AFRICA COMMUNITY ACCESS PROGRAMME
MALAWI STUDY TOUR
TO
ZAMBEZIA PROVINCE, MOZAMBIQUE

Contract Reference: AFCAP/MAL/020/B

14th to 18th September 2009

STANGE CONSULT
Konstanz
Federal Republic of Germany

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1 BACKGROUND

The Government of Malawi, in collaboration with development partners, is developing a new maintenance system for a core network of about 10,000 kilometres of higher traffic unpaved roads. This core network will be managed by the Malawi Road Authority at Head Office level and through their zonal structures.

It has been proposed that the maintenance system could use tractor based technologies and an area based management structure along the lines of the system developed by the District Development Fund in Zimbabwe and now also being implemented by the National Road Administration of Mozambique in some provinces. In Zimbabwe the system has been implemented through force account whilst in Mozambique the works have been carried out by private contractors. A notable difference between the Zimbabwe/Mozambique operations and the planned maintenance system for Malawi is that most of the road sections in Malawi will not have a gravel wearing course.

Lessons learned from the implementation of the maintenance system in Zimbabwe and Mozambique are relevant to the development of the Malawi programme. This includes the specifications for the maintenance work, the differences between force account implementation and private contracting, unit costs, equipment specifications and maintenance, requirements for skilled workers, management arrangements etc.

The Africa Community Access Programme (AFCAP) was asked by the Malawi Roads Authority to support a study tour of a province of Mozambique where the tractor-based maintenance system is operational. As a result, a 5 day study tour of the Zambezia Province was held from Mon 14/09/09 to Fri 18/09/09. This report summarizes the main activities held during the study tour.

1.1 OBJECTIVES

The main objectives of the study tour were:

- Understand the concept and operation of the Area Based Maintenance System and observe on the routine maintenance activities being carried out;
- Identify the advantages and disadvantages of carrying out routine

maintenance of unpaved roads using the Area Based Maintenance System;

- Understand and observe and compare the condition of the roads being maintained under the Area Based Maintenance System and those maintained under different maintenance regimes.

Table 1: List of Participants

Name	Position	E-mail
Mateus Jakisson	Director of Maintenance ANE, Moz	mjakisson@ane.gov.mz
Kingston Gongera	Director of Feeder Roads DDF, Zim	gongera@ecoweb.co.zw
Collins Kumangirana	Director of Roads, Malawi	c.k.kumangamira@gmail.com
Adrian Mthini	Director of Maintenance, Malawi	amthini@nramw.com
Rob Geddes	AFCAP Technical Manager	rgeddes@africaonline.co.zw
Rui Branco	Internal Audit ANE, Moz	rbranco@ane.gov.mz
James Agingu	Technical Advisor, Malawi Roads Authority	joagingu@yahoo.co.uk
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Edward Musazi	Team Leader, Consultec	Emusazi@yahoo.com
Manuel Namurro	Inspector, Consultec	Manuel.namurro@yahoo.com.br
Manso	Technician, ANE Zambezia	

2 DAY 1 SITE VISIT

The first day was spent on a site visit to various roads being maintained under three different maintenance camps. A map of the Zambezia Road Network under the Area Based Maintenance System is included in Annex 1. The roads and camps inspected are as shown in Table 2 below:

Table 2: Roads and Camps Inspected

From	To	Length KM	Base Camp
Malei	Maganja da Costa	52	1
Maganja da Costa	Mocubela	70	2
Mocubela	Cruzeiro	70	6
Cruzeiro	Mugeba	24	6

Time was spent at base camps 1 and 6 with the Tour Facilitator explaining the basic facilities at the camp and their uses. He also explained the main routine maintenance activities carried out by each base camp, the minimum equipment required for the efficient operation of the camp and the basic key labour requirements. Other subjects discussed included the work cycles and the importance of carrying out the key mechanized activities during the right time of the year namely; towed grading during the rainy season and tyre drag during the dry season. There were comments on the routine maintenance activities that were being carried out during the site visit.

A lot of questions were asked by the participants but due to time constraints, it was agreed that more discussions would be carried out during the workshop as time had been already allocated for discussions to be carried out on observations from the site visit.

3 DAY 2 WORKSHOP

3.1 WELCOME BY DIRECTOR OF MAINTENANCE-MOZAMBIQUE

Day 2 started with the Director of Maintenance for ANE officially opening the workshop by welcoming all participants. The Director stated that the system of maintenance using the camp system started in 1996 to 2001 in Manica and Tete with the construction of 12 Camps that had the responsibility of maintaining 1830km. This system was then extended to Zambezia (2001 to 2007), Sofala (2003 to 2008) and currently more than 276km in Inhambane.

The Director went on to state that from various studies carried out, it is clear that there are advantages in use of the ABMS system such as a base for operation that reduces

the cost of mobilisation for Contractors. The Director hoped that the workshop would bring recommendations that would result in an improvement in the system of managing maintenance of roads. The Director's presentation is in Annex 2.

3.1.1 Overview of ABMS in Mozambique by Eng. J Chiwara

The Tour Facilitator, Eng. J Chiwara presented an overview of the Area Based Maintenance System in Mozambique starting with the pilot projects carried out in Tete and Manica between 1996 to 2000, then moving onto the Zambezia, Sofala and finally Inhambane Provinces. The presentation then touched on the experience of the ABMS in Zambezia using small scale Contractors with emphasis on the concept and operation of the system. Other subjects covered included among others:

- Work cycles for routine maintenance (equipment based and labour based) and preparation of work programmes;
- Times during the year when key activities have to be carried out i.e. ; towed grading during the rainy season and tyre dragging during the dry season;
- Staff and equipment resources and utilization;
- Maintenance contracts, costs, training and administration;
- Use of small Contractors for routine maintenance through competitive bidding;
- Contractor financing and capacity

The presentation by J Chiwara is in Annex 3.

3.1.2 ABMS in Mozambique by Eng. Rui Branco

Eng. Rui Branco of ANE presented a history of the ABMS in Mozambique giving details of each project since the beginning with the pilot projects in Tete and Manica ending with the current project in Inhambane. Eng. Branco also touched on a report by an Independent Consultant commissioned by KfW in 2004 who carried out an assessment of the pilot projects of Tete and Manica where he concluded that roads under the ABMS were better maintained. This presentation also looked at the advantages and disadvantages of the ABMS. Annex 4. is a full copy of the presentation by Eng. Branco.

3.1.3 The Rural Roads Programme in Zimbabwe by Eng. K Gongera

The Director of DDF Rural Roads, Eng. Gongera gave a presentation on the Rural Road programme in Zimbabwe where the ABMS has been used extensively with the main difference to the Mozambican one being the use of force account. The presentation touched on the planning rationale and the development of the ABMS in Zimbabwe. Also covered were work programmes for equipment and labour and influence area of ABMS. The presentation also explained the use of force account and the advantages of using force account as opposed to small Contractors for routine maintenance. Eng. Gongera also stressed that the main advantages of the system were improved efficiency of equipment utilization and easier management of smaller units since each camp has on average between 15 and 20 labour force at any given time and covers a network of between 150 to 200km. In conclusion, the presentation touched on the present situation in Zimbabwe following 10 years of economic decline. The full presentation by Eng Gongera is in Annex 5.

3.1.4 Development of the Malawi Rural Road programme by Eng. A Mthini

After lunch, there was a presentation on the Development of the Malawi Rural Road Programme and this was presented by the Director of Maintenance, Eng. Adrian Mthini. This presentation touched on a number of subjects with the main topics being:

- Malawi National Transport Policy;
- Road Sector Reforms;
- Road Authority Establishment;
- Road Infrastructure Development and Management;
- National Roads Programme and;
- Challenges and Proposed Interventions.

The presentation by Eng. Mthini is in Annex 6.

3.1.5 AFCAP Progress Presentation by Eng. R Geddes

The final presentation was presented by Eng. Rob Geddes who started by explaining that AFCAP is a UK funded knowledge and research program for Africa. The presentation went on to demonstrate the AFCAP approach, the Constraints and challenges and the AFCAP Four Way Test. Eng. Geddes also touched on other activities that AFCAP is engaged in such as:

- Technical Monitoring;
- Facilitating holding of Workshops/Seminars and Study Tours
- Support in Institutionalizing Technical Specifications etc.

In conclusion Eng. Geddes also summarized AFCAP activities in Malawi and Mozambique. Presentation by Eng. Geddes is in Annex 7.

3.2 DISCUSSIONS AND EXPANSION OF TOPICS

After the final presentation, general discussions and expansion of topics proceeded with a very lively debate of issues. Observations from the previous day's site visit generated a lot of questions. It was generally felt that the contractors on site did not appear to be knowledgeable with what they were doing, for example using unsuitable material for pothole patching and erosion repairs. The participants felt that this was mainly a supervision problem. However, it was stressed that the current contractors and consultants had not undergone any form of training on the ABMS system. From observations, some of the roads visited had sections that had not been towed graded this current maintenance year due to a delay in the procurement system which resulted in contractors moving on to site in mid May instead of at the beginning of January. It was felt that the Road Authorities and consultants must allow adequate time for the procurement process in order to ensure that routine maintenance activities are carried out at the prescribed times. In the event that this is not possible, addenda must be prepared in advance for the period when the new contractors will not have been selected.

4 DAY 3 WORKSHOP AND VISIT WRAP UP

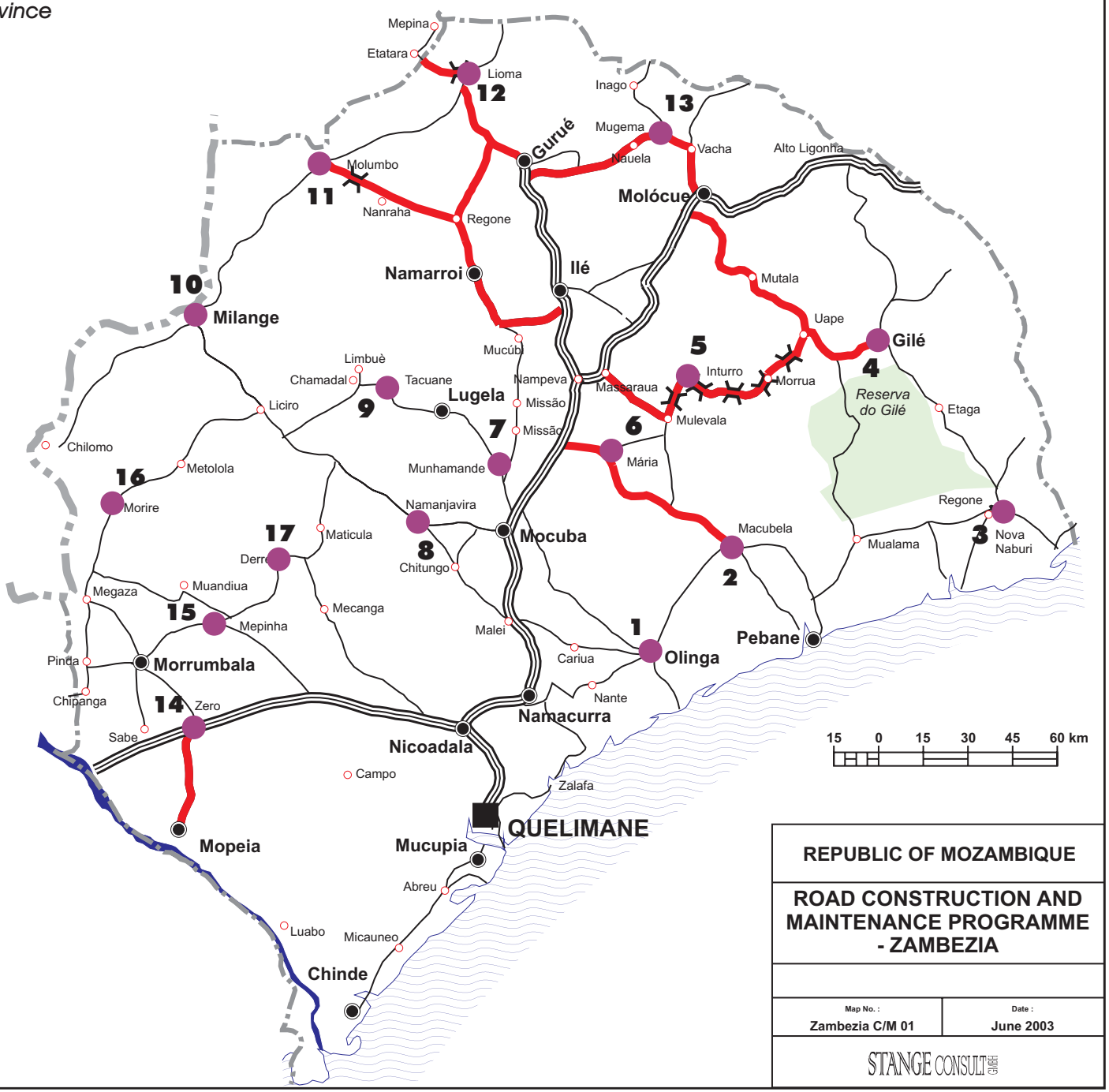
The proceedings resumed with the Facilitator briefly going through the training content usually covered during training of different levels of participants from operators in the field to clerks, supervisors and contractor management and consultant supervisors as this issue had not been covered in detail during the presentations. After the training presentation, Eng. Rob Geddes took over for the final session of compiling the Workshop Evaluation forms. The completed form is presented in Annex 8.

5 RECOMMENDATIONS

The Area Based Maintenance System has some preconditions for it to be successful. Firstly, the system is effective if all the roads to be maintained are first rehabilitated or brought up to a good engineering standard. Secondly, the system has to be managed in such a way that it is cyclic and routine to minimize the supervisory role of more qualified staff. The Malawi case therefore calls for a major rehabilitation exercise prior to implementing a maintenance regime similar to the one in Mozambique or Zimbabwe. Finally, Malawi needs to adopt a blend between the Zimbabwe practice and the Mozambican approach and the find the best method suitable to the Malawi conditions. A pilot programme is therefore highly recommended.

ANNEX 1

Map of Road Network in Zambezia Province showing Scope of the Project



LEGEND

- *Primary Road*
- *Project Roads*
- *Secondary Roads*
- *Location of Maintenance Base Camps*
- *International Boundary*
- *Provincial Boundary*
- *Rivers & Cost Line*
- *National Parks & Reserves*
- **QUELIMANE** *Provincial Capital*
- **Espungabera** *District Capitals*
- Chitobe *Small Centres*
- *Maintenance Unit Influence Areas*

REPUBLIC OF MOZAMBIQUE

ROAD CONSTRUCTION AND MAINTENANCE PROGRAMME - ZAMBEZIA

Map No. :	Date :
Zambezia C/M 01	June 2003

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ANNEX 2

Exmo senhor representante do Malawi

Exmo senhor representante de Zimbabwe

Exmo senhor representante da AFCAP

Estimados presentes,

E com orgulho que me dirijo a todos os presentes para em conjunto analisarmos e discutirmos a manutencao de estradas através do sistema de acampamentos.

A manutencao de estradas através do sistema de acampamento iniciou em 1996 a 2001 nas

Provincias de Manica e Tete com a construcao de 12 acampamentos para amanutencao de 1830 km de estrada.

De 2001 a 2003 o sistema foi implantado na Provincia da Zambezia para a manutencao de 2700 km de Estradas.

Já no ano de 2003 a 2008 o sistema foi implatado na Provincia da Sofala e envolvia a manutencao de mais de 653 km.

Actualmente esta em processo de implantacao do mesmo sistema na Provincia de Inhambane para a manutencao de mais de 276 km.

Dos estudos efectuados, focou claro que o sistema de acampamentos apresenta varias vantagens sendo de destacar o facto de a base logística para o armazenamento dos acampamentos e acomodacao dos operários estar mais perto da obra, diminuindo os custos e o tempo de deslocacao para o empreiteiro.

Espero que deste encotro saiam recomendacoes que vão ainda melhorar o processo de gestão de manutencao de estradas.

Portanto, declaro aberto o siminario sobre o sistema de acampamentos

Muito Obrigado

ANNEX 3

RURAL ROAD MAINTENANCE IN MOZAMBIQUE

OPERATION OF THE AREA BASED MAINTENANCE SYSTEM IN MANICA, SOFALA, TETE AND ZAMBEZIA PROVINCES

2009

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1 AREA BASED MAINTENANCE SYSTEM

1.1 BACKGROUND

The Area Based Maintenance System (ABMS) for routine road maintenance was originally developed in Zimbabwe to look after the roads that were constructed under the KfW funded Rural Road Programme. Under this programme some 21 500 km of selected rural roads serving rural communities were constructed or improved. Part of this programme was to establish an organisation to look after the rural road network and a maintenance system to maintain the roads.

The Area Based Maintenance System was developed to carry out effective road maintenance. The system uses the concept of having fixed “Maintenance Areas” which each contain between 150 and 200 km of road to be maintained under the system. This is the length of road which can be effectively maintained by a single maintenance unit using 1 tractor and the requisite tractor towed equipment.

Working with these fixed Maintenance Areas makes it easier to define the Routine Maintenance Tasks to be carried out by the Maintenance Units. A set number of work cycles for each of the defined maintenance activities is programmed for each Maintenance Areas. This specifies the type and quantity of work cycles which should be done, when they should be done (the number of work cycles will vary according to traffic, terrain and climate) and gives each Maintenance Unit a fixed programme to implement over the year. The monitoring of this is then a matter of checking that the programmed activities are carried out according to the time schedule and to correct standards.

1.2 EXPERIENCES WITH THE SYSTEM

The ABMS has evolved from starting with using a force account type setup in Zimbabwe to using small contractors in the Zambezia and Sofala Provinces of Mozambique.

Under the Zimbabwe Rural Road Programme 180 Maintenance Areas, complete with Maintenance Units, covering some 25 000 km of rural road were established. The Maintenance System was successfully operated in Zimbabwe through the District Development Fund from its start up in 1987.

Figure 1: Maintenance Base Camp in Manica

In Mozambique the ABMS was initially setup in the Manica and Tete provinces with KfW support following the KfW funded Emergency Road Opening Programme in the provinces.

A requirement for the maintenance system was that it should be provincial based and the long term goal was for work to be contracted out small contractors to carry out the maintenance activities. When the ABMS was implemented there were no suitable small contractors available for carrying out the maintenance so the ABMS was set up using the existing the ECMEP organisation (at the time was a parastatal construction company operated on commercial lines). The payments for the work were based on a Cost-plus system which was monitored by the consultant.

In Zambezia province the KfW funded Rural Road Programme included the construction of 17 Maintenance Base Camps for the ABMS covering 2 700 km of road, and the establishment of the Area Based Maintenance System in these areas. The system was adapted to use small and medium sized contractors who existed by this time in Zambezia. A training component was included in the project to support the small contractors.

Individual tender lots were prepared for each Maintenance Area along with a bill of quantities for the maintenance activities to be carried out on the road. These were then put out to competitive tender in the province.

2 AREA BASED MAINTENANCE SYSTEM

2.1 SUITABLE TYPES OF ROAD

The ABMS is suitable for gravel roads with traffic levels of between 5 and 50 vpd. The number of maintenance work cycles is varied according to the traffic – i.e. the more traffic the more cycles.

For any routine maintenance to be effective, the roads receiving routine maintenance first need to be built to standard, be technically complete and be in reasonable condition. This requires that the network is rehabilitated to bring roads to a uniform standard and good condition.

2.2 SERVICE LEVELS

The objective of the ABMS is to keep the roads in the same condition that they start in. It must be emphasised that that the Routine Maintenance can only keep a road in good condition if the road starts life in good condition and is also technically complete. Routine Maintenance cannot improve a road from poor condition to good condition.

A road which starts out in good condition and receives the necessary cycles of routine maintenance activities will remain in good condition – i.e. the carriageway will be kept smooth with the towed grading, tyre dragging and patch gravelling activities, and the other labour based activities will keep the drainage in good condition, the verges trimmed and the road side furniture in a good state.

2.3 WORK CYCLES FOR ROUTINE MAINTENANCE

The work activities used under the ABMS can be broken down into two main types – Equipment Based activities and Labour Based activities.

Equipment Based work activities comprise cycles of Towed Grading which is done during the wet weather and cycles of Tyre Dragging which is done during the dry weather. The activities are described below. A cycle comprises the carrying out of the work activity over the whole section of the road in a Maintenance Area. Typical numbers of cycles for different traffic counts are given below.

Table 1: Equipment Based Cycles

	High > 30 vpd	Medium 10 – 30 vpd	Low < 10 vpd
Towed Grading	1 cycle / month	1 cycle / 2 months	1 cycle / year
Tyre Dragging	1 cycle / week	1 cycle / 2 weeks	1 cycle /month

Note: based on rainy season from November - March

The Labour Cycles are not so dependent on traffic, but more on terrain and climate. The

more hilly terrain and higher rainfall areas will require higher levels of labour inputs, especially for drain clearing and verge clearing.
Typical numbers of cycles of labour based activities are as follows.

Table 2: Labour Based Cycles

Activity	No cycles per year
Verge Clearing	2
Clearing Culverts	2
Clearing Drains and Erosion Repair	2
Patch Gravelling	2
Road Furniture Maintenance	1

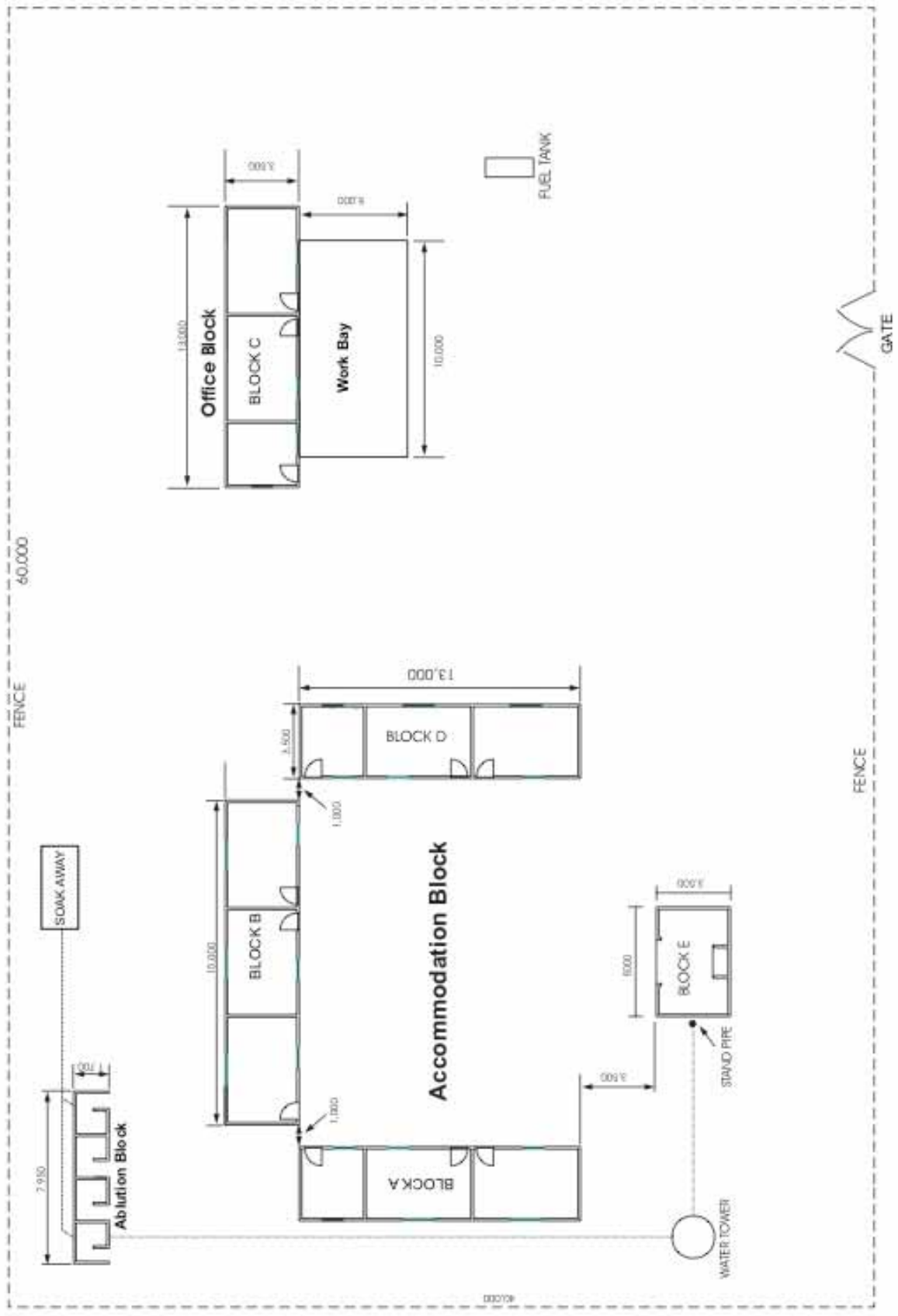
2.4 MAINTENANCE UNIT SETUP

MAINTENANCE AREAS: The Maintenance Areas are selected to cover some 150 – 200 km of classified gravel road under maintenance. Higher trafficked roads should have shorter lengths to compensate the additional cycles.

MAINTENANCE BASE CAMP: Each Maintenance Area is provided with a centrally located **Maintenance Base Camp** which has accommodation, office, workshop and stores facilities.

Figure 2: Maintenance Base Camp

Figure 3: Maintenance Base Camp Layout



The Maintenance Base Camp is an essential part of the system that provides the Contractor with a centrally located base from where he can carry out his maintain operations on the roads under his responsibility.

Staff and Equipment Resources

The main components to of the Maintenance Units are the Staff and Equipment:

Staff Requirements: The key Staff requirements are:

- Supervisor
- Unit Clerk
- Tractor Driver
- Towed Grader Operator

Equipment Requirements: The main Equipment requirements are as follows.

- 1 x Tractor (90 HP)[1]
- 1 x Towed Grader (tractor drawn)
- 1 x Water Bowser (tractor drawn)
- 1 x Trailer (tractor drawn)
- 5 x Tyre Drag (generally supplied)[2]

ROUTINE MAINTENANCE ACTIVITIES

Equipment-Based Activities

To keep the carriageway running surface in good condition regular smoothing and grading of the surface must be done throughout the year. The frequency of these operations depends on the traffic volume, quality of the surface material terrain and climate. Equipment-based activities are carried out by semi-skilled personnel using tractors, towed graders and tyre drags.

[1] The Tractor is a KEY item as all the equipment based activities rely on having an operational tractor.

[2] As they are unusual and not generally available the tyre drags have been manufactured through the rehabilitation projects to provide at least 1 for every 30 - 50 km of road. These are loaned to the contractors for the period of the maintenance contract

Figure 4: Tyre Dragging

TYRE DRAGGING: During the dry season grading should be avoided as it causes excessive damage to the road. There is, however, a definite need to keep the running surface smooth during the dry season, to keep minor deformations (corrugations) on the road carriageway in check and to restore the road profile using the existing surface material, we carry out tyre dragging. This means that an agricultural tractor pulls a tyre drag along the road according to a standardised pattern of passes. One tyre drag is employed for every 30 – 50 km of road which is stationed at the beginning of the respective tyre dragging section. Tyre dragging is generally restricted to the dry season, as it is not effective when the road carriageway is damp or wet.

Figure 5: Towed Grading

GRADING OF CARRIAGEWAY: Grading is carried out to smooth the carriageway surface and to restore the road profile (using the existing surface material). Grading should only be carried out when conditions are damp so that the loosened material can bind onto the surface, Grading should not be done during the dry season as it results in the loss of road surface material, thereby shortening the life-span of the road.

Labour–based Activities

The remaining Routine Maintenance activities are labour based. These activities are

performed by hand labour using simple hand tools with support of a tractor and trailer for transport of labour and material and a water bowser to supply water where necessary. The Labour based activities comprise:

Figure 6: Drain Clearing

PATCH GRAVELLING: Repair of minor defects on the road surface (e.g. pot holes, ruts and small erosion damages) by adding new surface material

CLEARING DRAINS AND EROSION REPAIR: Clearing of vegetation, cleaning out of silt and debris and minor reshaping of side drains, mitre drains, outlet drains and catch water drains. Control and/or repair of erosion damages in road reserve.

CLEARING CULVERTS: cleaning of culvert structure and inlets and outlets of vegetation, silt and debris and reshaping of outlets.

VERGE CLEARING Cutting and removal of grass, bush, trees, etc. which may obstruct the vision of road users on the road's verges.

ROAD FURNITURE MAINTENANCE: Repair repainting or replacing of markers, guide stones, signs as necessary.

ANNEX 4

ADMINISTRAÇÃO NACIONAL DE ESTRADAS

MANUTENÇÃO DE ESTRADAS ATRAVÉS DO SISTEMA DE ACAMPAMENTOS (FINANCIAMENTO ALEMÃO)

Introdução

- Âmbito da cooperação entre os Governos de Moçambique e Alemão a KFW tem estado a financiar vários projectos no sector de estradas desde 1994.
- Inicialmente o projecto previa a reabilitação de 200 km de estradas Secundárias na Provincia de Manica com uso intensivo de mão de Obra
- Em 1995 abandonou-se a utilização de mão de obra intensiva dando lugar a construção de 12 acampamento nas provincias de Manica e Tete com objectivo de assegurar a sustentabilidade das estradas terraplanadas nas zonas rurais.

Objectivos

- Os objecticvos do financiamento da KFW no sector de estradas eram:

- Reactivar as actividades economicas e melhorar as condições de vida da população através da restauração das vias de acesso durante todo o ano nas zonas rurais

- Garantir a redução no tempo de transporte e custos de manutençãp através de uma adequada manutenção.

- Garantir o acesso das populações à agua potável, educação, saúde e participação social e política através de melhoria das vias de acesso.

Projectos financiados pela KFW até á data

- Foram financiados até à data seis projectos conforme nomeadamente:

- Programa de Construção e Manutenção na Província de Inhambane, consistindo na reabilitação e manutenção de 276 km de estradas e construção de 4 acampamentos (Fevereiro de 2007 à Abril de 2012).

  Consultor : Stange

  Empreiteiro: TARCON

Projectos financiados pela kfw até a data

- **Programa de Construção e Manutenção de Estradas em Sofala, tendo o programa reabilitado 653 km e Construido 5 acampamentos (Janeiro de 2003 a Julho de 2008)**
- **Consultor:Stange**
- **Empreiteiro: Tarcon**

Projectos finaciados pela KFW - Cont

- **Programa de Construção e Manutenção de Estradas na Zambezia, tendo o programa reabilitado 770 km e Construido 17 acampamentos (Julho de 2001 a Outubro de 2003). O sistema de manutencao abrangia 2 700 km**
- **Consultor:Stange**
- **Empreiteiro: Grinaker/Lta**

Projectos financiados pela KFW até à data

- Reparações de emergência em Tete e Manica, tendo o projecto reabilitado 768 km de estradas

- Consultor:Stange
- Empreiteiro CETA

Projectos financiados pela KFW até à data

- Programa de Construção e Manutenção de Estradas terraplanadas em Manica e Tete onde foi implantado o sistema de acampamento como projecto piloto (Agosto de 1996 Junho de 2001)

- Consultor-Stange :
- Empreiteiro e empreiteiros locais

Estradas financiadas pela KFW até à data

- Abertura de emergência nas províncias de Tete e Manica que compreendeu a reabilitação de 1830 km de estradas(Janeiro de 1994 a Fevereiro de 1998)
- Consultor-Gitec
- Empreiteiro:GTEarthmovers

MANUTENÇÃO ATRAVÉS DO SISTAMA DE ACAMPAMENTOS

INICIO DA MANUTENCAO POR ACAMPAMENTOS

- Em 1995 abandonou-se a utilizacao de uso intensivo de mao de obra dando lugar a construcao de 12 acampamentos em Manica e Tete. Dando-se assim o inicio do sistema de manuencao acampamentos

O PRINCIPIO DO SISTEMA DE ACAMPAMENTOS

- O sistema de acampamentos consiste em duas fases:

➢ Reabilitacao de estradas prioritarias e construcao dos acampamentos atraves de um empreiteiro seleccionado na base de um concurso publico

O PRINCIPIO DO SISTEMA DE ACAMPAMENTOS-Cont

- Instalacao do sistema de acampamentos utilizando empreiteiros locais seleccionados atraves de um concurso publico e finaciado pelo Fundo de Estradas.
- Em muitos casos os acampamentos tambem sao usados para manter estradas que nao foram abrangidas pela reabilitacao. Normalmente um acampamento serve 150 a 200 km de Estradas

VANTAGENS DA UTILIZACAO DE ACAMPAMENTOS

- Em relacao as vantagens da utilizacao do sistema de acampamentos vou transcrever as conclusoes de um Consultor Independente contratado pela KFW , o Sr. Michael Schut, para fazer a avaliacao final do sistema de acampamentos em Manica e Tete

Conclusoes do Sr. Michael

- “ Durante a missao ficou evidente que a manutencao de rotina atraves de AB(acampamento Base) leva a resultados siginificativamente melhores e a uma qualidade superior em comparacao com a manutencao sem AB. Alem do mais constatou-se que os contratos que estipulam um nivel especifico de qualidade

Conclusoes do Sr. Michael

- De manutencao (os assim chamados contratos por nivel de servico) dao melhores resultados do que os contratos que apenas definem as tarefas em termos de quantidades na condicao que os trabalhos sejam corretamente fiscalizados.
- Ha varias razoes pelas vantagens do novo conceito de manutencao de rotina mediante os acampametos de base:

Conclusoes do Sr. Michael

- A base logistica para o armazenamento dos equipamentos e acomodacao dos operarios esta mais perto da obra(diminuindo o custo de deslocamento para o empreiteiro)
- A pouca distancia entre o acampamento e os cantoneiros de manutencao permite tambem o reparo de danos pequenos que no caso contrario onde o empreiteiro tenta evitar por causa do custo maior de deslocacao sem AB

Conclusoes do Sr. Michael

- A tecnologia e os equipamentos dos AB sao simples e de manuseio a manutencao facis, portanto adaptados a pequenos empreiteiros
- O trabalho de manutencao pode ser continuo e mais sistematico comparado com as intervencoes esporadicas sem AB
- Custo de manutencao inferior com AB(ver tabela seguinte)

Custos unitarios de Manutencao de Rotina e Periodica em USD(2004)

Tipo de Intervencao	Provincia de Manica custo/km	Provincia de Tetecusto/km
Manutencao de rotina com AB	USD 552	USD 412
Manutencao de rotina sem AB	USD 861	USD 909

Constragimentos

- Durante a implemetacao do sistema de manutencao dos acampamentos surgiram os seguintes constrabgimentos:
- Falta de fundos suficientes para reabilitar todas as estradas do sistema para um nivel mantivel. Actualmente a estrategia consiste e fazer melhoramentos localizados em seccoes criticas

Constragimentos

- Falta de capacidade financeira por parte dos empreiteiros o que muitas vezes impossibilita que estes realizem todas as actividades dentro do tempo previsto. A falta de fundos afecta principalmente as actividades mecanizadas como passagem de niveladora rebocavel e alisador de pneus
- Atrasos no lancamento de concursos para obras

Resultados

- O estudo efectuado pelo Sr. Michael revela que

- Na Provincia de Manica 77% de um total de 870 km das estradas classificadas e reabilitadas pelo Projecto se encontravam em boas condicoes enquanto 23% estao em condicoes razoaveis.
- Na provincia de Tete 15% de um total de 867 kms das estradas finaciadas pelo projecto tinham boas condicoes 53% condicoes razoaveis sendo que 32% destas estradas ou 281 km foram reclassificadas e pavimentadas.

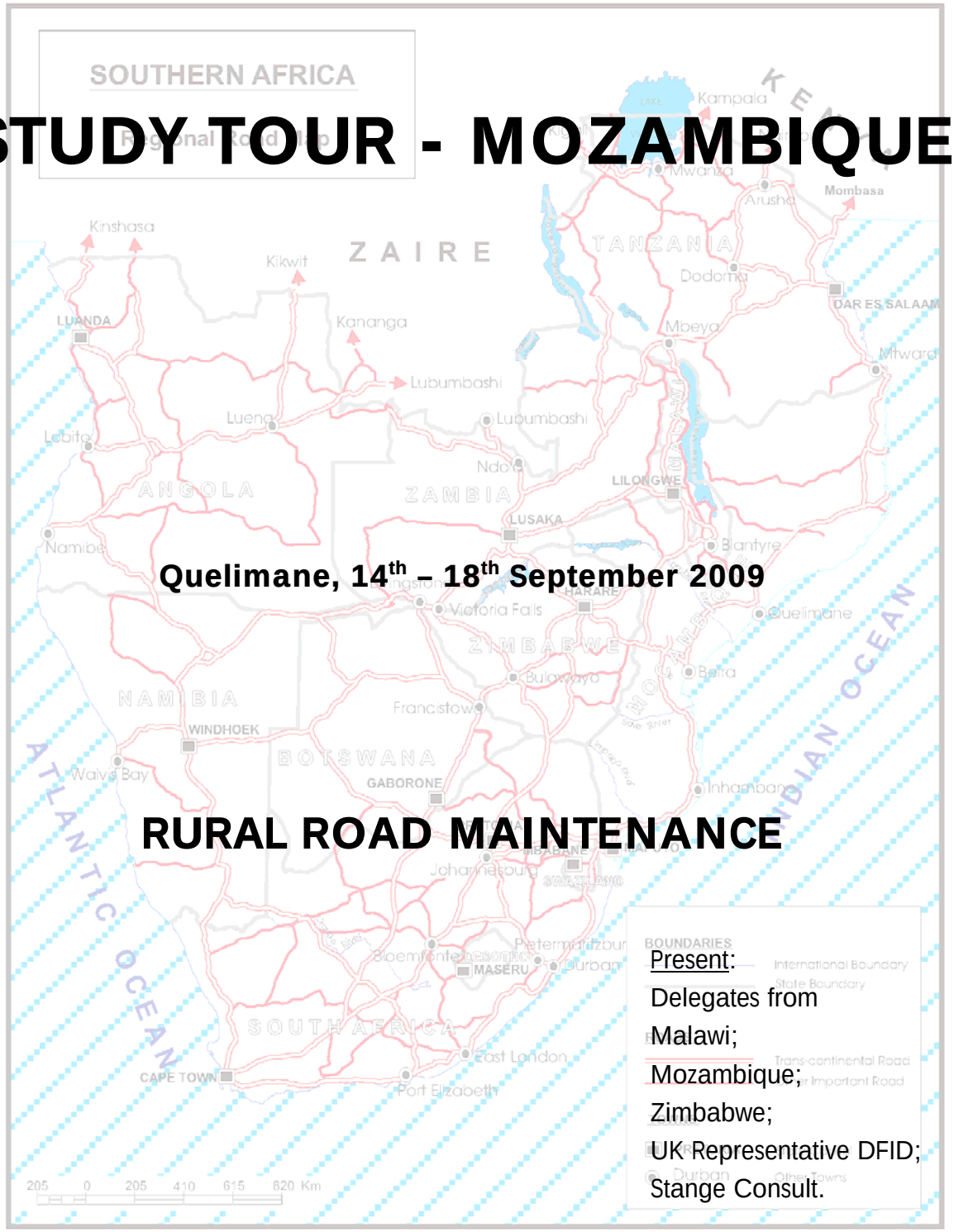
Resultados

- Em resumo pode se constatar que os objectivos dos projectos foram alcancados

FIM DA APRESENTAÇÃO

ANNEX 5

STUDY TOUR - MOZAMBIQUE



Quelimane, 14th – 18th September 2009

RURAL ROAD MAINTENANCE

Present:

Delegates from

Malawi;

Mozambique;

Zimbabwe;

UK Representative DFID;

Stange Consult.

THE DISTRICT DEVELOPMENT FUND IN ZIMBABWE

RURAL ROAD NETWORK

1. BACKGROUND

The Rural Road Programme (RRP) followed a cooperation agreement between the Government of Zimbabwe and Germany under which DDF was entrusted with the improvement and construction of 25 000km of rural roads in Communal and Resettlement Areas.

The huge task was preceded by the Rural Road Study (RRS) in 1982/84. During the study, planning procedures aimed at defining roads in terms of coverage and function were developed. A Simplified Economic Procedure (SEP) for economic evaluation of the large number of roads identified was also developed.

After the selection process was completed and economic evaluation of these roads was done, construction works commenced in all the districts through a co-funding arrangement between the Government of Zimbabwe and Germany. Zimbabwe provided 20% of the construction costs while Germany provided 80%. This was done so as to demonstrate commitment and capacity on the part of the Government of Zimbabwe. The ability to provide 20% was also a measure of future commitment to maintenance after the financing arrangement.

Parallel to the construction programme it was deemed imperative to develop certain milestones for the success of the programme. These included:-

- Setting up a Road Engineering Division
- Creation and operating a Road Planning Section
- Carrying out a road inventory
- Organising and developing personnel in the Road Engineering Division
- Develop a Road Maintenance System
- Develop a human resource development system and a staff development system within the Road Engineering Division

2. PLANNING RATIONALE

The main feature that characterized Zimbabwe's development situation at independence was a socio-economic dualism which was characterized by a well developed commercial sector and a largely neglected subsistence rural sector.

About 70% of the population live in rural areas and road infrastructure was in poor state due to neglect. At independence only 3000km of road existed against an identified road network of 25 000 km. The development gap resulted in the need to identify a critical road network that took into account the social expectation and the economic consideration of building roads.

The objectives for the road construction and improvement were as follows:-

- To provide adequate access to motorized transport and to allow for agricultural surplus to the market.
- To ensure equitable access for the entire population to basic social facilities – clinics, hospitals, schools and to Rural Service Centres and District Service Centres.
- To provide all weather access throughout the year

3. PLANNING PROCESS

The procedure was in three parts:-

i) Simplified benefit assessment was done by determining agro-economic and demographic benefits in influence areas of a similar agro-ecological region.

Planning team at work

ii) Determination of simplified cost assessment using standard costs for major road works along proposed road alignments.

iii) Conducting a Benefit Cost Analysis by comparing the potential benefits within an influence area to the construction costs, where the ratio of Benefit/Cost is over 1 the road is deemed economically feasible and where the ratio is less that 1 the road is then considered unfeasible. However, for practical application, this economic assessment provided a general guide to road selection criteria. Special cases were assessed on their individual merits.

4. RURAL ROAD PROGRAMME CONSTRUCTION

Motorised grader at work

Due to the workload that was involved in construction of the 25 000 km of roads, DDF engaged contractors on a plant hire basis to construct all the roads while in-house manpower constructed culverts and other drainage structures. Major bridges were contracted to private companies. On average, 1 500km were constructed to completion annually. As the mileage accumulated so was the need to develop a robust maintenance regime to preserve the capital investment. This saw the development of the Area Based Road Maintenance System (ABRMS).

5. AREA BASED ROAD MAINTENANCE SYSTEM

Routine Road Maintenance comprises mainly routine activities that have to be performed throughout the year and every year. The most effective way of organizing and controlling these activities is to have individual Road Maintenance Units which are responsible for all the road maintenance activities within a given area.

These smaller maintenance areas make for simpler planning and easier supervision and monitoring of the maintenance, thus reducing the need for highly technically qualified staff.

Grading of roads must be done by mechanical equipment. The two items of equipment for grading are either a motorized grader or tractor drawn grader.

The main considerations in comparing these are:

- A motorized grader and towed grader have the same work output for routine maintenance grading
- The motorized grader requires more specialized maintenance and repair
- The motorized grader has more logistical problems due to high fuel consumption, specialized parts etc.

The DDF Road Maintenance Units use Tractors and Towed Graders for all their road maintenance grading.

Tyre Dragging is a dry season operation to minimize corrugation on the road without disturbing the road surface as happens when grading is done. Tyre dragging is performed by a tractor pulling a tyre drag along the road for a specified number of passes.

The tractor is used for towed grading, tyre dragging and moving labour as well as materials with the trailer thereby ensuring full utilization of this item.

6. THE ROAD MAINTENANCE UNIT

Each DDF Road Maintenance Unit is responsible for a particular area within a district, which will contain some 150-200km of road under maintenance.

A base camp for the Maintenance Unit has been provided in each of the unit influence area – 194 camps altogether in Zimbabwe. These camps provide permanent accommodation for the unit staff, as well as office and store facilities.


Maintenance Base Camp

A small workshop is also part of the camp structure in order to enable the servicing and repair of the unit's equipment.

Additionally Pull-In Camps have been placed at strategic points to provide overnight accommodation where units have to move too far from the base camp. Over 250 Pull-In-Camps have been put in place each with 5 tin huts and a security fence around.

The DDF Road Maintenance Units have been set up that they are each self-contained in terms of personnel, accommodation and equipment. Each RMU is headed by a Maintenance Unit Supervisor, who is responsible for the operation of the Unit.

The Unit Supervisor is responsible for the day to day organization of the Unit, allocation of equipment, etc. according to his/her monthly work programme. DDF carries out routine maintenance according to programme at all its 194 Road Maintenance Units throughout Zimbabwe.

7. MAINTENANCE AREA SYSTEM

The Rural Roads Maintenance Unit is the core element of the maintenance organization. The Unit comprises a team of trained staff who operate from a base camp in a specified geophysical influence area.

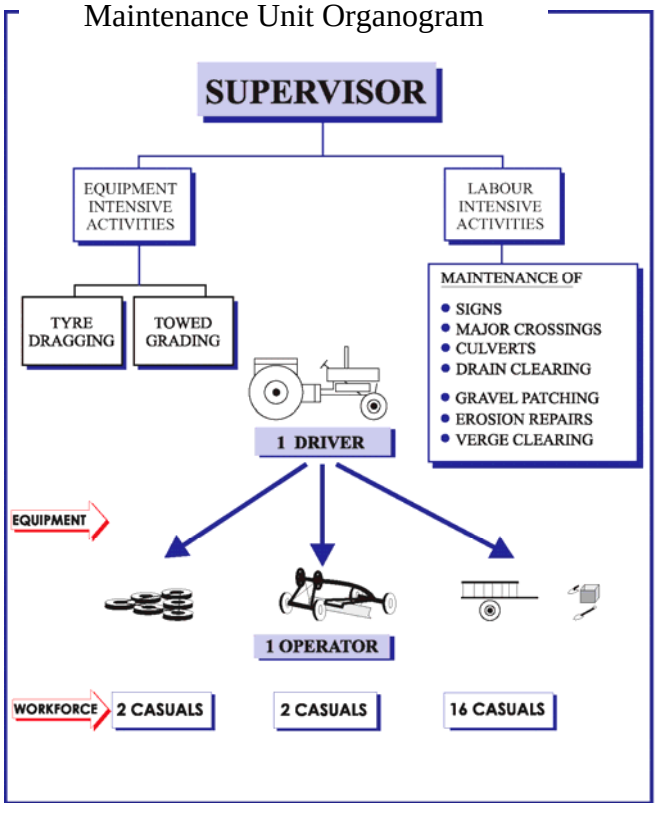
7.1 Influence Area of Maintenance Units

The influence area of the Maintenance Unit is the area which covers the roads being maintained by the unit. The main purpose of the Unit is to ensure that, through routine maintenance, the district network is kept in good trafficable condition throughout the year and that the useful life of the road is extended until periodic maintenance (regravelling) is required.

7.2 Area Based Maintenance Unit

Area based units are self-contained regarding their day to day operation. The influence area is what can be effectively and economically looked after by one maintenance unit. This is dictated by the length of road which can be handled using 1 tractor, which does grading, tyre dragging and transports the labour and materials. This length is between 150-200km of road.

Maintenance Unit Organogram



The advantages of the area base unit:

- Staff live close to place of work, enhancing their personal responsibilities to their work and their access to the workplace
- Improved efficiency of equipment can be achieved (i.e. tractor is available for grading, tyre dragging and transport.
- Logistical problems in the supply of fuel, transport and equipment maintenance and repair are reduced

- The planning and supervision of work for smaller areas is easier and can be done by less skilled supervisors
- The monitoring and control of smaller areas is improved

Bikita District, Unit 1 - Towed Grading Work Programme (Example)

District Development Fund
Roads Engineering Division

WORK PROGRAMME - WET SEASON											
(Equipment and Labour Activities)											
Province:	**Masvingo**			**District:**		**Bikita**			**Unit:**	**1 (Chirorwe)**	
	Activity	**DAY 1**		**DAY 2**		**DAY 3**		**DAY 4**		**DAY 5**	
Week 1	**Equipment**	C102	10	C102	10	C102	10	C102	10	C201	10
	Labour	**4**		2		5		7		9	
Week 2	**Equipment**	C201	7	C313	10	C313	4 to pull-in camp	C103	10	C103	7
	Labour	**11**		12		14		15		17	
Week 3	**Equipment**	C116	6	C101	8	C101	7	C101	3	Labour	
	Labour	**22**		18		19		20		21	
Week 4	**Equipment**	Labour		Labour		Labour		Labour		Labour	
	Labour	**1**		3		6		8		10	
Week 5	**Equipment**	C102	10	C102	10	C102	10	C102	10	C201	10
	Labour	4		2		5		7		9	
Week 6	**Equipment**	C201	7	C313	10	C313	4 to pull-in camp	C103	10	C103	7
	Labour	11		12		13		15		16	

8. TOWED GRADING

Grading is carried out to smooth the carriageway surface and to restore the road profile to its correct shape (using the existing surface material). The grading must be done by mechanical means - the two main types of equipment for grading roads are either a motorized grader or a tractor drawn towed grader. For a number of reasons – the towed grader is the most suitable equipment for rural road maintenance.

Grading in the wet season

As far as possible, grading is only carried out when conditions are damp so that the loosened material can bind onto the surface.

9. TYRE DRAGGING

Grading cannot be done during the dry season as it causes damage to the road. There is however a definite need to keep the running surface smooth during the 7 or 8 months of the dry season.

The carriageway's running surface cannot be properly maintained using labour activities since these are not effective in the control of surface deformations. This is due to rapid formation of corrugations as compared to the large areas of carriageway which would have to be worked on (7000m2 per km) – this is beyond the scope of a length man system.

Tyre dragging in the dry season

Tyre dragging is carried out using a tyre drag pulled by an agricultural tractor (80 HP 2-wheel drive) to retard minor deformations (corrugations) on the road carriageway. Tyre dragging is generally carried out during the dry season, as it is not effective when the road surface is damp or wet.

Tyre dragging is a dry season operation which minimizes corrugations on the road without disturbing the road surface as happens when grading is done. Tyre

dragging is performed by a tractor pulling a tyre drag along the road for a specified number of passes.

10. LABOUR BASED ACTIVITIES

- *Pothole repair*
- *Patch gravelling*
- *Maintenance of drainage system and road surrounds*
- *Minor repair of drainage structures*
- *Cleaning f drainage structures*
- *Repair of erosion damage to drains*
- *Verge clearing*

10.1 Patch Gravelling

Patch gravelling is done to repair minor defects on the road surface by adding new surface material to rough or eroded areas of the carriageway. This consists of importing suitable material to the road and placing this material on the road.

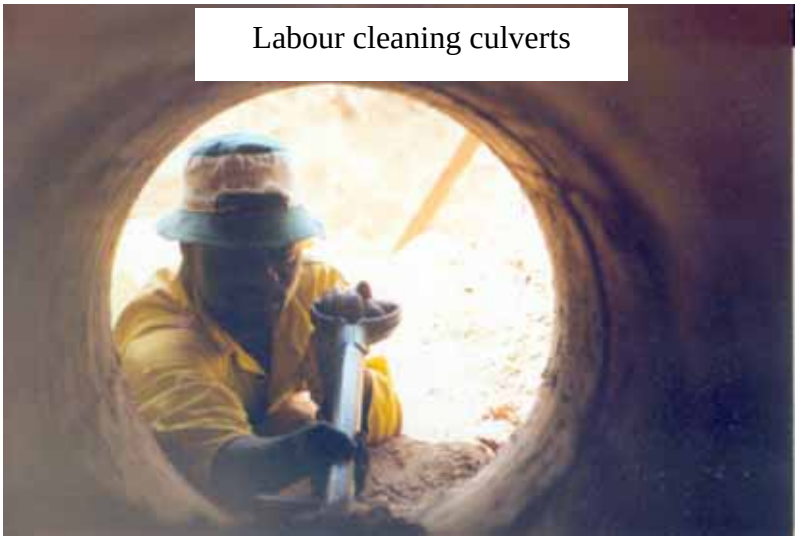
Tractor and trailer deploying labour

10.2 Clearing Drains

Clearing Drains is carried to remove materials (rock, silt, sand, tree trunks or other objects) which may collect in the drains thus allowing the water to flow freely. This includes side drains, mitre drains, catchwater drains etc.

10.3 Clearing Culverts

Clearing Culverts is carried out to remove materials, (rocks, silt, sand, weeds, bushes, tree trunks or other objects) that get lodged in the culvert pipes to allow water to flow freely.



Labour cleaning culverts

10.4 Verge Clearing

Labour cutting grass

Verge Clearing comprises the cutting of grass on the sides of the road and cutting or removing of any bush, trees, etc. which may affect the vision of road users.

10.5 Road Furniture Maintenance

Road furniture are the markers, guide stones, signs etc. which need to be repaired, repainted or replaced as necessary in order to maintain them in good conditions.

The tractor and trailer are used to transport the unit's labour.

11. BASIC CONCEPTS FOR LABOUR INTENSIVE WORK ORGANISATION WITHIN THE MAINTENANCE UNIT - Problems

- Labour is not being used effectively
- Labour lacks adequate transport
- No clear production targets exist for labour activities
- Poor work organization and planning for labour

12. OBJECTIVES

- To ensure that the labour employed by each unit is effectively used through proper planning and deployment in order to meet set production targets towards the maintenance of the rural roads

13. METHODOLOGY

- The method to achieve the above objective is to utilize the tractor to deploy the labour while it is carrying out its normal equipment intensive work WITHOUT disturbing the established circuits.

14. GUIDELINES/RULES

- The equipment intensive activities should not be disturbed or interfered with to accommodate labour activities

- Labour intensive activities are taken to be the same quantity on all sections of the road.

- The selection of the sections to be worked should be done in such a way that maximum usage of tractor ‘lift’ is utilized

- Free zones are established a distance of 5km from either a pull-in-camp or base camp, from which the labour force, can work on foot.

- Where appropriate the Area Manager should use his pick-up to deploy labour on sections selected outside the free zones.

15. ANNUAL OPERATIONS CALENDAR

ACTIVITIES	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Verge Clearing												
Erosion & Drains												
Culvert clearing and repair												
Sign Maintenance												
Patch gravelling												
Major Structures Maintenance												
Manpower			6	6	4	26	28	6	18	28	14	8

16. PROCEDURE

16.1 Section of the Road

Since the production for each of the labour activities is measured in road distances, the same units will be used for planning and deployment of labour force. It has been decided that 5 kilometres per day is an adequate production target for each of the labour activities. This is also in agreement with the 5 kilometre “free zone” around all based camps and pull-in-camps where the labour force walks to do the work.

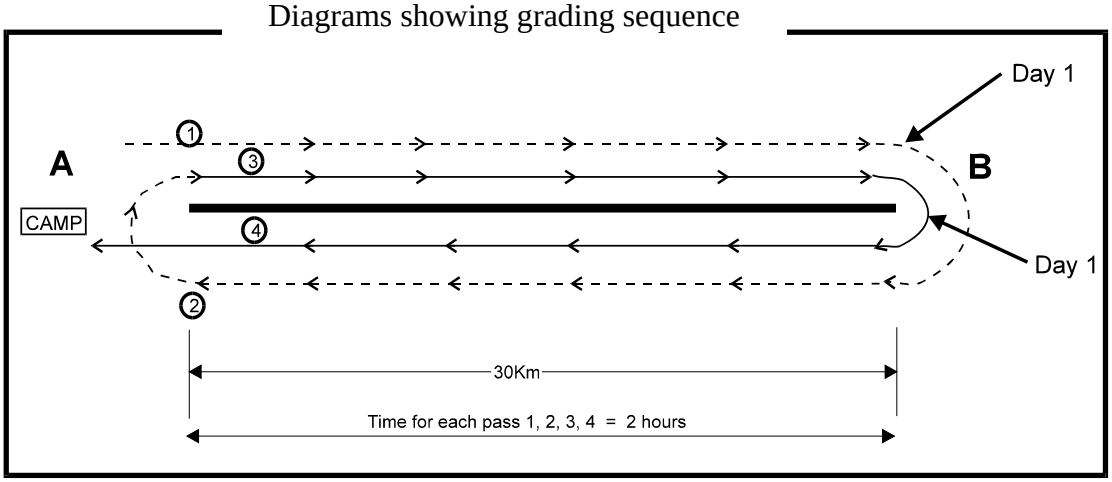
The next step is to provide all of the roads undertaken in each unit into 5km sections. This is done by dividing each road using small lines which show the beginning and end of each maintenance section. For example, if a road is 19km long, it must be divided into four sections (3 are 5kms and one 4km long). If the lengths of all the sections under a unit are added up, the result should be same as the total number of kilometers under maintenance by that unit. These sections must be labeled with numbers 1,2,3 and so on.

16.2 Tyre Dragging Circuits and Programme

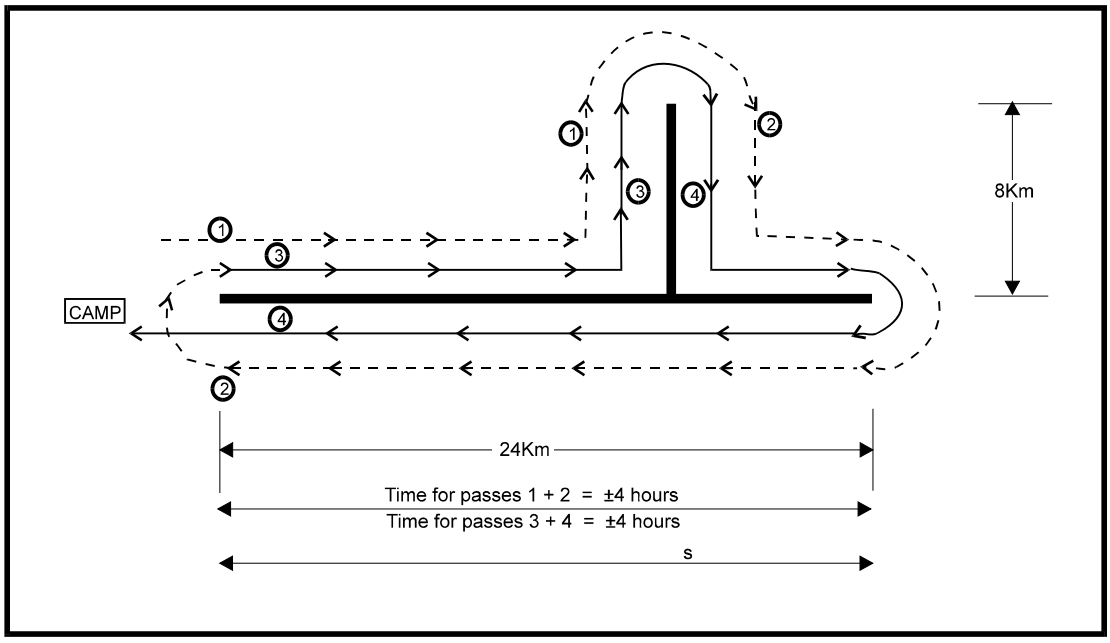
The tyre dragging circuits for each unit need to be planned and drawn on a map. This should already exist for all units)

Once the circuits are on the maps, the monthly work plan must be filled for the equipment intensive operations.

Diagrams showing grading sequence



This is done in the same manner as it has been done in the past. It must be emphasized that the equipment intensive operations (Tyre Dragging and Towed Grading) are not disturbed due to the need of labour deployment.



16.3 Labour Deployment in Relation to Tyre Dragging Programme

Once it is known what the tractor will be doing each day of the following month, the labour force can effectively use the tractor to get a “lift” to a different work place. For example, if the tractor is going to tyre drag a road (A) which is a distance from the Base Camp, then the labour can get a lift to the beginning of that road. That is where the trailer is unhitched and the tyre drag hitched onto the tractor. The tractor then continues with the work programme that day, while the labour works on the first “section” of that road (A).

Another possibility for the same situation is that the tractor uses another one of our roads (B) to get to where it must tyre drag road (A), then the driver can drop

off the labour (with their trailer) anywhere along road B, so they can on one of the sections while the tractor driver continues to road (A) to do his tyre dragging.

These labour intensive activities for each section are then noted on the maintenance plan and marked on the map which has sections as having been included in the labour intensive maintenance programme. This programme must be done for at least 2 months, or until all of the sections have received at least one day of labour intensive work.

16.4 Alternative Activities for the Labour Force

When the labour force is at one of the camps and all of the "free zone" have been worked on and the tractor cannot give them a "lift" to any un-worked section, then other roads related activities must be organized by the Supervisor.

For example:

- Maintaining the Base Camp, or
- Quarrying sand
- Quarry gravel for future use

17. PRESENT SITUATION ON RURAL ROADS IN ZIMBABWE

All the roads constructed during the Rural Road Programme remain open and trafficable. Sporadic maintenance funding has affected the state of these roads. All of them are due for regravelling. The maintenance system has remained intact but not fully implemented due to erratic supply of fuel and funding for labour activities. To correct this situation, sufficient funding for routine maintenance work is required while a programme for periodic maintenance is being worked out. Regravelling of all the roads will restore the network to its near original state and provide the much needed good service levels enjoyed in past.

The regravelling exercise will almost be equivalent to a rehabilitation programme as it will require huge capital investment. It must be noted though that for this reason, further expansion of the road network is discouraged.

STANDARD ECONOMIC ROAD CONSTRUCTION

- Determine on the geological map whether the project (or what length of the road) is located in Kalahari Sands.
- Determine the topographical characteristics for the entire road or sections thereof (flat, rolling, hilly or very hilly).
- Determine standard construction costs from Table 1 provided, according to road standard and type of terrain.

Road Standard	Type of Terrain	Standard Construction costs/km		Road length (km)		Total Construction Costs
			*		=	
			*		=	
			*		=	
			*		=	
TOTAL STANDARD ECONOMIC ROAD CONSTRUCTION COST					=	

[1] One decimal place

3. ECONOMIC COSTS OF MAJOR STRUCTURES (RIVER CROSSINGS)

3.1 Bridges and Arched Causeways

Type of Structure [1]	Name of River	Length (m)	Condition (if already existing)	Financial Costs of Bridges and/or Causeways	
				Provisional Costs [2]	Final Costs [3]
(1)					
(2)					
(3)					
Financial bridge/arched causeway costs					
Conversion factor				1.03	1.03
Economic bridge / arched causeway costs					

[1] Bridge = B; Arched Causeway = A/C

[2] if available, use final costs, otherwise estimate provisional costs. Do not fill in the provisional and the final costs.

3.2 Piped Drifts and Causeways

Estimate the total length of both existing and required piped drifts and causeways without approaches. If more than one crossing is necessary, add up the lengths of all crossings.

Total Length of Structures		Economic cost per m		Total economic cost of structures
m	*	$1030	=	$

3.3 Invert Slabs and Drifts

Estimate the total length of both existing and required invert slabs and drifts, without approaches. If more than one crossing is necessary, add up the lengths of all crossings.

Total Length of Structures		Economic cost per m		Total economic cost of structures
m	*	$515	=	$

3.4 Total Economic Costs of Major Structures

- BRIDGES AND ARCHED CAUSEWAYS (use total value from 3.1) $

+

- PIPED DRIFTS AND CAUSEWAYS (use total value from 3.2) $

+

- INVERT SLABS AND DRIFTS (use total value from 3.3) $

=

TOTAL ECONOMIC COSTS OF ALL STRUCTURES $

4. **ECONOMIC ROAD MAINTENANCE COSTS**

4.1 Annual Economic Routine Maintenance Cost

TOTAL ROAD LENGTH [1]		ECONOMIC COST PER KM		TOTAL ECONOMIC COST OF ANNUAL ROUTINE MAINTENANCE
km	=	$273	=	$

4.2 Periodic Maintenance Costs

Obtain the same information (type pf terrain and topographical conditions) and determine the Standard Economic Periodic Maintenance Cost from Table provided, according to road standard and type of terrain.

Road Standard	Type of Terrain	Standard Periodic Maintenance Cost ($/km)		Road Length (km) [1]		Total Periodic Maintenance Cost ($)
					=	
					=	
					=	
					=	
TOTAL STANDARD ECONOMIC PERIODIC MAINTENANCE COST					=	

[1] One decimal place

5. SUMMARY: ECONOMIC ROAD CONSTRUCTION AND MAINTENANCE COSTS AND CONVERSION INTO PRESENT VALUES (6% discount rate)

5.1 TOTAL ECONOMIC ROAD CONSTRUCTION COSTS

(sum of total values of 2 and 3.4.)

$	*	1.00	=	$

5.2 ANNUAL ECONOMIC ROUTINE MAINTENANCE COST

(use total value from 4.1)

$	*	10.82	=	$

5.3 ECONOMIC PERIODIC MAINTENANCE COST

(use total value from 4.2)

$	*	0.82		$

5.4 TOTAL PRESENT VALUE OF ECONOMIC PROJECT COSTS OVER 20 YEARS $

6 **DETERMINATION OF ECONOMIC BENEFITS FROM CROP PRODUCTION**

6.1 INPUT DATA FOR CROP PRODUCTION

6.1.1 Size of Road influence Area by Natural Region

NATURAL REGION AND TERRAIN		INFLUENCE AREA (sq. km.)
I Hilly		
II Hilly		
III Hilly		
II Flat/Rolling		
III Flat/Rolling		
IV Flat/Rolling w/o draught constraint)	[1]	
IV Flat/Rolling (with draught constraint)	[2]	
IV Cattle Areas	[3]	

[1] Natural Region IV only, except Matabeleland North and South and Tsetse Control Areas of 1983

[2] Tsetse Control Areas effective in 1983 only (Binga, Kariba, Gokwe, Hurungwe, Guruve, Mt. Darwin, Rushinga and Mudzi districts)

[3] Matabeleland North and South only, except Binga district.

6.1.2 Calculation of Number of Inhabitants

Determine the number of inhabitants in the influence area (see 1982 CENSUS DATA provided for Enumeration Area breakdown) Multiply the obtained census figures by population adjustment factors. (see Table of Population Adjustment Factors attached)

NATURAL REGION / TERRAIN	1982 INHABITANTS		ADJUSTMENT FACTOR		1988 INHABITANTS
I Hilly		*		=	
II Hilly		*		=	
III Hilly		*		=	
II Flat/Rolling		*		=	
III Flat/Rolling		*		=	
IV Flat/Rolling w/o draught constraint		*		=	
IV Flat/Rolling with draught constraint		*		=	
IV Cattle Areas		*		=	

NOTE: Observe footnotes in 6.1.1

Determine the population density in road influence area. Divide the adjusted census figures by the size of influence area (sq.km).

NATURAL REGION / TERRAIN	1988 INHABITANTS		INFLUENCE AREA (sq.km)		INHABITANTS PER SQ.KM.
I Hilly		*		=	
II Hilly		*		=	
III Hilly		*		=	
II Flat/Rolling		*		=	
III Flat/Rolling		*		=	
IV Flat/Rolling w/o draught constraint		*		=	
IV Flat/Rolling with draught constraint		*		=	
IV Cattle Areas		*		=	

NOTE: Observe footnotes in 6.1.1

6.2 SUMMARY ECONOMIC BENEFITS FROM CROP PRODUCTION

Fill in the above derived data into the following table and obtain from the Table of Standard Benefits from Crop Production provided, the Standard Benefits per capita.

Natural Region and Terrain	Density Inhabitants / Sq.km.	Standard benefits per capita		Total inhabitants (no.)		Total Benefits
I Hilly			*		=	
II Hilly			*		=	
III Hilly			*		=	
II Flat/Rolling			*		=	
III Flat/Rolling			*		=	
IV Flat/Rolling w/o draught constraint			*		=	
IV Flat/Rolling with draught constraint			*		=	
IV Cattle Areas			*		=	
TOTAL PRESENT VALUE OF CROP BENEFITS OVER 20 YEARS						

7 DETERMINATION OF ECONOMIC BENEFITS FROM CATTLE PRODUCTION

7.1 INPUT DATA FOR CATTLE PRODUCTION

7.1.1 Size of Cattle Herd and Cattle Density

- Determine the current number of cattle in road influence area (figures from the last cattle census in your district) on the cattle worksheet attached (worksheet 3)
- Determine cattle density in the road influence area.

Natural Region	Number of Cattle		Influence Area		Cattle Density (cattle/sq.km)
		=		=	
		=		=	

[1] Matabeleland North and South only, except Binga District

[2] relevant for all Natural Region V areas throughout the country.

7.2 SUMMARY OF ECONOMIC BENEFITS FROM CATTLE PRODUCTION

Determine the total cattle benefits by multiplying the standard economic benefits per head of cattle (from Tables 4 and/or 5), by the corresponding number of cattle. This should be done separately for each Natural Region.

Natural Region	Cattle Density (Cattle/sq.km)	Standard Benefits over 20 Years ($/Head of Cattle)		Total no. of cattle (head)		Total Cattle Benefits ($)
IV [1]			*		=	
V [2]			*		=	

[1] For Matabeleland North and South only, except Binga District.

[2] Relevant for all Natural Region V areas throughout the country.

8. CALCULATION OF ECONOMIC BENEFITS FROM IRRIGATION AREAS LOCATED IN THE INFLUENCE ARE OF THE ROAD

Determine the number of hectares, by Natural Region, currently under irrigation (Small Scale Irrigation Areas) in the influence area of the road.

Natural Region	Standard Benefit in Irrigated area ($/ha)		Area Under Irrigation (ha)		Total Benefits ($)
I	12 100	*		=	
II	12 100	*		=	
III	12 100	*		=	
IV	10 900	*		=	
V	9 700	*		=	
TOTAL PRESENT VALUE OF IRRIGATION BENEFITS				=	

9 TOTAL PRESENT VALUE OF ECONOMIC BENEFITS OF THE PROJECT

Total Present Value of Crop Benefits (from 6.2) $

+

9.1 Total Present Value of Cattle Benefits (from 7.2) $

+

9.2 Total Present Value of Irrigation Benefits (from 8 $

+

9.3 TOTAL PRESENT VALUE OF ECONOMIC PROJECT BENEFITS (add above totals of 1,2,&3) $

10. **DETERMINATION OF BENEFITS/COST RATIO**

To obtain the benefit/cost ration of the project, divide the total present value of benefits by the total present value of costs.

10.1 Total Present Value of Benefits (from 8)

10.2 Total Present Value of Costs (from 5.4)

10.3 Benefit/Cost Ration (1) : (2))

(result to 2 decimal places)

NOTE: **Feasible Roads**

A Benefit/Cost Ration of 1 or greater than 1 indicates that the Project is economically feasible. The higher the Benefit/Cost Ration the better the economic value of the Project!

Unfeasible Roads

A Benefit/Cost Ration lower than 1 indicates that the Project is not economically feasible. The lower the Benefit/Cost Ratio, the lower the economic value of the Project!

TABLE 1: **ECONOMIC STANDARD CONSTRUCTION COSTS PER KM**

TYPE OF TERRAIN	TYPE OF ROAD		
	PRIMARY A ($/Km)	PRIMARY B ($/Km)	SECONDARY ($/Km)
Flat	8 932	5 419	3 844
Rolling	9 590	6 077	4 403
Hilly	13 156	10 622	8 179
Very Hilly	30 893	29 247	21 466
Kalahari Sand	16 983	14 482	10 098

TABLE 2: ECONOMIC STANDARD PERIODIC MAINTENANCE COSTS PER KM

TYPE OF TERRAIN	TYPE OF ROAD		
	PRIMARY A ($/Km)	PRIMARY B ($/Km)	SECONDARY ($/Km)
Flat	5 319	1 806	728
Rolling	5 319	1 806	728
Hilly	5 319	2 784	1 473
Very Hilly	9 883	8 237	3 5863
Kalahari Sand	13 305	10 804	6 927

TABLE 3: **STANDARD BENEFITS FROM CROP PRODUCTION**

Population Density per Sq.km of Road Influence Area	STANDARD BENEFIT PER CAPITA						
	NATURAL REGION						
	II	III	IV Flat/Rolling Terrain		I	II	III
Inhabitants / sq. km	Flat/Rolling Terrain	Flat/Rolling Terrain	With draught power constraint	w/out draught power constraint	Hilly Terrain	Hilly Terrain	Hilly Terrain
2.5 – 5.0	-	-	-	158	-	-	-
5.1 – 7.5	-	-	-	433	-	-	-
7.6 – 10.0	-	-	-	452	-	-	-
10.1 – 15.0	504	388	193	560	-	-	-
15.1 – 20.0	484	372	182	562	-	-	-
20.1 – 30.0	504	388	168	511	-	587	208
30.1 – 40.0	322	246	109	415	-	459	197
40.1 – 50.0	141	108	61	-	455	296	153
50.1 – 60.0	97	75	46	-	321	186	94
60.1 – 70.0	-	-	37	-	215	124	47
70.1 – 80.0	-	-	-	-	150	76	-
80.1 – 90.0	-	-	-	-	96	59	-
90.1 – 100.0	-	-	-	-	60	-	-
>100	-	-	-	-	33	-	-

NOTE: This Standard Benefit Table is valid for all Natural Region I to II areas in all provinces, except for Natural Region IV areas in the Matabeleland Provinces (Except Binga District)

The Standard Benefits for Natural Region IV – With draught power constraint refer to Tsetse Control Areas effective 1983. They are valid only for Natural Region IV areas in the following districts Binga, Kariba, Gokwe, Hurungwe, Guruve, Mt. Darwin, Rushinga and Mudzi.

TABLE 4: STANDARD BENEFITS FROM CROP PRODUCTION (CATTLE AREAS)

Population Density per Sq. km of Influence Area	Standard Benefit per Present Head of Cattle (in $) in Natural Reg. IV)	Population Density per Sq. Km of Influence Area	Standard Benefit per Present Head of Cattle (in $) in Natural Reg. IV
2.5 – 5.0	100	20.1 – 30.0	75
5.1 – 7.5	108	30.1 – 40.0	53
7.6 – 10.0	119	40.1 – 50.0	30
10.1 – 15.0	112	> 50	20
15.1 – 20.0	102		

NOTE: This Standard Benefit Table is valid for all Natural Region IV areas in Matabeleland North and South (except Binga)

TABLE 5: STANDARD BENEFITS FROM LIVESTOCK PRODUCTION (CATTLE AREAS)

Cattle Density per Sq. Km of Influence area	Standard Benefit per Present Head of Cattle ($)	
	Natural Region IV	Natural Region V
01 – 4.0	492	424
4.1 – 8.0	264	246
8.1 – 12.0	260	243
12.1 – 16.0	254	240
16.1 – 20.0	254	239
20.1 – 24.0	248	233
24.1 – 28.0	206	199
28.1 – 32.0	142	132
32.1 – 36.0	127	107
36.1 – 40.0	91	64
> 40	82	61

NOTE: This Standard Benefit Table is valid for all Areas in Matabeleland North and South (Natural Regions IV and V) as well as for all Natural Region V areas in the other Provinces. There are no cattle benefits in Natural Region IV in Binga District.

ANNEX 6

Accelerating Malawi's Economic Growth

DEVELOPMENT OF MALAWI RURAL ROAD PROGRAMME

PRESENTATION TO MOZAMBIQUE STUDY TOUR TEAM – 16 SEPT 2009

NATIONAL TRANSPORT POLICY

Accelerating Malawi's economic growth

- Overall Policy Goal
  - Coordinated transport environment that fosters
    - Safe
    - Competitive
    - Financially sustainable
    - Environmentally friendly
- Road Transport Policy Goal
  - Creation of environment that meets current and future needs through the provision of
    - Adequate
    - Safe
    - Reliable
    - Efficient
    - Economical

ROAD SECTOR REFORMS

Accelerating Malawi's economic growth

- Prior to 1998, road maintenance and construction was largely under the Ministry of Works and Supplies (now Ministry of Transport and Public Infrastructure) with funding based on appropriations from the Ministry of Finance.

- However, allocation of financial resources to the road sector did not match with the maintenance requirements on the ground due to poor state of the country's economy and competing demands from other sectors. As a result, service delivery on road infrastructure development and management deteriorated considerably, a situation that manifested in the poor state of the road infrastructure during the early 1990s.

ROAD SECTOR REFORMS (CONT'D)

Accelerating Malawi's economic growth

- This led to road sector reforms, which were set in motion by Road Maintenance Initiative (RMI) Studies in 1995 following Government decision to effectively address road infrastructure development, management, and funding problems.

- The principle was to sustain the road network investment through a targeted approach to revenue generation from the road users and the establishment of an agency outside the public service to manage the road network and account for the resources against tangible achievements in road infrastructure development and management

ROAD SECTOR REFORMS (CONT'D)

Accelerating Malawi's economic growth

- Continuing reforms in 2006, aimed at improving accountability and transparency, resulted in the separation of the National Roads Authority into Roads Authority (Act No. 3 of 2006) and Roads Fund Administration (Act No. 4 of 2006). The Boards for these organisations were appointed in November 2006, and the new organisations were fully established by 1 July 2007.

ROADS AUTHORITY ESTABLISHMENT

Accelerating Malawi's economic growth

- The Board comprises 10 members including 2 Ex officio members.

Altogether the Roads Authority has 96 members of staff.

1. Head Office has a total of 51 members of staff including

2. Regional Office – North, has a total 12 members of staff including 1 Regional Engineer, 2 Maintenance Engineers, 3 Road Inspectors (Each assigned specific Districts to oversee)

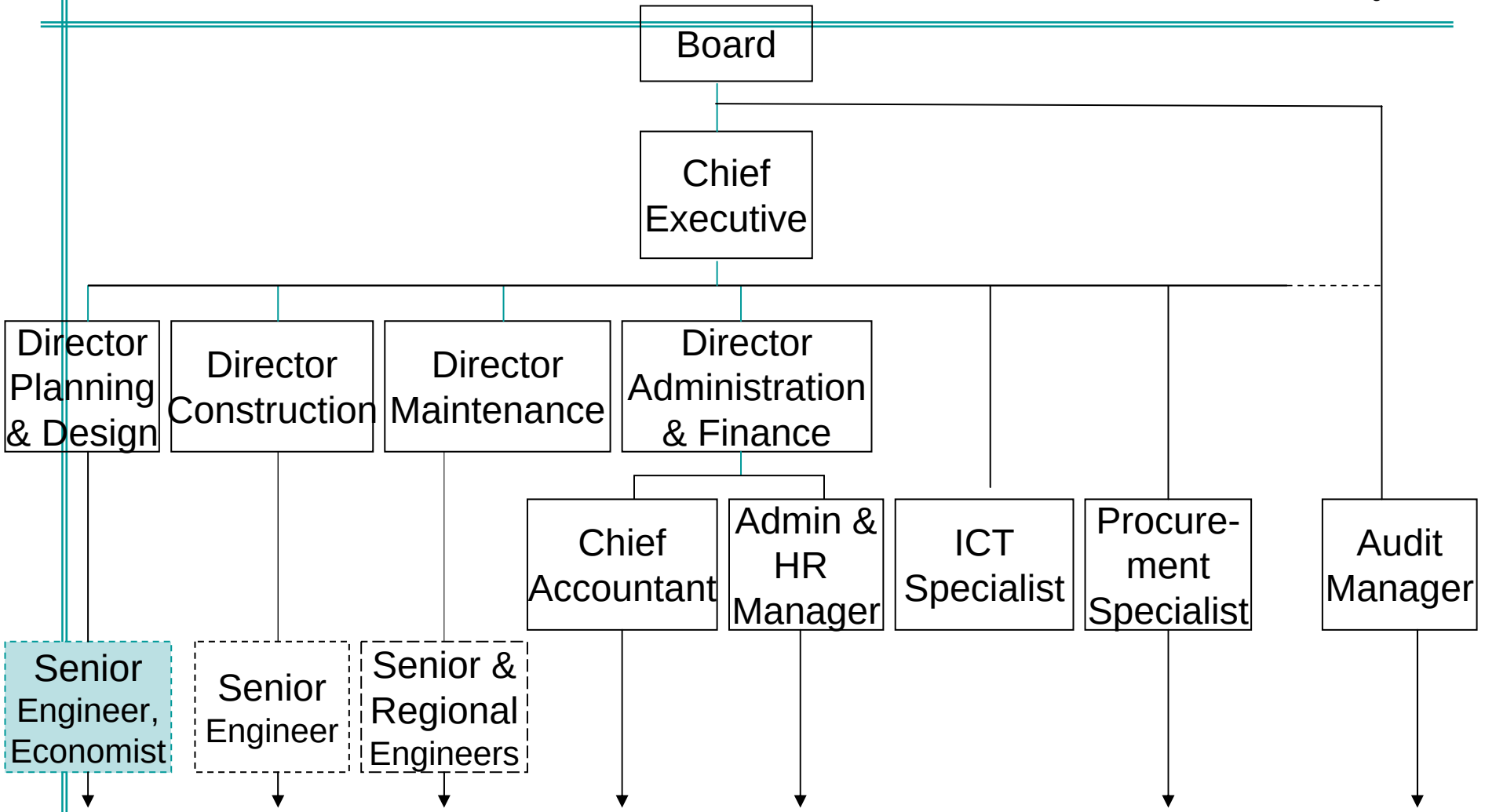
3. Regional Office – Centre has 14 members of staff including 1 Regional Engineer, 2 Maintenance Engineers, 4 Road Inspectors

4. Regional Office – South has 19 members of staff including 1 Regional Engineer, 3 Maintenance Engineers, 5 Road Inspectors

ROADS AUTHORITY ESTABLISHMENT (CONT'D)

ROADS AUTHORITY MANAGEMENT

Accelerating Malawi's economic growth



PURPOSE OF THE ROADS AUTHORITY

Accelerating Malawi's economic growth

The purpose of the Authority shall be to:

(a) ensure that public roads are constructed, maintained or rehabilitated at all times

(b) advise the Minister and, where appropriate, the Minister responsible for Local Government on the preparation and the efficient and effective implementation of the annual national roads programme.

ROAD INFRASTRUCTURE DEVELOPMENT AND MANAGEMENT

Accelerating Malawi's economic growth

- Currently the implementation of the road infrastructure development and management programmes is based on the NRA's 5 Year (2006 – 2011) Rolling Strategic and Business Plan *under review)* and the Road Sector Programme *(under review)* that answers the Malawi Growth and Development Strategy which underscores the fact that effective transport infrastructure is a prerequisite to sustainable economic growth.

- In accordance with Roads Authority and Roads Fund Administration Acts roads projects are contained in the Annual National Roads Programme (ANRP) which is approved by the Minister responsible for public roads by March.

- In the preparation of the ANRP, the Roads Authority consults and liaises with the stakeholders including local assemblies and Roads Fund Administration. **Only projects appearing in the ANRP can be funded by Roads Fund Administration**

ROAD INFRASTRUCTURE DEVELOPMENT AND MANAGEMENT (CONT'D)

Accelerating Malawi's economic growth

- The major guiding principle in the road investment infrastructure management and development to ensure that good roads remain good. Therefore routine and periodic maintenance interventions are of paramount importance.

- However, some roads are not in a condition where routine or periodic maintenance is effective or economic. Hence rehabilitation (backlog maintenance).

- In order to answer to MGDS, earth roads have to be upgraded to bitumen standards. Hence studies for economic appraisals and upgrading projects of economically, socially and strategically justified roads

ROAD INFRASTRUCTURE DEVELOPMENT AND MANAGEMENT (CONT'D)

Accelerating Malawi's economic growth

PUBLIC ROAD NETWORK

Road Class	Pavement Type		Total (km)
	Paved (km)	*Unpaved (km)*	
Main	2,809	548	3,357
Secondary	407	2,718	3,125
Tertiary	44	4,077	4,121
District	15	3,485	3,500
Urban	770	578	1,348
Total	**4,045**	**11,406**	**15,451**

About 75% of the network is unpaved. From recent reclassification studies, approximately 10,000km will be added to the public roads network

ROAD INFRASTRUCTURE DEVELOPMENT AND MANAGEMENT (CONT'D)

Accelerating Malawi's economic growth

CURRENT AND DESIRED ROAD INFRASTRUCTURE STATUS

- Current condition
  - Paved - 79% good, 19% fair and 2% poor
  - Unpaved – 14% good, 46% fair and 40% poor

- Desired Condition by 2011 *(under review)*
  - Paved - 81% good and 19% fair
  - Unpaved – 50% good, 40% fair and 10% poor

2009/10 ANNUAL NATIONAL ROADS PROGRAMME SUMMARY

Accelerating Malawi's economic growth

RECURRENT PROGRAMMES

- Planning and Design Services
- Maintenance and Rehabilitation
- Routine Maintenance (Performance based)
- Grading and Reshaping
- Spot Rehabilitation of Earth Roads
- Spot Periodic and Rehabilitation of Paved Roads
- Routine Pothole Patching
- Timber Bridges Replacement with Concrete

2009/10 ANNUAL NATIONAL ROADS PROGRAMME SUMMARY (CONT'D)

Accelerating Malawi's economic growth

- Routine Road Marking
- Road Reserve Demarcation
- Accident Spot Improvement
- Routine Road Signs Replacement
- Routine Spot Repairs
- Community Roads (Routine and Periodic)
- Special Backlog Maintenance of Urban Paved Roads
- Road Condition Assessment, Traffic Survey and Road Inventory
- Research and Development

2009/10 ANNUAL NATIONAL ROADS PROGRAMME SUMMARY (CONT'D)

Accelerating Malawi's economic growth

DEVELOPMENT

- Periodic Maintenance
- Rehabilitation
- Upgrading
- Feasibility and Design Studies

IMPLEMENTATION OF ANNUAL NATIONAL ROADS PROGRAMME

Accelerating Malawi's economic growth

- All works projects including supervision and road studies are outsourced
- Roads Authority (RA) plans, prepares road works programmes for construction, rehabilitation and maintenance annually
- RA packages works and tenders them out and enters into contract with contractors and consultants on behalf of Government

CHALLENGES AND PROPOSED INTERVENTIONS

Accelerating Malawi's economic growth

- Vandalism of road furniture
  - Impacts
    - Road safety compromised
    - Replacement deprives other roads scarce resources
  - Proposed interventions
    - Sensitization at local level

CHALLENGES AND PROPOSED INTERVENTIONS Cont..

Accelerating Malawi's economic growth

- Encroachment into road reserve
  - Impacts
    - Unnecessary and costly compensation
    - Delayed implementation of projects
  - Proposed interventions
    - Sensitization at local level

CHALLENGES AND PROPOSED INTERVENTIONS Cont..

Accelerating Malawi's economic growth

- High construction and maintenance needs
  - Impacts
    - Increased backlog maintenance
    - High vehicle operating costs
    - Reduced economic activities
  - Proposed interventions
    - Increased funding level from existing local revenue bases
    - Consider introducing other revenue bases
    - Increased government appropriation
    - Develop innovative low-cost options

CHALLENGES AND PROPOSED INTERVENTIONS Cont..

Accelerating Malawi's economic growth

- **Weak construction industry**
  - Impacts
    - Delayed implementation of projects
    - Inability to adopt new and cost-effective construction techniques
    - Compromised quality of finished works
  - **Proposed interventions**
    - Empower contractors to acquire plant and equipment through
      - Deliberate work continuity
      - Government guaranteed Loan facilities
    - Re-introduction of diploma/technician courses at the University

CHALLENGES AND PROPOSED INTERVENTIONS Cont..

Accelerating Malawi's economic growth

- **Surtax charges on road works**
  - Impacts
    - Resources earmarked for road works less by surtax percentage (16.5%) in real terms
  - **Proposed interventions**
    - Road works to be exempted from surtax since the Roads Fund is already a tax

CHALLENGES AND PROPOSED INTERVENTIONS Cont..

Accelerating Malawi's economic growth

- **Stakeholder input**
  - Impacts
    - Delayed implementation of projects
    - Compromised quality of works due to either no plans or hastened planning
    - Costly projects when planning comes after tendering process
    - Departure from planned programmes
  - **Proposed interventions**
    - Stakeholder input to come at projects' identification and planning stage

CHALLENGES AND PROPOSED INTERVENTIONS Cont..

Accelerating Malawi's economic growth

- **Role of Assemblies as Road Agencies as part of the decentralization process**
  - Impacts
    - Roads Authority's lacking concentrated efforts on public road network
    - High priority roads suffering at the expense of undesignated roads
  - **Proposed interventions**
    - Decentralization process to be concluded for Assemblies to start working as Road Agencies
    - Establish a proper allocation of resources amongst different classes of roads

CHALLENGES AND PROPOSED INTERVENTIONS Cont..

Accelerating Malawi's economic growth

- **Non-programmed projects**
  - Impacts
    - Programmed projects suffer
  - **Proposed interventions**
    - All non-programmed projects to come with funding

END OF PRESENTATION

Thank you all for your attention

Accelerating Malawi's economic growth

Questions and comments

ANNEX 7

DFID Department for International Development

The Africa Community Access Programme (AFCAP)

Update on Progress
Malawi Study Tour to Mozambique
September 2009

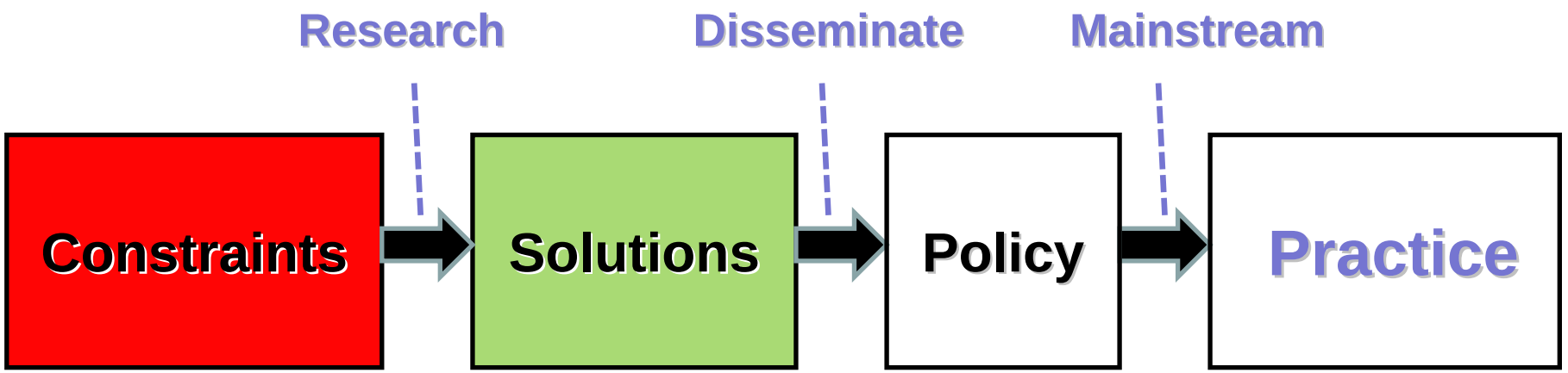
Robert Geddes
Technical Manager

Crown Agents

What is AFCAP?

- AFCAP is a UK government (DFID) funded knowledge and research programme for Africa
- Mozambique, Ethiopia, Tanzania, Kenya and Malawi are the first countries to participate
- Expanding into West Africa (Ghana, Burkina Faso, Cameroon) + Regional organisations (SADC, ECOWAS)
- AFCAP supports projects that promote safer and more sustainable access for rural communities
- AFCAP has a budget of £7.5million over 5 years from 2008 (small but strategic contribution)
- Crown Agents management team.

AFCAP Approach



Constraints

- Institutional:
  - Lack of clear national policies for rural transport
  - Inadequate capacity in road sector agencies and in the private sector
  - Lack of transport services.
- Technical:
  - Poor quality construction materials
  - Black cotton soils or sand
  - Slopes
  - Lack of appropriate national design standards
  - Low traffic levels.

AFCAP Four Way Test

Does the project have strong local ownership?

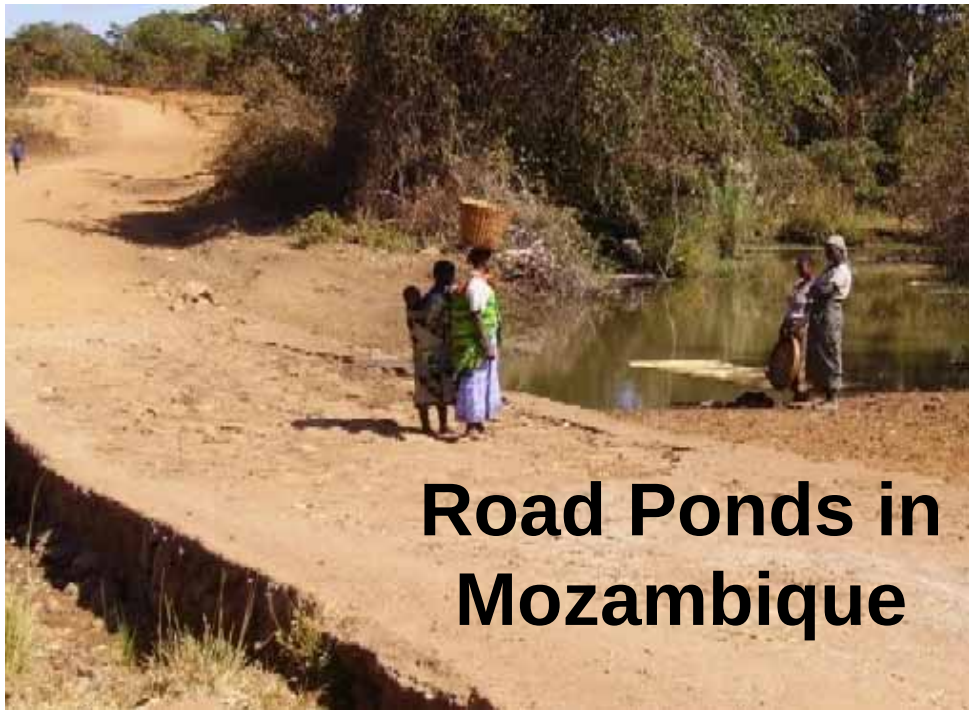
Does the project include mainly research or knowledge dissemination?

Will the project contribute to sustainable improvements to rural transport?

Will the project contribute to building national or regional capacity?

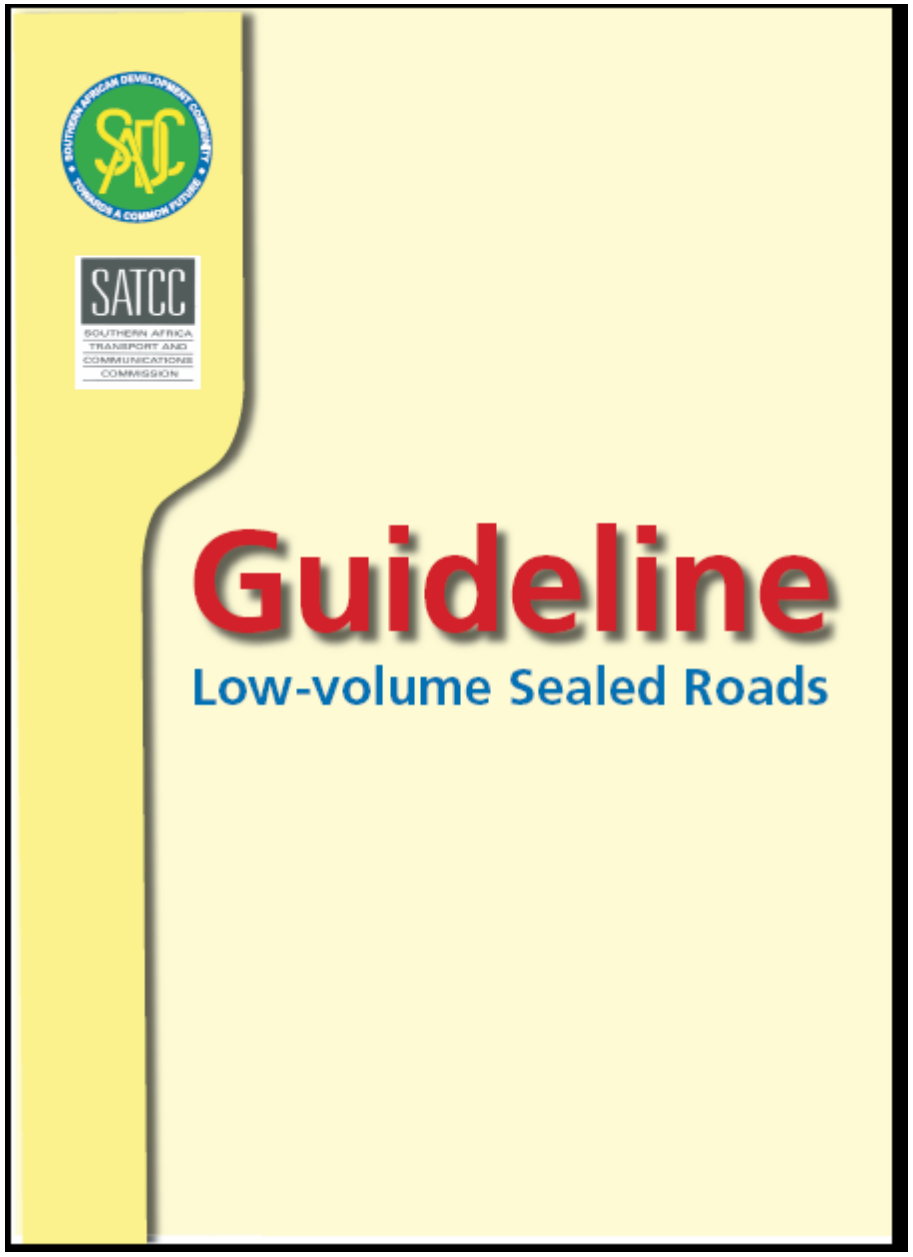
- Demonstration sites
- Technical Monitoring
- Design standards
- Specifications

- Workshops
- Seminars
- Study tours



Condition monitoring study

Low Volume Sealed Roads



Low Volume Sealed Roads in Malawi

AFCAP support:

Institutionalising SADC Guideline recommendations in Malawi through:

- Evidence-based review of existing Low Volume Sealed Road standards (convince the sceptics!)
- Leading to preparation of Design Manual for LVSR (possible).

Area Based Road Maintenance System

Malawi Unpaved Rural Roads Programme

- o Upgrade 10,000km district roads to engineered earth standard
- o Install maintenance system

AFCAP Support

- o Study tour to maintenance camps in Mozambique.

Summary

- AFCAP is active in Mozambique and Malawi
- In Mozambique
  - Support to Targeted Interventions under the RRIP
  - Feasibility study of Road Ponds
  - Condition monitoring study
- In Malawi:
  - Review of Design Standards for Low Volume Sealed Roads
  - Study tour to Mozambique maintenance camps
  - Other projects emerging from Priorities Workshop (July).

DFID Department for International Development

The Africa Community Access Programme (AFCAP)

The End

Crown Agents

ANNEX 8

AFRICA COMMUNITY ACCESS PROGRAMME (AFCAP)

STUDY TOUR OF MALAWI ROAD SECTOR REPRESENTATIVES TO THE MOZAMBIQUE AREA BASED ROAD MAINTENANCE PROGRAMME

SEPTEMBER 2009

EVALUATION FORMAT

This evaluation framework has been developed to assist the study tour group in drawing useful experiences from the Mozambique Area Based Road Maintenance System. It is based on the documented knowledge of the Zimbabwe DDF rural road maintenance system, and the identified reasons for success of the DDF system, which partly inspired the Mozambican ABMS. For each key issue space is provided to comment on the Mozambique experiences and relevance to application in Malawi.

KEY ASPECT	DDF FEATURE?	ZAMBEZIA FEATURE?	COMMENTS RELEVANT TO APPLICATION IN MALAWI
1. Funding: *Government has been convinced of the importance of Routine Maintenance and is willing to fund it sufficiently.*	Willingness but lack of resources.	Yes, but insufficient resources to fully fund.	Yes, but insufficient resources to fully fund.
2. Technology: *Maximises the use of appropriate, low-cost, local-resource-based technologies (regional equipment manufacture & local labour).*	Yes. Alternative systems might have collapsed	Yes	Tendency to use motor graders. Need to convince decision makers. Need to show lower costs. Towed graders bought under previous programmes are rotting in the yard. Should it be a contractor's decision? Heavy graders can damage roads.
3. Strategy: *Roads are initially brought to a "Maintainable" condition under a separate operation.*	Yes	Not all roads were built to a "maintainable" condition.	Higher traffic roads should be rehabilitated and regravelled and put under maintenance. Lower traffic roads might not need gravelling depending on soils. Drainage structures might be required.
4. Strategy: *Routine Maintenance is carried out as a 'Routine' activity. Once set up it is a logistical, rather than technical challenge.*	Yes	System established but not fully understood by implementers. Need for ongoing training. Implementation affected by change of supervisor and delayed start to 2009 contact. From 2010 will have 2 year contracts.	Grading sometimes carried out in dry season due to lack of capacity of contractors to procure graders. Consultants instruct the contractors and supervise the works. Capacity of consultants is a constraint. Insufficient inspectors and inadequate experience.
5. Flexibility: *System is adapted to local and seasonal maintenance requirements. Sufficient flexibility to tackle emergencies.*	Yes	Too much flexibility.	Have guidelines for sequence and timing of activities but not fully implemented yet. Current system is highly flexible. RA staff guide the consultants.
6. Management: *Efficient organisation & management systems result in low management costs.*	Force account is efficient in principle. Depends on self motivation of management.	Less efficient than DDF, but no less efficient than other systems using consultants and contractor.	No less efficient than other systems using consultants and contractor.
7. Management: *System is freed from bureaucratic constraints of the civil service.*	No completely free. Some political interference.	Bureaucratic constraints.	Government (Office of Director of Public Procurement) no objection before signing contracts.
8. Management: *Managers able to motivate*	Difficult to motivate	Inspectors and contractor staff lack	Motivation depends of management of consultants and

staff to achieve performance. Field managers involved in work planning.	staff when resources were constrained.	motivation due to lack of experience and confidence. Training required. Lack of continuity of work affects motivation. Contractors delay invoices and don't pay workers.	contractors.
9. Human Resource Development: *Ongoing programme of training & re-training.*	Yes. In-house and on the job training.	More training required.	Courses are available. NCIC offers training for contractors. Re-establishing technician training. District assembly training through INSTAP.
10. Equipment: *Effective equipment funding and replacement policy. Effective maintenance results in long equipment operating lives (about 10,000 hours per tractor).*	Yes, but replacement constrained by funds. Increased service intervals.	Provision of equipment should not be a constraint but not always well managed by contractors.	Insufficient equipment, especially graders.
11. Cost effectiveness: *The system is more cost effective for maintenance of the roads than other options.*	Reviews have shown system to be cost effective. Cost $500 per km per annum excluding management.	Kfw study (2006) showed system to be cost effective. Concern about cost effectiveness for very low traffic roads. Average costs $1200 - $1500 per km per annum (includes some regravelling) – ***to be confirmed.***	To be confirmed.
12. Monitoring: *Effective performance monitoring enables improvements to the system.*	Monthly returns from each camp analyzed at head office.	ANE Delegate monitoring work. Road Fund also monitoring – technical audits of 4 provinces per year.	RA has internal technical and financial auditors. Annual external technical audits. Road Fund monitoring.

ANY FURTHER COMMENTS OR OBSERVATIONS OF RELEVANCE TO THE DEVELOPMENT OF THE MALAWI UNPAVED ROAD PROGRAMME (MURP)? Consider especially:

- **The MURP plans to improve and maintain most of the roads at earth standard with spot improvements**
- **The requirements of the planned local private sector implementation of works, and supervision arrangements?**

- Anticipate that more roads will need to be graveled than currently estimated.
- RA currently planning to maintain roads (10,000km) through the existing Term Maintenance Contract system, and a decision has been made to place some roads under Performance Based Contracts. Decision to change to area based system should be made early because camps ideally should be built during rehabilitation phase.
- Need to promote concept of towed graders in Malawi.
- Can RA own maintenance camps? The Ministry already has camps but decision was made not to transfer them to RA.
- Delay in the award of contracts is highly damaging, particularly if reshaping cannot be carried out during the wet season. Less risky in Malawi where financial year runs from June to July.