseal	$3.7
152	R698: Oasse - Mueda	Cabo Delgado	Tertiary	57	Reseal	$4.6
153	N1: Inchope - Gorongosa	Sofala	Primary	72	Reseal	$5.8
50	N7: Changara - Tete	Tete	Primary	91	Reseal & Light Rehab	$8.7
62	N1: Nicoadala - Namacurra	Zambezia	Primary	35	Reseal	$2.8
47	N10: Nicoadala - Quelimane	Zambezia	Primary	34	Reseal	$2.7
	Total			**1,803**		**$204.0**

a. Exact project definitions may vary from those specified in Draft Final Report.
b. Estimated financial costs in million US$.

Bridges Rehabilitation and Construction Projects

Eleven bridge projects are included the Investment Plan, all included on the basis of Mozambique's prioritized bridge program (Table 12). In addition to the eleven bridges listed there, numerous bridges on mainly tertiary and vicinal roads are in need of repair and construction.

Table 12: GOM Priority Bridge Rehabilitation and Repair Program

Name	Link	Crossing	Province	Road No	Class	Length (m)	Est. Cost (US$ mn)[a]	
							Total	Phase 2
Zambezi Bridge	Caia - Chimuara	Zambezi	Sofala	N1	P	2,400	$88.1	$71.7
Guijá Bridge	Guijá - Chokwé	Limpopo	Gaza	N221 - R856	P	500	$13.6	$8.2
Unity Bridge [b]	Negomane – Mtambaswala	Rovuma	Cabo Delgado	R1251	T	730	$13.2	$9.2
Moamba Bridge	Moamba – Sabie	Incomate	Maputo	R409 / R811	T	300	$5.4	$3.7
Lugela Bridge	Mocuba - Manhamade	Lugela	Zambezia	R653	T	200	$6.3	$3.2
Tete Bridge	Tete City	Zambezia	Tete	N7	T	720	$7.4	$3.7
Rio Chire Bridge	Morrumbala – Nhamayabue	Chire	Tete, Zambezia	N322	S	250	$10.7	$7.5
Rio Muíra Bridge	Mungari – Buzua	Muíra	Manica	R950	V	240	$5.5	$5.5
Rio Mussapa Bridge	Dombe - Gogoi	Mussapa	Manica	N260	S	80	$2.2	$2.2
Rio Lucite Bridge	Dombe - Gogoi	Lucite	Manica	N260	S	120	$3.3	$3.3
Rio Nhamucuarara Bridge	Mavonde - Frontier Zimbabwe	Nhamu-cuarara	Manica	N/C	NC	80	$2.2	$2.2
Total						5,620	$ 157.9	$ 120.4

a. Estimated costs include engineering costs. Costs for Phase 2 shown for projects initiated under Phase 1.
b. Cost for Unity Bridge shared with Government of Tanzania. Cost shown is for Mozambique only.

3.3 Strategic Financial Plan

The Strategic Financial Plan to support RSS brings together the uses of funds contained in the Strategy and indicates the sources required to provide funding in a sustainable way.

Uses of Funds

Financing must be provided for the following elements:

- **Strategic Maintenance Plan**: the SMP includes funding requirements for both standard maintenance (routine and periodic maintenance) and transitability maintenance for classified and urban road networks. The Plan also includes a provision for addressing the need for backlog maintenance (on paved roads) and funds for emergency works.
- **Investment Plan**: the Investment Plan for prioritized investment in rehabilitation and upgrade projects on the national network, a program of rehabilitation of the regional roads network (RRIP), and a Priority Bridge Rehabilitation and Construction Program.
- **Overhead, Institutional Support and Capacity Building**: this element includes the expected administrative costs of the Roads Administration System, funding for the development of road sector institutions, enhancing human resources capacities, technical assistance, studies and consultancies to assist in sector development (e.g., technical support for IRMS, implementation of the new road classification, network master planning, improved financial controls); assistance for improvement of private sector capacity; programs for road safety and for axle load controls; logistical and material assistance; engineering studies in support of network development, and contingencies.

Total program needs for Phase 2 are shown in Table 13, projected annually, for 3 years, and for 5 year time frames. Not all expenditures will be uniformly distributed over the entire period of Phase 2, but for purposes of the Strategic Financial Plan, funding needs have not been programmed over time.[13] Detailed programming, including procurement, implementation, and disbursement schedules are included as part of PIP 2007 - 2009.

Sources of Funds

The three sources of funds for the road sector are:

- Road User Charges collected by the Road Fund;
- Government of Mozambique contributions through the general budget;
- Donor Contributions to the road sector program.

Road user charges (Road Fund): Table 14 shows the projections of road user charges collected by the Road Fund for 2007 – 2009. These projections are for a medium scenario which forecasts moderate growth in total revenues from approximately US$ 60 million in 2007 to US$ 66 million in 2009. Projections to 2011 would indicate annual Road Fund revenues of US$ 73 million. More detailed analysis can be found in Chapter 5 of Volume I of the full Strategy report. Note that projections for revenues from vehicle license fees are very speculative, and as such, have not been included the comparison of sources and uses presented below.

Government of Mozambique: The GOM commitment to counterpart contributions for Phase 1 investments was approximately US$ 3.5 million annually. For Phase 2 the GOM is expected to contribute approximately US$ 50 million over 5 years. US$ 33 million will be directed to the Priority Bridge Program and an additional US$ 3.5 million annually to the Regional Roads Investment Program.

Donors: Donors have shown great commitment to assisting Mozambique under Roads-3 and are expected to have contributed some US$ 455 million by the end of Phase 1. The contributions of the various donors to Phase 2 is still under discussion. For purposes of the SFP, only donor commitments which have been firmly established have been included.

[13] The only exception is backlog maintenance of paved roads which is programmed only for the first three years of the plan. The indicative implementation schedules for the priority bridge program suggest that almost all works will be completed within two years, but the SFP has not been adjusted to reflect this intention.

Table 13: Strategic Financial Plan (2007-2011) US$ mn

Line	Element	Annual	2007-2009	2007-2011
1	**Overhead, Institutional Support and Capacity Building**			
2	Administrative Costs	$6.0	$18	$30
3	Institutional Support	$5.0	$15	$25
4	Road Safety	$3.5	$10	$17
5	Axle Load Control	$3.9	$12	$19
6	Contingencies	$3.0	$9	$15
7	**Total "Overhead"**	**$21.4**	**$64**	**$106**
8	**Strategic Maintenance Plan**			
9	**Paved Road Maintenance Program**			
10	PRMP: Routine Maintenance	$4.5	$14	$23
11	PRMP: Periodic Maintenance	$36.2	$109	$181
12	PRMP: Backlog Maintenance	$16.0	$48	$48
13	**Subtotal PRMP**	**$56.7**	**$171**	**$252**
14	**Unpaved Classified Road Maintenance**			
15	Routine Maintenance	$8.1	$24	$41
16	Periodic Maintenance	$37.5	$112	$187
17	Transitability Maintenance	$5.8	$17	$29
18	**Subtotal Unpaved Maintenance**	**$51.4**	**$153**	**$257**
19	**Urban Road Maintenance**	**$6.0**	**$18**	**$30**
20	**Emergency works**	**$3.0**	**$9**	**$15**
21	**Total Strategic Maintenance Plan**	**$117.1**	**$351**	**$554**
22	**Strategic Investment Plan**			
23	Bridges Rehabilitation	$40.0	$120	$120
24	Regional Roads Investment Program	$17.0	$51	$85
25	Priority Rehabilitation and Upgrading	$100.1	$300	$429
26	Ongoing Phase 1 Projects	Na	$22	$22
26	**Total: Priority Rehabilitation**	**$157.1**	**$493**	**$656**
27	**Total Strategic Financial Plan**	**$295.6**	**$908**	**$1,316**

Note: Figures to be revised as part of the Project Implementation Plan

Table 14: Projected Road Fund Revenues

(values in million US$ unless otherwise noted)

Predicted Road Fund Revenues	**Analysis by Year**			
Sources of Funds	**2007**	**2008**	**2009**	**Total 2007-2009**
User Fee (US cents per liter)	13.0	13.5	14.0	
Fuel Consumption (est., m liters)	410	415	420	
Road Fuel Levy	$53.3	$56.0	$58.8	$168.1
Road Fees	$7.0	$7.0	$7.0	$21.0
Vehicle License Fees (estimated)	$2.0	$2.1	$2.2	$6.3
Total excluding License Fee	**$60.3**	**$63.0**	**$65.8**	**$189.1**
Total including License Fee	**$62.3**	**$65.1**	**$68.0**	**$195.4**

Summary and Comparison of Needs and Sources

Sources and Uses for Phase 2 are projected initially for 2007-2009, as shown in Table 15. Projected Road Fund revenues are allocated first to administrative costs, routine maintenance (both paved and unpaved), and transitability maintenance. The balance of funds is then equally divided between paved and unpaved periodic maintenance. GOM contributions flow to the Priority Bridge Program and the RRIP. The table shows the balance of funding to be provided by donors. The total allocation of local sources (Road Fund and GOM) is US$ 233 million, leaving funding of US$ 675 million for donors during the first three years of Phase 2 if the full plan is to be realized within that period.

The table does not indicate what level of donor funding is already committed. However, donors have committed to finance the balance of the Priority Bridge Program and most of the priority national roads rehabilitation and upgrade. Donor funding under a sector budget support arrangement is desired for the remainder of program funding and is detailed in PIP 2007 - 2009.

Table 15: Sources and Uses Financial Plan (2007-2009) US$ mn

Line	Element	Uses	Road Fund and GOM	Donors and Gap
1	**Overhead, Institutional Support and Capacity Building**			
2	Administrative Costs	$18	$18	
3	Institutional Support	$15		$15
4	Road Safety	$10		$10
5	Axle Load Control	$12		$12
6	Contingencies	$9		$9
7	**Total "Overhead"**	**$64**	**$18**	**$46**
8	**Strategic Maintenance Plan**			
9	**Paved Road Maintenance Program**			
10	PRMP: Routine Maintenance	$14	$14	
11	PRMP: Periodic Maintenance	$109	$49	$60
12	PRMP: Backlog Maintenance	$48		$48
13	**Subtotal PRMP**	**$171**	**$63**	**$108**
14	**Unpaved Classified Road Maintenance**			
15	Routine Maintenance	$24	$24	
16	Periodic Maintenance	$112	$49	$63
17	Transitability Maintenance	$17	$17	
18	**Subtotal Unpaved Maintenance**	**$153**	**$90**	**$63**
19	**Urban Road Maintenance**	$18	$18	
20	**Emergency works**	$9		$9
21	**Total Strategic Maintenance Plan**	**$351**	**$171**	**$180**
22	**Priority Roads Rehabilitation and Upgrading**			
23	Bridges Rehabilitation	$120	$33	$87
24	Regional Roads Investment Program	$51	$11	$40
25	Priority Rehabilitation and Upgrading	$300		$300
26	Ongoing Phase 1 Projects	$22		$22
27	**Total: Priority Rehabilitation**	**$493**	**$44**	**$449**
28	**Total Strategic Financial Plan**	**$908**	**$233**	**$675**

Note: Figures including final financing commitments to be revised as part of the Project Implementation Plan. GOM funding of IVA and other counterpart contributions to investment projects not finalized.

4 STRENGTHENING SECTOR MANAGEMENT

The implementation of RSS and overall management of the road sector are the responsibility of two, *autonomous, independent, and commercially oriented* public agencies operating under the authority of the MOPH: the Road Fund is responsible for road sector financing while ANE is responsible for sector planning and for implementing works.

Strengthening road-sector management is a prime objective of RSS. The management and staff of ANE and the Road Fund were instrumental in formulating RSS and PIP 2007 - 2009 and take ownership of the overall strategic vision and of their specific elements. As a kickoff to Phase 2, the staffs of both institutions, including ANE's new provincial offices, will hold seminars and workshops on RSS and PIP 2007 - 2009 to prepare for their implementation.

Joint annual reviews of RSS and PIP 2007 - 2009 will be held for ANE and Road Fund staff, management, Boards and, senior advisors in order to focus on performance of the sector and the institutions. These review meetings will precede the joint reviews to be held with Government and donors.

4.1 Building an Effective Road Sector Organization

The RSS incorporates the decision taken in Beira in October 2005 by the Consultative Council of the MOPH to restructure the organization of roads management. ANE now assumes full responsibility for the management of the entire classified road network, including all planning, maintenance, and implementation of investment decisions. The practical implication of this reorganization is that ANE takes over the resources and staff of the former DEPs in the provinces.

A separate document, the "Provincial Level Organizational Study" lays out the strategy and plan for implementation of the Beira decision, including the use of Provincial Road Management Consultants (PRMCs) with responsibility for implementing maintenance and investment plans in the provinces, as well as for building Mozambican capacity to plan, manage, and maintain the road networks in the provinces. The study includes plans for the effective development of structures, assignment of qualified staff to the provinces, and formulation of clear lines of authority, responsibility, accountability and communications. It specifies the terms of reference for the PRMCs, and identifies the resources and accompanying measures that will be needed to carry out the restructuring.

District Involvement

Decentralization to the District level is one of the principles of the new PARPA. RSS includes the possibility of devolving responsibilities for vicinal roads to the District level in a phased approach, possibly using pilot schemes. Where capacity is demonstrated, ANE's provincial offices may consider deconcentrating routine maintenance management of vicinal and tertiary roads to District administrations. This way, the principle of bringing maintenance planning, works supervision and monitoring closer to the road can be applied to the District level. ANE and the Road Fund will study possible approaches, including:

- Establishment of satellite branches of ANE's provincial delegations in the District Centers.
- Involving District authorities in planning maintenance activities within their jurisdiction.

- Encouraging cooperative undertakings at the District level to take on routine maintenance contracts for roads in their area.

4.2 Completing Institutional Reforms and Improving Management

Under RSS the Inter-Ministerial Road Commission plays an important role in dealing with cross sectoral issues such as network priorities, institutional arrangements at provincial level and initiatives to deal with rural transport and travel, in addition to providing a wider road-user perspective.

RSS calls for changes in the structure and management of the major implementation agencies consistent with the Beira Decision and with the move to the Sector Wide Approach to sector management and financing. Both ANE and the Road Fund will use their autonomy in areas of employment, administration, and implementation of plans to increase organizational efficiency, ensure timely decision making, and implement a results-oriented management approach. Specific important changes will include:

- Realignment of internal responsibilities of ANE headquarters operations to take into account the line responsibility for provincial operations;
- Planning functions will be upgraded with the creation of a Planning Directorate in ANE;
- ANE's new organization will be efficient and streamlined, with fewer management levels;
- ANE will establish an unit responsible for internal audits and information management to feed into the sector's Performance Assessment Framework;
- The Road Fund will have responsibility for road sector Monitoring and Evaluation under the Planning and Assessment Framework (PAF) and will establish a unit to carry out those tasks.
- The Road Fund will create a separate executive in the form of a Director General;
- The co-coordinating linkages between ANE and the Road Fund will be strengthened and formalized through a contract program and administrative guidelines to ensure financial accountability in planning and implementation.
- Non-core functions and operations will be contracted out wherever possible;
- The roles of the Boards (Conselho de Administração) of ANE and the Road Fund will be sharpened to permit them to achieve their oversight and policy guidance responsibilities;

4.3 Reviving Network Maintenance Planning and Monitoring

RSS includes significant strengthening in road sector planning and in monitoring, evaluation, and reporting (MER). Long-term road network planning will be undertaken by the MOPH in the form of master planning. Medium-term planning will be the responsibility of ANE, with network planning (investments) separated from maintenance planning.

Road sector planning and evaluation will be an integral part of the Sector Wide Approach (SWAP) and the Planning and Assessment Framework (PAF) for the road sector which are detailed in a separate document. Briefly, the planning and evaluation cycle includes:

- Long-term national and provincial master plans formulated for 15-year horizons by MOPH;

- Medium-term rolling, 5-year sector plans for investment and maintenance prepared by ANE, and revised every three years;
- Medium-term 3-year contract programs of works and activities including commitments by implementing and financing agencies, prepared by the Road Fund and revised each three years;
- Annual adjusted plans coordinated with the GOM budget process and based on the 5-year sector plans and 3-year contract program;
- Bi-annual joint evaluations of plan achievements under the leadership of MOPH and including ANE, Road Fund, and donors.

Planning

The role of planning within ANE will be elevated to directorate level and planning capacity will be strengthened. Investment planning will include systematic identification of potential projects and preparation of pre-feasibility or feasibility studies which can then be incorporated into project prioritization. Systematic and regular evaluation of candidate projects using economic and multi-criteria analysis will be done and presented to management and to the Government for prioritization and possible inclusion in the medium-term plan. ANE will develop capacities in the provinces to identify and evaluate investment projects and include provincial-level input into the planning process.

Paved and unpaved road maintenance will be planned and programmed separately. Road condition, traffic and other data collection will be contracted out, and data will be regularly input into the new IRMS (Integrated Road Management System). The IRMS will be fully utilized in the preparation of annual plans multi-annual plans. Until staff capacity is available to fully operate and maintain the IRMS and produce the required planning outputs, these functions will be contracted out, with the consultant having responsibility to both perform the required planning functions and develop ANE staff capabilities. Skilled and experienced network and maintenance planners will be recruited to fill skill gaps if necessary.

Monitoring and Evaluation

Systematic monitoring and evaluation of the program and of overall institutional performance remains an integral part of RSS and of the Planning and Assessment Framework (PAF) being implemented. The goal of road sector management is to transform ANE and the Road Fund into performance-oriented institutions whose accomplishments can be measured by their success in achieving explicit targets. Specific performance indicators and benchmarks are included in PIP 2007 - 2009 and in the Contract Program. Four types of indicators are called for:

- Institutional indicators: generally one-time changes in institutional arrangements that improve sector management;
- Process indicators: measures of the efficiency of the system to deliver services;
- Implementation indicators: direct measures of outputs of road sector management;
- External Impacts: measures of the desired impacts from road sector management, including PARPA objectives, Government development objectives, and social and economic impacts.

The Road Fund will have overall responsibility for road sector Monitoring and Evaluation. This function will include independent verification of performance through ongoing technical

audits. As the principal implementing agency, ANE will be responsible for collecting and reporting most of the data required for evaluating process, implementation and impact indicators. A high-level unit (within the Directorate of Planning or in the Office of the Director General) led by a Monitoring Officer and with sufficient resources and authority will be responsible for data collection and reporting, project report preparation and ensuring that Action Plans are updated.

Reporting

Overall reporting on road sector performance indicators is the responsibility of the Road Fund. Reporting requirements will be rationalized, harmonized, and consolidated so that separate reporting requirements for Government and the various donors do not overly burden the MER system. The objectives of reports will be:

- To regularly provide management, Boards, Government and donors with timely and accurate information that permits the assessment of performance within the PAF;
- To provide management tools to effectively manage the organization, in the form of timely, accurate and relevant summaries of key activities, focusing on problem areas that need to be addressed.

4.4 Streamlining Procurement

The purpose of procurement is to ensure that capable service providers are engaged at prices balanced against the quality of the services provided. Procurement procedures will ensure transparent, effective, and punctual acquisition of the required services. It is essential that procurement work be done according to established and realistic time frames, and that those responsible for procurement be given the resources and authority to achieve them.

General Procurement and Contract Management Issues: ANE's headquarters procurement functions will be centralized to improve efficiency and controls, staffed by a specialist core of persons capable of running procurement according to the required procedures and regulations. Procurement procedures and regulations will be harmonized as much as possible among the various donors in conjunction with the establishment of a single national procurement process and set of documents.

The evaluation system to rate suppliers of services will be made operational and data from project completion reports input automatically into the database of consultants and contractors. This will facilitate prequalification and tender evaluations.

Procurement delays due to bureaucratic obstacles and multiple required approvals will be eliminated. A high level Government commission will be established to rationalize and streamline procurement and contract approval procedures. The objective is to delegate authority to implementing agencies to run their own procurement functions with the minimum amount of externally imposed delays, subject to adherence to Government guidelines. ANE will be authorized to approve contracts up to predefined financial levels without having to seek the approval of MOPH and Ministry of Finance.

Procurement and Management of Engineering Services: Procedures for evaluating Expressions of Interest (EOIs) for professional engineering services to general and specific procurement notices will be codified and followed transparently.

Alternative options for determining the cost of material investigations in the competitive bidding process will be explored, as for example by requiring tenderers to provide provisional sums for the investigation which are then confirmed with ANE after award of the contract.

The terms of reference (TOR) for engineering and specialist services will be performance based, indicating the result desired rather than how to do the work. TORs will also better reflect Mozambican conditions and the implementing agencies' capacities to manage services.

Construction Procurement and Execution of Projects: During Phase 2 special efforts will be undertaken to address the problem of excessive claims and their processing. There will be increased focus on tender estimates to ensure better cost estimates for budgeting purposes. ANE will develop better contract management skills, particularly in the area of anticipating and dealing with contract disputes and claims. In particular, decision-making time will be cut to avoid delays in issuing instructions which lead to further claims and higher project costs. Management will address such issues promptly, thoroughly, and responsively.

4.5 Professionalizing the Management of Services

Effective management of projects by ANE staff is crucial to project success and requires improvement. Project management will focus on value for money and improved quality of works by:

- correctly identifying the requirements for projects in terms of quality and program, reflected in TORs that are fully descriptive of the requirements for consulting services, and are then clearly explained to the appointed design engineers;
- ensuring that contracts for consulting services (design and supervision phases) reflect the performance requirement of the services and the quality of the end product required;
- giving clear and accurate design data to consultants, or alternatively making the consultant explicitly responsible for obtaining the data;
- following through to ensure that the design function is performed (and completed) to the required standard, that there is consistency between designs and technical solutions, and that *pre-tender estimates* of cost are carried out in a market responsive manner;
- improving the evaluation of consultants to ensure that those appointed are appropriately qualified;
- evaluating tenders against the estimates prepared and awarding contracts targeting best response to the end-product requirement;
- timely actions including acceptance of designs and documentation, response to claims, response to variation proposals, and processing of payment submissions;
- continuous monitoring of project progress in terms of time, cost, physical execution and quality, with prompt and appropriate rectification of problems;
- avoiding contract documentation that impedes consultants and contractors from applying their expertise or compromises their responsibilities and liabilities;
- incorporating performance requirements in contracts, including the *liability* to provide services of the required standard, and *penalties* that will be applied in the event of noncompliance.

Project management teams will be established that will see projects (or sets of projects) through from feasibility stage to construction. Strengthening in-house capabilities for project management is a priority as described below. Until such time that capacities to effectively manage the scope of major civil works contracts foreseen under Phase 2 are fully developed, ANE will selectively contract out project management functions in order to ensure the best performance of the sector and best provision of quality end product to road users.

Improving the Quality of Consulting Services: Improving the performance of design and supervision consultants is critical to the improvement of the quality of works and cost efficiency. In addition to strengthening project management in general, several actions aimed at improving the performance of consultants will be taken:

- TORs will adopt criteria for proposals based on quality of end product rather than adherence to specified methodology;
- criteria for and evaluation of personnel to be provided by consultants will target proven records of ability rather than academic qualifications;
- evaluations of proposals will give more weight to the experience and track record of the company rather than exclusively that of the individual staff;
- proposals will be more effectively evaluated by using experienced and competent staff capable of rendering professional assessments of tenderers' qualifications;
- consultants will be made aware of the problems they will face with materials and informed of ANE's experiences with solutions;
- implementing the evaluation system for consultants noted earlier to ensure that good performers are rewarded with opportunities to bid on future works, and poor performers are informed of their deficiencies and penalized in terms of short-listing opportunities.
- upgrading the performance of the provincial consultants responsible for supervising the critical routine maintenance (and other tasks).

4.6 Creating Effective Local Capacity

Achieving the Government's goal of creating effective local capacity to manage the road network requires a change in the approach to personnel management and capacity building. These include:

- Adopting a system of accountability including formal staff evaluations and rewards based upon measurable accomplishments;
- Refocusing training to include more on-the-job and mentoring relationships, and reducing the role of external training that doesn't have task-specific relevance;
- Requiring demonstrable and measurable improvements in local capacity to manage and carry out technical tasks;
- Recruiting qualified professionals for key technical posts rather than relying exclusively on training which can complement but never substitute for experience;
- Selective outsourcing functions or units, with a medium-term (3-5 years) requirement to develop local capacity and offering contractors specific incentives to do so.

Rethinking Training, Technical Assistance and Mentoring: A new direction will be taken in developing the capacity of local engineers in the road engineering industry. A formal mentorship program will be implemented and driven by a technical assistant that will have knowledgeable, capable and experienced engineers as his main key performance area. The program will focus on aspects that have the biggest impact and effect, such as on-the-job training. Secondment to consultants and contractors with specific goals will also be part of the process.

Currently, technical assistants execute what are in effect line functions when ideally they should guide and train road-sector technical staff, providing mentoring and on-the-job training. In Phase 2 TAs will function as advisors, backing-up and monitoring the work done by regular personnel, rather than performing line tasks themselves.

Supporting Provincial Roads Staff: ANE's new responsibility for all works implemented in the provinces requires the strengthening of provincial staff to effectively manage works, especially maintenance contracts. Improving the capabilities of ANE's provincial road staff first requires that senior experienced staff be placed in provincial offices. Provincial staff will receive appropriate training and mentoring opportunities. The Road Network Managing Consultants that will be employed in the provinces will have explicit responsibility for ensuring that ANE's provincial engineers' skills are upgraded by on-the-job training, supplemented by formal training.

Provincial roads staff will also be supported with adequate resources necessary to carry out their roads management responsibilities. This includes sufficient transportation to regularly inspect roads and visits works sites.

Private Sector Development: Significant enhancement in local capacity to execute civil works will be achieved in Phase 2. In particular, the capabilities of small-scale contractors to undertake routine maintenance contracts (and other civil works) throughout the country will be upgraded.

Development of the local roads construction industry is being undertaken by the MOPH, which has consulted with contractors and materials producers from the construction sector, with the objective of identifying problems and developing an initial strategy for the growth of the private sector. The following range of supporting actions will be implemented:

- **Organizational development**: contractors are interested in the creation of provincial associations with a national confederation. Support for this has been a longstanding policy and will be implemented. These organizations will provide a wide range of supporting services and serve as a voice for the sector, providing important input in the needed review of the contractor registration system, which impedes creation of capacity.
- **Training**: contractors and their staffs require training at all levels. Technical and management skills can be gained through formal courses, through on-the-job training, and through partnerships. Provisional sums can be included in works contracts to be used as payment for formal training. In-service training on site can be provided by provincial consultants or by external service providers. Independent mentoring will be made available to contractors to complement technical training.
- **Finance**: most small contractors have limited financial capacity, resulting in a "hand-to-mouth" mode of operation with no capacity for expansion. Most small contractors require some form of financial assistance, to meet the collateral requirements for tendering, to provide credit lines and bank guarantees, and for working capital. One simple means of addressing the cash-flow problem is to ensure that invoices are paid promptly. Requirements for guarantees and performance bonds could be relaxed where the risks involved are small. Difficulties in obtaining some of the plant required for execution of works can be remedied by the development of operational plant-hire companies.
- **Contracting**: small contractors with satisfactory performance histories can be assisted through contractual set-asides for some work. Domestic preference clauses will be included in medium and large scale tenders to promote the inclusion of local firms in joint ventures and as subcontractors.
- **Partnerships**: joint ventures and other partnerships between large-experienced and small-inexperienced contractors will be encouraged. An ambitious approach to development of local capacity would be to require that output- and performance-based periodic maintenance and rehabilitation projects be tendered as joint ventures between large (often international) contractors and smaller (local) contractors. The small contractor would work with the large contractor on the major intervention, gaining valuable experience. The local contractor would then take on the maintenance phase of the contract, with assistance from

the large contractor. Another variant on the large-small contractor partnership approach is to let out large routine maintenance contracts to experienced contractors on a contract management basis, with responsibility for subcontracting, training and supporting small contractors in the purchase of equipment.

4.7 Revitalizing Sector Dialogue

Sector dialogue with all stakeholders will be strengthened. These stakeholders included road users, civil society, road sector professionals, financing partners, local and provincial authorities, and governmental agencies. The following additional actions will be implemented:

Donor Coordination: Donors have expressed their desire to improve both coordination and harmonization of their programs (and procedures) in support of the road sector. A willingness to move to a sector wide approach including an integrated planning and assessment framework and sector budget support is one manifestation of this. Donors have made clear that they look to the GOM and its implementing agencies to take the lead in establishing the priorities and desired areas for support through RSS and PIP 2007 - 2009. This opportunity will be exploited by the implementing agencies by scheduling regular opportunities for joint donor consultation, including bi-annual reviews of program achievements. Donors will be requested to conform to Mozambican procurement and other administrative guidelines to the extent possible. And GOM and donors will strive to harmonize their reporting requirements.

Improving Internal Coordination of Donor Programs: Coordination among donor programs can be further enhanced by establishing a forum for personnel responsible for liaising with the various donors. Currently different agencies, directorates, departments and individuals have liaison responsibilities with the various donors. These offices and officers must have a cohesive view of what support is required from the various donors. Such a forum will be led by the Chairman of the Road Fund in coordination with the Director General's office of ANE.

Winning Over Provincial Authorities: Improved liaison between provincial and National Roads Administration agents will be critical to the successful implementation of the "Beira Decision". Provincial authorities—political, administrative, and professional—are all closer to the ground and more aware of the problems and issues than national bodies can possibly be. Their input and their support is vital to the success of any locally implemented program of maintenance and rehabilitation. ANE will upgrade the level of liaison with provincial authorities, including more frequent consultations at the highest level. Regular (at least annual) meetings of provincial governors, directors, with the Director General of ANE and Chairman of the Road Fund will help to establish a greater environment for cooperation.

Giving Road Users Voice: The term "road users" is most often associated with the phrase "road user charges". This makes road users, in particular fleet operators, feel that their main function in the Roads Administration System is as a source of revenue. Although the private sector is nominally represented on the Boards of the Road Fund and ANE, few believe that this representation is meaningful. Private-sector representatives to the Board will meet regularly with their constituencies.

Partnering With Service Providers: One or more forum of service providers will be established as a venue for raising the issues that create problems in effectively delivering the services contracted by the road sector agencies. These forums will be open to all consultants and contractors working or tendering in the road sector. The agenda for these meetings will be jointly established, and will include such issues as VAT, late payments, and validity of contracts.

4.8 Ensuring the Attainment of Broad Social Objectives

The Road Sector Strategy recognizes the importance of ensuring that road sector interventions and investments are compatible with broad social objectives including poverty alleviation, environmental protection, control and mitigation of the impacts of HIV/AIDS, and promotion of opportunities for women. To this end, ANE, through its Social Issues and Environment Unit (UASMA) will continue to monitor and evaluate the impact of the roads program in these areas and to develop programs to achieve national goals in these areas.

Poverty: Although poverty alleviation *per se* is not ANE's mandate, it is an essential criterion for resource allocation. Additionally, it is recognized that roads civil works may inadvertently adversely affect populations in terms of displacement and loss of livelihoods. Thus, the adoption of poverty reduction measures indirectly becomes obligatory for ANE. In this context, the RSS requires the preparation of social safeguard documents (resettlement policy framework and resettlement action plan) for implementation, so that negative project impacts are appropriately mitigated. Another objective with regard to social safeguards and poverty reduction is to promote long-term local employment opportunities in roads construction and maintenance. Achievement of these and additional poverty reduction objectives will be accomplished by incorporating appropriate specifications into civil works contracts.

Environment: Given the well recognized adverse environmental impacts from road construction and maintenance, the RSS requires the formulation and implementation of environmental safeguard measures. ANE will continue to enhance its technical capacity to effectively and efficiently monitor and alleviate adverse environmental impacts and to protect sensitive environmental zones. ANE through UASMA will develop guidelines to integrate environmental (and social) aspects into the project cycle, and will continue to ensure that stakeholders, especially civil works contractors, are trained in environmental safeguard issues.

Gender Equality: the road sector being one of the major sources of private sector employment, it has a special responsibility for promoting employment and entrepreneurial opportunities for women. To this end, the RSS will continue to encourage women to participate in the sector through training and employing women in a variety of activities. Not only does this directly generate income opportunities for women, but it also assists them to gain durable skills that can be a source of income generation into the future in a variety of sectors. Involving women in community-based road maintenance is especially beneficial in that that this is a recurring activity and it is possible to train unskilled women without the need for special technology or equipment. It is also recognized that economic and social opportunities for women are also enhanced by increasing mobility, access to social services, and reducing market/transportation costs. These impacts will be monitored by UASMA and the analyses used in the formulation of future revisions to the RSS and plans.

HIV/AIDS Mitigation: The need to implement effective HIV/AIDS awareness and mitigation programs in the workplace, construction sites, and in the areas influenced by road works is well recognized by road sector leadership. The importance of these programs is underscored by the specific HIV/AIDS-issues arising from roads and bridges construction, where the presence of itinerant construction and maintenance workers, as well as road operators, increase exposure to the disease for otherwise relatively isolated populations. ANE's sector-wide HIV/AIDS strategy was formulated in 2003, with interventions designed to address the needs of road sector staff at the central and provincial levels, road workers, and communities living along the roads. In general, NGOs have been used for implementing *behavior change communication* activities among staff, and in the implementation of programs aimed at the road workers as well as the communities. The requirements for these programs will continue to be included as specifications in road works contracts, supervised and coordinated by ANE's *HIV/AIDS Unit*.

5 FINE-TUNING ROAD SECTOR FINANCE

Road sector finance has been one of the most successful elements of overall sector management. Road user charges have grown, there has been substantial improvement in the allocation of those resources to maintenance, and financial management of the Road Fund has been sound. The Revised Strategy seeks to build on these successes and to focus on the development of new sources of revenue to fund the ever increasing demands for maintenance finance. The main financial innovation in RSS to be implemented in Phase 2 is the move toward sector budget support under a sector-wide approach to road sector planning, finance, implementation, and assessment. The details of the approach will be finalized prior to Phase 2.

5.1 Fundamental Principles of Road Sector Financing

The key financial principle of RSS is that road users pay the costs of maintaining the highways, while the government finances road investment through the state development budget and through external resources. This division of financing responsibilities is the first of several principles summarized here.

Road User Charges to Fund Maintenance: A continuing fundamental principle of the RSS is to fund all maintenance through road user charges. During Phase 2 all routine maintenance and an increasing share of periodic maintenance continue to be funded by Road Fund revenues. Full funding of periodic maintenance through road user charges remains the target to be achieved by the end of Phase 3; meanwhile, during Phase 2, additional assistance from donors toward periodic maintenance will be necessary while revenues continue to be developed. In particular, donors will be asked to carry a substantial share of the Paved Road Management Program (both periodic maintenance and backlog maintenance).

One area which requires strengthening during Phase 2 is the assurance that road user charges be restricted to their intended uses. In particular, greater control will be exercised to prevent cost overruns and claims on construction projects. Donors must respect this by not insisting that the Road Fund co-fund investments as long as maintenance needs are still insufficiently funded. Control over this issue will be critical to moving toward sector budget support.

Moving Toward Sector Budget Support: Financing for the road sector will continue to evolve toward the use of the Road Fund as the single channel for financial operations. The various financial management organizations and systems shall be consolidated and strengthened.

The opportunity to make the Road Fund a "center of excellence" in financial management, which will manage all funds for the sector has obvious advantages. These include operational efficiency in the context of the sector-wide Planning and Assessment Framework, while also providing funds for allocation according to local priority. To this end, donors will shift their support from direct project support to sector budget support.

This approach requires careful management of funds intended for different purposes, and even *ring fencing* of earmarked funds until full sector budget support can be implemented. Clear procedures and mechanisms will be developed to ensure that maintenance funds are not diverted to investment purposes, payment of VAT, or other uses.

Efficient and Transparent Financial Management: The independent financial management systems implemented for the Road Fund and for ANE during Phase 1 will be utilized more effectively in Phase 2 to enable management to have accurate real time financial information,

and to fulfill reporting requirements efficiently. Performance agreements in the form of Contract Programs between the Road Fund and ANE (and eventually with other implementing agencies) will specify the conditions and procedures by which funds are allocated and disbursed. Once these agreements are finalized and brought into force, they will improve the clarity of the relationships.

Paved Road Management Fund: The need for a "ring fenced" fund to provide for the resources to operate this facility is fundamental to make this specialist operation work. The Fund will be established within the Road Fund and receive a significant part of its funding from this source. It is intended that the Road Fund will, in the course of time, be able to provide completely for this fund from its own revenues. The fund will be subject to control by the Road Fund Board and to oversight through a Steering Committee.

Regional Roads Investment Fund: A Regional Roads Investment Fund (RRIF) will be created in the Road Fund specifically for the purpose of providing resources for investment (as opposed to maintenance) in regional roads and bridges. The RRIF shall be financed by donors with GOM counterpart contributions from the capital budget (and not from road user charges). The fund shall be controlled by the Road Fund in conjunction with a Regional Road Investment Committee, which will assist in setting the priorities for regional road rehabilitation. The commitment of adequate resources to this fund will facilitate the rehabilitation of the regional road network.

Multi-Year Budgeting: Maintenance planning, programming and even procurement will be done on a multi-year basis, facilitating the execution of multi-annual maintenance contracts. Further, procurement will be spread throughout the year to even out workload. Many innovative maintenance contract forms (output- and performance-based, level of service, build and maintain concessions) require contracts to be awarded for multi-year terms. This will require regular and systematic preparation of provincial level annual maintenance programs and multi-annual budget agreements (contract programs) between the Road Fund and ANE.

Planning, budgeting, and funding commitment discipline will be required. ANE will prepare provincial-level multi-annual plans and budget requests sufficiently early for them to be reviewed and authorized, in whole or in part. For its part, the Road Fund will make its budget commitments to the provinces sufficiently early for them to plan procurement and implementation schedules, tender, evaluate and award contracts in time to allow the necessary interventions to be effected at the optimal time.

Improving the Business Climate: The confidence of businesses operating in the road sector has eroded with a detrimental effect on price efficiency. The causes are numerous, but the most serious have been due to financial and contractual problems. These problems have harmed the relationship between the contracting authorities and service providers, and have led to increases in the prices of contracts, to cover financing and risk charges.

To remedy the problems, concrete steps will be taken to improve payment discipline, fulfill outstanding payment obligations, and resolve the problems of VAT and tax liability. As importantly, GOM and the contracting authority will make clear their commitments to fulfilling their obligations under standard international contracts, and ensure that clauses relating to dispute resolution and the legal recourses for the parties are brought into conformity with Mozambican law.

5.2 New Financing Mechanisms

The ever-increasing demands for maintenance financing require that new and innovative sources of road user charges be explored. A comprehensive Road User Charges Study will be

commissioned early in Phase 2 to explore alternative approaches for enhancing revenues. The consultancy will also include accompanying measures for implementing the proposed enhancements.

The existing sources of revenue to the Road Fund are the fuel levy, road and bridge tolls and transit (cross border) charges. In most countries motor vehicle license fees form part of the revenue to the Road Fund. These fees enable road user charges to recover the costs related to the use of each vehicle more accurately. Including motor vehicle license fees as a user charge to be paid into the Road Fund will be explored.

A promising source of additional user charges is the imposition of road tolls and the granting of long-term concessions. A pilot project to investigate the concept was recently completed on the Inchope-Caia section of the N1. It was concluded that a performance-based operations and maintenance contract (concession) awarded to a private-sector entity on the basis of competitive bidding and incorporating routine maintenance only is financially viable. There is a potential for covering a wider scope of maintenance (i.e., including periodic) on other road sections where traffic volumes are higher than Inchope-Caia.

Although not all roads are candidates for tolling, many more could be the object of maintenance concessions that bundle rehabilitation or periodic maintenance to long-term routine maintenance of the infrastructure. A number of the more heavily trafficked roads in Mozambique, e.g., those that serve tourist destinations such as coastal resorts, are potential candidates for tolling. The possibility of imposing a road-use surcharge on tourist facilities also offers an avenue to be explored.

Other sources of revenue are also used in other countries to supplement the revenue to the Road Fund, including weighbridge fees on over-loaded vehicles, permit fees for buses and heavy vehicles, weight-distance charges on heavy vehicles, and congestion charges in cities. These will be systematically considered for inclusion in the revenue to the Road Fund.

Road sector legislation empowers local authorities to raise funds to maintain roads. This area requires substantial investigation. The authority to raise funds must be compared to the capacity to do so. But where potential revenues can be realized, these could substantially contribute to local (District, Municipal, Provincial) maintenance and rehabilitation initiatives. These approaches will be incorporated into the proposed road user charges study and the Municipal Roads Task Force.

6 VALUE FOR MONEY THROUGH BETTER ENGINEERING

More attention will be paid to suitable engineering solutions to Mozambique's geo-physical, environmental, and economic conditions. When roads are properly designed for the conditions and maintenance applied correctly, the effective cost of providing at least minimal level of service or transitability is greatly reduced, and the potential for expanding those services to communities commensurately enhanced.

6.1 Realistic Approaches to Maintenance

Maintenance Definitions: The definitions of maintenance activities and actions have been revised and expanded to include the addition of *Transitability Maintenance* and *Targeted Intervention*. These definitions will be discussed with all concerned road sector professionals and a final draft adopted formally by ANE and the Road Fund. The definitions will be thoroughly reviewed on a bi-annual basis and any modifications distributed throughout the Roads Administration System.

Standard Maintenance Approaches: The term "standard maintenance" means maintenance activities which would be applied in a theoretically optimal maintenance program . It is recognized that maintenance cannot be applied mechanically to roads without the input of experienced road maintenance professionals. Consequently, while maintenance can be planned and programmed at the central or regional level, the determination of specific and timely maintenance requirements will be done locally. Well trained and experienced local personnel in charge of maintenance at the provincial or District level will be authorized to make the final determination of what specific maintenance interventions are required and their timing.

In general, roads that have been engineered and are considered to be "maintainable" should usually follow a pattern of *Standard Maintenance* comprising:

- **Routine Maintenance** activities applied to the entire length of road annually and regularly in order to preserve the condition of the road and maintain the level of service close to the design standard.
- **Periodic Maintenance** activities undertaken at generally predictable intervals of several years in order to preserve the structural integrity of the road surface.
- **Rehabilitation** activities carried out at extended intervals at the end of a road's design life in order to restore the structural integrity of the road and to enable the road to carry increased axle loadings.
- **Emergency Works** includes any repair or reinstatement of a section or sections of an existing route (including structures) where the circulation of traffic has been interrupted due to unforeseen circumstances, usually due to a natural event.

Specialized Maintenance Approaches: A sizable portion of the classified road network cannot be maintained using Standard Maintenance approaches, including roads that have yet to be engineered (tracks), roads that have deteriorated and cannot be brought back into service without being rehabilitated or reconstructed, and roads with sections or major structures that require upgrading to make them transitable or to permit them to be maintained using standard maintenance . In such cases, attempts to apply standard maintenance are usually ineffective and very costly. In order to address these problems, two specialized categories of maintenance are introduced:

- **Transitability Maintenance (TM)** is defined as interventions on unimproved roads or on roads that have degraded and are currently intransitable, with the goal of providing year-

round transitability. In most cases, TM would be applied to regional roads with the objective of providing accessibility for otherwise isolated communities. The purpose of these interventions is not to rehabilitate entire roads, but rather to ensure that as many roads as possible are made transitable. TM would include relatively low-cost localized repairs or *Spot Improvements* over limited road sections (a concept that has already been introduced as the first step in the rehabilitation or upgrading of tertiary, vicinal or unclassified roads that carry little traffic).

- **Targeted Intervention (TI)** is generally applied to problem sections of already improved (but usually unpaved) roads, most often national roads (primary and secondary), with the goal of ensuring year-round transitability at a reasonable level-of-service. TI applies to roads that have previously been rehabilitated and require specific and targeted actions on limited sections in order to solve recurrent maintenance problems, very often related to problems of drainage or localized problems with poor quality materials. TI often indicates a level of activity between periodic maintenance and rehabilitation By concentrating on short stretches, this approach can maximize the benefit of access to the largest number of people. The rest of the road may not be in "good" or "fair" condition, but if the problem section becomes transitable it may provide vital network connectivity or accessibility to poor communities. TIs can include raising road formations, the construction or upgrade of bridges, culverts and drifts, or the upgrade of road surfaces in order to reduce seasonal problems of transitability.

6.2 Maintenance Contracting and Management

Routine maintenance contracts should have a significant contract period (e.g., at least 24 months) to give the contractor some continuity and time to make a difference on the road. Contract clauses permitting the extension of the contract period when the client is satisfied with the contractor's performance will be incorporated. In addition, the procurement of the contracts will be phased over the year to give provincial contracting authority a more even workload.

The specifications and conditions of contract for maintenance contracts will be reviewed and updated. Good specifications are essential to achieve good workmanship and effective supervision. The use of innovative maintenance contract forms such as output- and performance-based contracts will be encouraged. Trials of quality-based or level-of-service contracts for routine maintenance will be monitored to determine their suitability for widespread use.

The current system that has taken engineering out of routine maintenance will be modified to bring good engineering judgment back into the system. This will require good maintenance engineers, which in turn will require active recruitment, training and mentorship as noted earlier. It will also require good performance by provincial consulting engineers.

6.3 Rationalizing Design Standards and Practices

The draft "Design Requirements" developed by ANE from the SATCC Design Standards will be reviewed and finalized in order to ensure consistency in designs produced by consultants.

Design Guidelines: Design guidelines must sensitize the designer to the practical realities prevailing in Mozambique. In particular the designs must be builder friendly, taking into account the plant, materials and skill levels that are available in the region. Design guidelines must emphasize boldly the importance of material investigations; life-cycle assessments of

designs (maintainability); effects of overloading on the pavements; balancing of design (e.g., not cheap seal on expensive base layers); and economic justifications of the design.

Given the limited availability of resources for both maintenance and for road rehabilitation and upgrade, it is essential that the design of investment projects strive for the most efficient and economical solutions. This entails careful scrutiny of the technical (e.g., engineering), economic (e.g., traffic) and social (e.g., safety) requirements for all rehabilitation and upgrade designs so as to minimize life-cycle costs and maximize the impact of scarce resources.

Geometric Design: One area of particular concern is in the geometric design of roads. Put plainly, Mozambique can ill afford to design and construct roads that provide higher levels of service than the bare minimum required for the conditions. Where traffic is very low (i.e., normally less than 200-300 vehicles per day with relatively few heavies), gravel roads should normally prevail. Where either traffic justifies the paving of a road, or where maintenance considerations dictate paved surfaces, widths will be kept to the minimum consistent with traffic and environment. The question of paving shoulders will be subjected to tough-minded analysis, with the burden of proof on the case for going beyond the minimum standards.

While it is not appropriate to establish hard and fast rules, it would not be inappropriate to note that in many neighboring countries, rural roads are built to 6 meter width standards for very low-volume roads, 7 meter standards for low-volume roads, and that in general, paved shoulders of 0.5 meters are reserved for those cases where projected traffic or environmental conditions require.

One area where design standards should not be compromised is in the area of road safety. The provision of appropriate, consistent, vertical and horizontal curvatures, site distance and road marking and signing for safety should not be compromised. Similarly, the volume and nature of nonmotorized traffic will be taken into account when designing roads for width and shoulder treatments.

Lane Width: As indicated in the SATCC guidelines, selection of lane width should be based on traffic volume, vehicle types and anticipated vehicle speeds. Higher volumes, larger vehicle types and higher speeds require wider lanes:

- The greatest lane width recommended in the SATCC guideline is 3.7 meters. In rural situations, no operational or safety benefit accrues from lane widths wider than 3.7 meters.
- The narrowest width recommended is 3.1 meters, giving a clear space of 0.3 meters on either side of a vehicle that is 2.5 meters wide. This lane width will normally be employed only where speeds or traffic volumes are expected to be low.
- Intermediate conditions of volume and speed can be adequately catered for by a lane width of 3.5 meters.

Recommended lane widths established in the IRRS remain valid. National primary roads should not have lanes that exceed 3.5 meters, except where clearly justified based on the abovementioned criteria (traffic volumes, vehicle types and speeds). Even on national roads where traffic is projected to be low, ANE's existing 3.4 meter standard will be applied. For low-volume and very low-volume roads of all classes, the established standard of 3.1 meters will be maintained as the preferred width unless expressly justified by other considerations.

Surfacing of Shoulders: Surfacing of shoulder area will be adopted as a standard only for higher traffic volume roads (>1,500 AADT) to reduce the risk of shoulder damage through edge breaking. This will also reduce the intensity of traffic loading on the outside edge of the lane where it can cause the most damage due to moisture ingress from a gravel shoulder.

In all other cases the presumption will be not to surface shoulders, except where specifically justified by other considerations. Based on the SATCC guidelines, full width surfacing of shoulders will be considered:

- where significant usage by pedestrians and nonmotorized traffic occurs;
- where shoulders are constructed with materials that are readily erodable, or where the availability of materials for shoulder maintenance is restricted;
- in front of guardrails;
- where the total gradient exceeds five per cent;
- where heavy vehicles would tend to use the shoulder as an auxiliary lane;
- in mist belts;
- wherever it is economically justified;
- in cuttings where concrete side drains are provided.

Drainage and Erosion Protection: Drainage must be a major aspect of future road and rehabilitation designs. The significant maintenance problems that erosion causes can and should be reduced through proper design and planning. The life of many roads is reduced because they are located at the same level as the surrounding ground. The raising of the road surface should always be considered during design. Problems with Armco type pipes in coastal regions should be made known to prevent maintenance problems due to rusting or collapse.

6.4 Materials and Research

Over large areas of Mozambique, locating suitable construction materials is a big problem due to widespread occurrence of sands and decomposed granites with high plasticity. The real cost of not having access to a full inventory of the road materials available and their location is enormous. The absence of sound material investigation data contributes significantly to the high cost of rehabilitation and periodic maintenance by creating an area of high risk in what could be a technically determinable area with great impact on overall pricing by bidders. This aspect of road projects in Mozambique also contributes greatly to the high incidence of contractual claims.

The execution of a project to determine an inventory of road building materials will be implemented in Phase 2. The facilities which exist through satellite imaging make this task readily achievable at reasonable cost. The required ground confirmation testing will be incorporated into the project to create viability through privatization of the provincial materials laboratories and the Engineering Laboratory of Mozambique (LEM). The database will be linked to a GIS and the IRMS, and the data made available to project engineers when required for investigations.

Research: The current program of research of into pavement designs (ETB, asphalts and sands) using accelerated pavement testing will be continued, expanded and accelerated. Money invested in generating better performing pavements will provide significant returns in future savings on a national basis.

Experiments have been underway with ETBs for some time and decisions will be made whether to implement this technique on a larger scale. The results from labor-based surfacing trials in Zambezia are also promising and will be introduced where appropriate for *Spot Improvement* and *Targeted Intervention* works on tertiary and vicinal roads, making a major contribution to the reduction of maintenance costs.

Highway Laboratory System: The Beira decision includes the return of provincial laboratories to ANE's authority. As a matter of highest priority, these laboratories will be brought to professional operational standards. The effectiveness of each of the provincial laboratories will be evaluated and a business plan drawn up for each to address the aspects that cause them not to operate effectively. Serious consideration will be given to outsourcing the operation of the laboratories, and to involving the (LEM) in overseeing their operation.

6.5 Protecting Pavements: Effective Axle Load Controls

A program of axle load control has been prepared under the Heavy Vehicle Overload Control Study. Procurement and operationalization of weighbridge infrastructure is important, and will be complemented by a coherent strategy that includes monitoring, enforcement, legislation, and incorporating the results in future pavement designs.

The analysis of the economic consequences of alternative policies, and the introduction of southern African axle and vehicle load standards into Mozambique, prescribed in the original Strategy, remain to be implemented. These will be complemented and strengthened by two additional actions:

- Future civil works designs will revisit the question of the most likely level of vehicle loadings and the implementation of improved enforcement procedures and of changes in the legal framework and overload control regulations.
- Data collection and vehicle load monitoring (in addition to legal controls) will be reinforced.

6.6 The Imperative of Highway Safety

A full road safety Strategy has been prepared under the Road Safety Action Plan And Safety Strategy Study. This will include a medium-term plan for actions to enhance highway safety. The results of this study will be given high profile and priority.

One institutional step that will be taken is to elevate the importance of highway safety by establishing a unit within ANE with oversight responsibilities for the road safety. This unit will be staffed by an engineer trained in road safety matters. This unit will liaise with the road safety personnel in INAV.

Other specific actions that are included in the road safety Action Plan:

- Government adoption of the SATCC road sign guidelines;
- Require that necessary minimum road signing be incorporated in all major civil works projects, and not allow their elimination even in the face of tight budgets;.
- Incorporating non-motorized road traffic safety in road design;
- Proper traffic accommodation plans for all civil works projects and monitoring execution;.
- Improved coordination between ANE and INAV regarding road design features;
- Activating the road safety council with senior representation from ANE and INAV;
- Implementing road safety audits as a routine part of project appraisal;
- Funding and implementing a program to collect and analyze accident information.
- Liaising with communities to reduce the theft of traffic signs.